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* Nomenclature of Amino-Acids

In Review Articles it will be that agreed upon by the Editors of the *Journal of the Chemical Society* and of the *Biochemical Journal* published in *Biochem. J.*, 1948, 42, 1.

In Abstracts the nomenclature will be that used in the paper being abstracted.



LIST OF JOURNALS SCRUTINISED

(Arranged alphabetically according to Contracted Title)

<i>Title of Journal</i>	<i>Contracted Title</i>	<i>Last Number Scrutinised</i>	<i>Place of Publication</i>
Acta Academiae Scientiarum Naturalium Moravo-Silesiace	Acta Acad. Sci. Nat. Moravo-Siles.	1952, 24	Brno, Czechoslovakia
Acta Agraria Fennica	Acta agral. fenn.	1953, 82, No. 1/2	Helsinki, Finland
Acta Agriculturae Scandinavica	Acta Agric. scand.	1954, 4, No. 3	Stockholm, Sweden
Acta Agronomica	Acta agronom., Colombia	1954, 4, No. 3	Palmira, Colombia
Acta Biologica Hungarica	Acta biol. hung.	1953, 4, No. 3/4	Budapest, Hungary
Acta Chemica Scandinavica	Acta chem. scand.	1954, 8, No. 5	Copenhagen, Denmark
Acta Chimica Hungarica	Acta chim. hung.	1954, 4, No. 1	Budapest, Hungary
Acta Cientifica Venezolana	Acta cientif. venezol.	1953, 4, No. 5	Caracas, Venezuela
Acta Gastro-Enterologica Belgica	Acta gastro-enterol. belg.	1954, 17, No. 8/9	Brussels, Belgium
Acta Gerontologica	Acta gerontol.	1954, 4, No. 1	Milan, Italy
Acta Leidensia	Acta leidensia	1953, 23	Leyden, Holland
Acta Medica et Biologica	Acta med. biol.	1954, 2, No. 1	Kilgata, Japan
Acta Medica Hungarica	Acta med. hung.	1954, 5, No. 3/4	Budapest, Hungary
Acta Medica Jugoslavica	Acta med. jugoslav.	1954, 8, No. 1	Belgrade, Yugoslavia
Acta Medica Philippina	Acta med. philipp.	1952-53, 8, No. 4	Manila, Philippines
Acta Medica Scandinavica	Acta med. scand.	1954, 149, No. 5	Stockholm, Sweden
Acta Paediatrica	Acta paediat.	1954, 43, No. 4	Stockholm, Sweden
Acta Paediatrica Belgica	Acta paediat. belg.	1954, 8, No. 2	Brussels, Belgium
Acta Pathologica et Microbiologica Scandinavica	Acta pathol. microbiol. scand.	1954, 35, No. 1	Copenhagen, Denmark
Acta Physiologica Hungarica	Acta physiol. hung.	1954, 6, No. 1	Budapest, Hungary
Acta Physiologica et Pharmacologica Neerlandica	Acta physiol. pharmacol. neerl.	1954, 3, No. 1	Amsterdam, Holland
Acta Physiologica Scandinavica	Acta physiol. scand.	1954, 31, No. 2/3	Stockholm, Sweden
Acta Radiologica	Acta radiol.	1954, 42, No. 2	Stockholm, Sweden
Acta Scholae Medicinalis in Kioto	Acta Scholae med. Univ. Kioto	1954, 31, No. 3	Kioto, Japan
Acta Societatis Medicorum Upsalienis	Acta Soc. Med. upsalien.	1954, 59, No. 3/4	Uppsala, Sweden
Acta Veterinaria	Acta vet., Belgrade	1954, 4, No. 2	Belgrade, Yugoslavia
Acta Vitaminologica	Acta vitaminol.	1954, 8, No. 2	Milan, Italy
Advances in Biological and Medical Physics	Advances in Biol. Med. Phys.	1953, 3	New York, U.S.A.
Advances in Carbohydrate Chemistry	Advances in Carbohydrate Chem.	1953, 8	New York, U.S.A.
Advances in Enzymology	Advances in Enzymol.	1954, 15	New York, U.S.A.
Advances in Food Research	Advances in Food Res.	1954, 5	New York, U.S.A.
Advances in Protein Chemistry	Advances in Protein Chem.	1953, 8	New York, U.S.A.
Advances in Veterinary Science	Advances in Vet. Sci.	1953, 1	London, England
Agricultural Engineering	Agric. Eng.	1954, 35, No. 8	St. Joseph, Mich., U.S.A.
Agricultural Gazette of New South Wales	Agric. Gaz. N.S.W.	1954, 65, No. 6	Sydney, Australia
Agricultural Progress	Agric. Progress	1953, 28, No. 2	London, England
Agriculture, Journal of the Ministry of Agriculture	Agriculture, J. Minist. Agric. Engl.	1954, 61, No. 6	London, England
Agrobiologia	Agrobiologia	1953, No. 6	Moscow, U.S.S.R.
Agronomy Journal	Agronom. J.	1954, 46, No. 4	Washington, D.C., U.S.A.
Agronomia Lusitana	Agronom. lusitana	1953, 15, No. 4	Alcobaca, Portugal
Akusherstvo i Ginekologiya	Akusherstvo Ginekol.	1953, No. 5	Moscow, U.S.S.R.
American Economic Review	Amer. Econ. Rev.	1954, 44, No. 3	Menasha, Wis., U.S.A.
American Heart Journal	Amer. Heart J.	1954, 48, No. 1	St. Louis, Mo., U.S.A.
American Journal of Anatomy	Amer. J. Anat.	1954, 95, No. 1	Philadelphia, Pa., U.S.A.
American Journal of Clinical Nutrition	Amer. J. Clin. Nutrit.	1954, 2, No. 3	Allentown, Pa., U.S.A.
American Journal of Digestive Diseases	Amer. J. Digest. Dis.	1954, 21, No. 8	Fort Wayne, Ind., U.S.A.
American Journal of Diseases of Children	Amer. J. Dis. Child.	1954, 88, No. 2	Chicago, Ill., U.S.A.
American Journal of Medicine	Amer. J. Med.	1954, 16, No. 6	New York, U.S.A.
American Journal of Medical Sciences	Amer. J. Med. Sci.	1954, 228, No. 2	Philadelphia, Pa., U.S.A.
American Journal of Obstetrics and Gynecology	Amer. J. Obstet. Gynecol.	1954, 67, No. 6	St. Louis, Mo., U.S.A.
American Journal of Ophthalmology	Amer. J. Ophthalmol.	1954, 38, No. 2	Menasha, Wis., U.S.A.
American Journal of Orthopsychiatry	Amer. J. Orthopsychiat.	1954, 24, No. 2	Menasha, Wis., U.S.A.
American Journal of Pathology	Amer. J. Pathol.	1954, 30, No. 4	Ann Arbor, Mich., U.S.A.
American Journal of Physical Anthropology	Amer. J. Phys. Anthropol.	1954, 12, No. 2	Philadelphia, Pa., U.S.A.
American Journal of Physiology	Amer. J. Physiol.	1954, 178, No. 1	Baltimore, Md., U.S.A.
American Journal of Surgery	Amer. J. Surg.	1954, 88, No. 2	New York, U.S.A.

<i>Title of Journal</i>	<i>Contracted Title</i>	<i>Last Number Scrutinised</i>	<i>Place of Publication</i>
American Journal of Veterinary Research	Amer. J. Vet. Res.	1954, 15, No. 56	Chicago, Ill., U.S.A.
Analytical Chemistry	Anal. Chem.	1954, 26, No. 8	Washington, D.C., U.S.A.
Analytica Chimica Acta	Anal. chim. Acta	1954, 10, No. 6	Amsterdam, Holland
Analyst	Analyst	1954, 79, No. 942	London, England
Anatomical Record	Anat. Rec.	1954, 119, No. 2	Philadelphia, Pa., U.S.A.
Annals da Faculdade de Medicina da Universidade de São Paulo	An. Fac. Med. Univ. São Paulo	1952, 22, No. 3	São Paulo, Brazil
Annals do Instituto de Medicina Tropical	An. Inst. Med. trop.	1953, 10, No. 2	Lisbon, Portugal
Annales Instituto Nacional de Investigaciones Agronomicas Madrid	An. Inst. Nac. Invest. Agron. Madrid	1954, 3, No. 2	Madrid, Spain
Angewandte Chemie	Angew. Chem.	1954, 66, No. 17/18	Weinheim, Germany
Annales de l'Institut National de la Recherche Agronomique. A. Annales Agronomiques	Ann. agronom.	1954, 5, No. 3	Paris, France
Annals of Applied Biology	Ann. Appl. Biol.	1954, 41, No. 2	Cambridge, England
Annales de Chimie	Ann. Chim., Paris	1954, 9, June	Paris, France
Annals of Human Genetics	Ann. Human Genetics	1954, 19, No. 1	London, England
Annales de l'Institut Pasteur	Ann. Inst. Pasteur	1954, 87, No. 1	Paris, France
Annals of Internal Medicine	Ann. Int. Med.	1954, 41, No. 2	Ann Arbor, Mich., U.S.A.
Annales Medicinales Experimentales et Biologiques Fenniae	Ann. Med. exp. Biol. Fenn.	1954, 32, No. 2	Helsinki, Finland
Annales Medicinales Internae Fenniae	Ann. Med. Int. Fenn.	1954, 43, No. 2	Helsinki, Finland
Annales de la Nutrition et de l'Alimentation	Ann. Nutr. Alimentation	1954, 3, No. 3/4	Paris, France
Annales d'Oculistique	Ann. Oculist.	1954, 137, No. 7	Paris, France
Annals of Otolaryngology and Laryngology	Ann. Otol. Rhinol. Laryngol.	1954, 63, No. 1	St. Louis, Mo., U.S.A.
Annales Pediatricae	Ann. paediat.	1954, 133, No. 3	Basle, Switzerland
Annales de Parasitologie Humaine et Comparée	Ann. Parasitol.	1954, 29, No. 3	Paris, France
Annales Pharmaceutiques Françaises	Ann. pharm. franç.	1954, 12, No. 5	Paris, France
Annals of Science	Ann. Sci.	1954, 10, No. 1	London, England
Annales de la Société Belge de Médecine Tropicale	Ann. Soc. belg. Méd. trop.	1954, 34, No. 2	Brussels, Belgium
Annals of Surgery	Ann. Surg.	1954, 140, No. 1	Philadelphia, Pa., U.S.A.
Annals of Tropical Medicine and Parasitology	Ann. Trop. Med. Parasitol.	1954, 48, No. 2	Liverpool, England
Annales de l'Institut National de la Recherche Agronomique. S. D. Annales de Zootechnie	Ann. Zootech.	1954, 2, No. 2	Paris, France
Annual Review of Biochemistry	Annua. Rev. Biochem.	1954, 23	California, U.S.A.
Annual Review of Medicine	Annua. Rev. Med.	1954, 5	California, U.S.A.
Annual Review of Microbiology	Annua. Rev. Microbiol.	1954, 8	Stanford, Calif., U.S.A.
Annual Review of Physiology	Annua. Rev. Physiol.	1954, 16	California, U.S.A.
Antiseptic	Antiseptic	1954, 51, No. 8	Madras, India
Antonie van Leeuwenhoek Journal of Microbiology and Serology	Antonie van Leeuwenhoek J. Microbiol. Serol.	1954, 20, No. 3	Amsterdam, Holland
Applied Statistics. A Journal of the Royal Statistical Society	Appl. Statistics	1954, 3, No. 1	London, England
Arbeitsphysiologie	Arbeitsphysiologie	1953, 15, No. 4	Berlin - Göttingen - Heidelberg, Germany
Archives of Biochemistry and Biophysics	Arch. Biochem. Biophys.	1954, 62, No. 1	New York, U.S.A.
Archives of Disease in Childhood	Arch. Dis. Childhood	1954, 29, No. 146	London, England
Nannyn-Schmiedeberg's Archiv für Experimentelle Pathologie und Pharmacologie	Arch. exp. Pathol. Pharmacol.	1954, 223, No. 2	Berlin - Göttingen - Heidelberg, Germany
Archivio di Fisiologia	Arch. Fisiol.	1954, 54, No. 1	Florence, Italy
Archiv für Gefäßkunde	Arch. Gefäßk.	1954, 18, No. 8	Stuttgart - Berlin, Germany
Archiv für Geschwulstforschung	Arch. Geschwulstforsch.	1954, 7, No. 3	Dresden - Leipzig, Germany
Archiv für Gynäkologie	Arch. Gynäkol.	1953-54, 184, No. 6	Munich, Germany
Archives of Industrial Hygiene and Occupational Medicine	Arch. Indust. Hyg.	1954, 10, No. 1	Chicago, Ill., U.S.A.
Archives de l'Institut Pasteur d'Algérie	Arch. Inst. Pasteur Algérie	1954, 32, No. 2	Algiers, Algeria
Archives Internationales de Pharmacodynamie et de Thérapie	Arch. internat. Pharmacodyn.	1954, 98, No. 2	Ghent, Belgium
Archives Internationales de Physiologie	Arch. Internat. Physiol.	1954, 62, No. 2	Liège, Belgium
Archives of Internal Medicine	Arch. Int. Med.	1954, 94, No. 2	Chicago, Ill., U.S.A.
Archivio Italiano delle Malattie dell' Apparatto Digerente	Arch. ital. Malat. Appar. diger.	1954, 20, No. 2	Bologna, Italy
Archivio Italiano di Pediatria e Puericoltura	Arch. ital. Pediat. Puericult.	1954, 16, No. 3	Bologna, Italy
Archives des Maladies de l'Appareil Digestif et des Maladies de la Nutrition	Arch. Mal. Appar. digest.	1954, 43, No. 8	Paris, France
Archiva Medica Belgica	Arch. med. belg.	1954, 9, No. 2	Brussels, Belgium
Archives of Neurology and Psychiatry	Arch. Neurol. Psychiat., Chicago	1954, 73, No. 1	Chicago, Ill., U.S.A.
Archives of Pathology	Arch. Pathol.	1954, 55, No. 1	Chicago, Ill., U.S.A.
Archives of Pediatrics	Arch. Pediat.	1954, 71, No. 7	New York, U.S.A.
Archiv der Pharmazie	Arch. Pharm.	1954, 287, No. 7	Weidenheim, Germany
Archiv für Pharmacogochem	Arch. Pharm. Chem.	1954, 81, No. 17	Copenhagen, Denmark
Archives Portugaises des Sciences Biologiques	Arch. portugaises Sci. biol.	1952-53, 11, No. 1	Lisbon, Portugal

<i>Title of Journal</i>	<i>Contracted Title</i>	<i>Last Number Scrutinised</i>	<i>Place of Publication</i>
Archiv für Protistenkunde	Arch. Protistenkunde	1954, 100, No. 1	Jena, Germany
Archiv für Psychiatrie und Nervenkrankheiten	Arch. Psychiat. Nervenkrankh.	1954, 192, No. 1/2	Berlin : Heidelberg : Göttingen, Germany
Archivio di Scienze Biologiche	Arch. Sci. biol. Bologna	1954, 38, No. 3	Bologna, Italy
Archives des Sciences Physiologiques	Arch. Sci. physiol.	1954, 8, No. 3	Paris, France
Archiv für Tierernährung	Arch. Tierernährung	1954, 4, No. 1/2	Berlin, Germany
Archivos Uruguayos de Medicina, Cirugía y Especialidades	Arch. urug. Med.	1954, 44, No. 1/2	Montevideo, Uruguay
Archivos Venezolanos de Nutrición	Arch. venezol. Nutrición	1953, 4, No. 2	Caracas, Venezuela
Archiv Pathologi	Arch. Patol.	1953, 15, No. 6	Moscow, U.S.S.R.
Arkiv för Kemi	Ark. Kemi	1953, 8, No. 4	Uppsala, Sweden
Arkiv för Zoologi	Ark. Zool.	1953, 5, No. 4	Uppsala, Sweden
Arquivos Brasileiros de Nutrição	Arq. brasil. Nutrição	1953, 9, No. 1	Rio de Janeiro, Brazil
Australian Journal of Agricultural Research	Austral. J. Agric. Res.	1954, 5, No. 3	Melbourne, Australia
Australian Journal of Biological Sciences	Austral. J. Biol. Sci.	1954, 7, No. 2	Melbourne, Australia
Australian Journal of Botany	Austral. J. Botany	1954, 2, No. 2	Melbourne, Australia
Australian Journal of Experimental Biology and Medical Science	Austral. J. Exp. Biol. Med. Sci.	1954, 32, No. 2	Adelaide, Australia
Australian Journal of Marine and Freshwater Fish	Austral. J. Marine Freshwater Res.	1954, 5, No. 3	Melbourne, Australia
Australian Journal of Zoology	Austral. J. Zool.	1954, 2, No. 1	Melbourne, Australia
Australian Veterinary Journal	Austral. Vet. J.	1954, 30, No. 6	Sydney, Australia
Bacteriological Reviews	Bacteriol. Rev.	1954, 18, No. 2	Baltimore, Md., U.S.A.
Beiträge zur Pathologischen Anatomie und zur Allgemeinen Pathologie	Beitr. pathol. Anat.	1954, 114, No. 1	Jena, Germany
Berliner und Münchener Tierärztliche Wochenschrift	Berl. Münch. tierärztl. Wochenschr.	1954, 67, No. 18	Berlin, Germany
Biochemical Journal	Biochem. J.	1954, 68, No. 1	London, England
Biochem. Zeitschrift	Biochem. Ztschr.	1954, 328, No. 7	Berlin : Göttingen : Heidelberg, Germany
Biochimica et Biophysica Acta	Biochim. biophys. Acta	1954, 15, No. 1	New York, U.S.A.
Biokhimiya	Biokhimiya	1953, 13, No. 1	Moscow, U.S.S.R.
Biological Bulletin	Biol. Bull.	1954, 106, No. 3	Lancaster, Pa., U.S.A.
Biologie Médicale	Biol. méd.	1954, 43, No. 5	Paris, France
Biological Progress	Biol. Progr.	1952, 2	New York, U.S.A.
Biological Reviews and Biological Proceedings of the Cambridge Philosophical Society	Biol. Rev.	1954, 29, No. 3	Cambridge, England
Biometrika	Biometrika	1954, 41, No. 1/2	London, England
Blood, The Journal of Hematology	Blood, J. Hematol.	1954, 9, No. 8	New York, U.S.A.
Die Bodenkultur	Bodenkultur	1953, 7, No. 3	Munich, Germany
Boletín de Instituto Nacional de Investigaciones Agronómicas	Bol. Inst. Nac. Invest. agron. Madrid	1954, 14, No. 30	Madrid, Spain
Boletino dell'Istituto Sieroterapico Milanese	Bol. Ist. sieroterap. milan.	1954, 33, No. 7/8	Milan, Italy
Boletín de la Oficina Sanitaria Panamericana	Bol. Ofic. sanit. panamer.	1954, 36, No. 6	Washington, D.C., U.S.A.
Boletino della Società Italiana di Biologia Sperimentale	Bol. Soc. ital. Biol. sper.	1954, 30, No. 4/5	Naples, Italy
Brain, A Journal of Neurology	Brain	1954, 77, No. 1	London, England
British Agricultural Bulletin	Brit. Agric. Bull.	1954, 6, No. 33	London, England
British Dental Journal	Brit. Dent. J.	1954, 97, No. 4	London, England
British Heart Journal	Brit. Heart J.	1954, 16, No. 2	London, England
British Journal of Animal Behaviour	Brit. J. Animal Behaviour	1954, 2, No. 3	London, England
British Journal of Dermatology and Syphilis	Brit. J. Dermatol.	1954, 66, No. 7	London, England
British Journal of Experimental Pathology	Brit. J. Exp. Pathol.	1954, 35, No. 4	London, England
British Journal of Industrial Medicine	Brit. J. Indust. Med.	1954, 11, No. 3	London, England
British Journal of Nutrition	Brit. J. Nutrition	1954, 8, No. 3	London, England
British Journal of Ophthalmology	Brit. J. Ophthalmol.	1954, 38, No. 8	London, England
British Journal of Pharmacology and Chemotherapy	Brit. J. Pharmacol. Chemotherapy	1954, 9, No. 2	London, England
British Journal of Preventive and Social Medicine	Brit. J. Prev. Social Med.	1954, 8, No. 3	London, England
British Journal of Radiology	Brit. J. Radiol.	1954, 27, No. 320	London, England
British Journal of Surgery	Brit. J. Surg.	1954-55, 42, No. 171	Bristol, England
British Journal of Urology	Brit. J. Urol.	1954, 26, No. 2	Bristol, England
British Medical Bulletin	Brit. Med. Bull.	1954, 10, No. 3	London, England
British Medical Journal	Brit. Med. J.	1954, No. 4389	London, England
British Veterinary Journal	Brit. Vet. J.	1954, 110, No. 9	London, England
Bulletin de l'Académie Vétérinaire de France	Bull. Acad. vét. France	1954, 27, No. 5	Paris, France
Bulletin of the Central Food Technological Research Institute	Bull. Central Food Technol. Res. Inst., Mysore	1954, 3, No. 8	Mysore, India
Bulletin of the History of Medicine	Bull. Hist. Med.	1954, 28, No. 3	Baltimore, Md., U.S.A.
Bulletin de l'Institut Agronomique et de Recherches de Gembloux	Bull. Inst. agronom. Gembloux	1954, 22, No. 1/2	Gembloux, Belgium
Bulletin of the Institute for Medical Research, University of Madrid	Bull. Inst. Med. Res., Univ. Madrid	1953, 6, No. 2/3	Madrid, Spain
Bulletin de l'Institut National d'Hygiène	Bull. Inst. nat. Hyg., Paris	1954, 9, No. 3	Paris, France

<i>Title of Journal</i>	<i>Contracted Title</i>	<i>Last Number Scrutinised</i>	<i>Place of Publication</i>
Bulletin Oxford University Institute of Statistics	Bull. Inst. Statistics, Oxford	1954, 16, No. 7/8	Oxford, England
Bulletin of the Johns Hopkins Hospital	Bull. Johns Hopkins Hosp.	1954, 95, No. 1	Baltimore, Md., U.S.A.
Bulletin de Microscopie Appliquée	Bull. Microscop. appl.	1954, 4, No. 4	Paris, France
Bulletin of the National Institute of Agricultural Sciences, Yabagi, Japan	Bull. Nat. Inst. Agric. Sci., Japan	1954, No. 8	Osaka, Japan
Bulletin de la Société de Chimie Biologique	Bull. Soc. Chim. Biol.	1954, 36, No. 4/5	Paris, France
Bulletin de la Société Chimique de France	Bull. Soc. chim. France	1954, No. 7/8	Paris, France
Bulletin de la Société de Pathologie Exotique	Bull. Soc. Pathol. exot.	1954, 47, No. 3	Paris, France
Bulletin de la Société Scientifique d'Hygiène Alimentaire	Bull. Soc. sci. Hyg. aliment.	1954, 42, No. 4/6	Paris, France
Bulletin of the World Health Organization	Bull. World Health Organiz.	1954, 11, No. 1/2	Geneva, Switzerland
Calcutta Medical Journal	Calcutta Med. J.	1954, 51, No. 6	Calcutta, India
Canadian Journal of Agricultural Science	Canad. J. Agric. Sci.	1954, 34, No. 4	Ottawa, Canada
Canadian Journal of Biochemistry and Physiology	Canad. J. Biochem. Physiol.	1954, 32, No. 5	Ottawa, Canada
Canadian Journal of Botany	Canad. J. Botany	1954, 32, No. 4	Ottawa, Canada
Canadian Journal of Chemistry	Canad. J. Chem.	1954, 32, No. 9	Ottawa, Canada
Canadian Journal of Comparative Medicine	Canad. J. Comp. Med.	1954, 18, No. 8	Quebec, Canada
Canadian Journal of Microbiology	Canad. J. Microbiol.	1954, 1, No. 1	Ottawa, Canada
Canadian Journal of Physics	Canad. J. Phys.	1954, 32, No. 8	Ottawa, Canada
Canadian Journal of Technology	Canad. J. Technol.	1954, 32, No. 4	Ottawa, Canada
Canadian Journal of Zoology	Canad. J. Zool.	1954, 32, No. 4	Ottawa, Canada
Cancer Research	Cancer Res.	1954, 14, No. 3	Chicago, Ill., U.S.A.
Časopis Lékařů Českých	Čas. Lék. čes.	1954, 93, No. 87	Prague, Czechoslovakia
Cereal Chemistry	Cereal Chem.	1954, 31, No. 4	Pennsylvania, U.S.A.
Chemist-Analyst	Chemist-Analyst	1954, 43, No. 2	Phillipsburg, N.J.
Chemistry and Industry	Chem. and Indust.	1954, No. 37	London, England
Chemické Listy	Chem. listy	1954, 48, No. 6	Prague, Czechoslovakia
Chemical Reviews	Chem. Rev.	1954, 34, No. 4	Baltimore, Md., U.S.A.
Chinese Medical Journal	Chinese Med. J.	1954, 72, No. 3	Peking, China
Chronicle of the World Health Organization	Chron. World Health Organiz.	1954, 8, No. 7/8	New York, U.S.A.
Circulation	Circulation	1954, 10, No. 2	Baltimore, Md.
Circulation Research	Circulation Res.	1954, 2, No. 4	Baltimore, Md.
Clin. Sci.	Clin. Sci.	1954, 13, No. 2	London, England
Colonial Plant and Animal Products	Colonial Plant Animal Prod.	1954, 4, No. 1	London, England
Cornell Veterinarian	Cornell Vet.	1954, 44, No. 3	Ithaca, N.Y., U.S.A.
Comptes Rendus Hebdomadaires de Séances de l'Académie des Sciences	C.R. Acad. Sci.	1954, 238, No. 23	Paris, France
Comptes Rendus des Travaux du Laboratoire Carlsberg (Série Chimique)	C.R. Lab. Carlsberg (Sér. chim.)	1954, 29, No. 5	Copenhagen, Denmark
Comptes Rendus des Travaux du Laboratoire Carlsberg (Série Physiologique)	C.R. Lab. Carlsberg (Sér. physiol.)	1950-54, 25, No. 10	Copenhagen, Denmark
Comptes Rendus des Séances de la Société de Biologie	C.R. Soc. Biol.	1954, 148, No. 5/6	Paris, France
La Crónica Médica	Crón. Méd., Lima	1952, 69, No. 1063-1066	Lima, Peru
Československá Fysiologie	Čsl. fsiol.	1954, 3, No. 3	Prague, Czechoslovakia
Dansk Tidsskrift for Farmaci	Dansk Tidsskr. Farm.	1954, 23, No. 9	Copenhagen, Denmark
Dental Journal of Australia	Dent. J. Austral.	1954, 28, No. 3	Sydney, Australia
Deutsches Archiv für Klinische Medizin	Deutsch. Arch. klin. Med.	1954, 201, No. 3	Munich, Germany
Deutsche Medizinische Wochenschrift	Deutsch. med. Wochenschr.	1954, 79, No. 39	Stuttgart, Germany
Deutsche Zeitschrift für Verdauungs und Stoffwechselkrankheiten	Deutsch. Ztschr. Verdauungs- u. Stoffwechsler.	1954, 14, No. 2/3	Leipzig, Germany
Documenta de Medicina Geographica et Tropica	Doc. Med. geogr. trop.	1954, 6, No. 9	Amsterdam, Holland
Doklady Akademii Nauk S.S.S.R.	Dokl. Akad. Nauk S.S.S.R.	1954, 95, No. 5	Moscow, U.S.S.R.
East African Agricultural Journal of Kenya, Tanganyika, Uganda and Zanzibar	East African Agric. J.	1954, 20, No. 1	Nairobi, Kenya
East African Medical Journal	East African Med. J.	1954, 31, No. 7	Nairobi, Kenya
Econ. J.	Econ. J.	1954, 64, No. 254	London, England
Economic Proceedings of the Royal Dublin Society	Econ. Proc. Royal Dublin Soc.	1953, 4, No. 2	Dublin, Republic of Ireland
Economica	Economica	1954, 21, No. 83	London, England
Edinburgh Medical Journal	Edinb. Med. J.	1954, 61, No. 8	Edinburgh, Scotland
Empire Journal of Experimental Agriculture	Empire J. Exp. Agric.	1954, 22, No. 85	Harpenden, England
Endeavour	Endeavour	1954, 13, No. 51	London, England
Endocrinology	Endocrinology	1954, 55, No. 2	Boston, Mass., U.S.A.
Enzymologia	Enzymologia	1954, 16, No. 5	Amsterdam, Holland
Experientia	Experientia	1954, 10, No. 7	Basle, Switzerland
Experimental Cell Research	Exp. Cell. Res.	1954, 7, No. 1	New York, U.S.A.
Experimental Medicine and Surgery	Exp. Med. Surg.	1954, 13, No. 2	Basle, Switzerland
Experimental Parasitology	Exp. Parasitol.	1954, 3, No. 4	New York, U.S.A.
Farm Economist	Farm Economist	1954, 7, No. 7	Oxford, England
Farming in South Africa	Farming in S. Africa	1954, 29, No. 339	Pretoria, South Africa

<i>Title of Journal</i>	<i>Contracted Title</i>	<i>Last Number Scrutinised</i>	<i>Place of Publication</i>
Federation Proceedings	Federation Proc.	1954, 13, No. 2	Baltimore, Md., U.S.A.
Fiji Agricultural Journal	Fiji Agric. J.	1953, 24, No. 1/2	Suva, Fiji
Fisheries Research Board of Canada, Progress Reports of the Atlantic Coast Stations	Fish. Res. Board Canada, Progr. Rep. Atlantic Coast Stat.	1954, No. 59	St. Andrew, N.B., Canada
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations	Fish. Res. Board Canada, Progr. Rep. Pacific Coast Stat.	1954, No. 98	Vancouver, B.C., Canada
Fiziologičeskii Zhurnal S.S.S.R. im. Sechenova	Fiziol. Zh. S.S.S.R. Sechenova	1954, 40, No. 1	Leningrad, U.S.S.R.
Folia Haematologica	Folia haematol.	1953-54, 72, No. 3	Leipzig, Germany
Food Research	Food Res.	1954, 19, No. 4	Illinois, U.S.A.
Forskning og Forsøk i Landbruket	Forskning og Forsøk Landbruket	1954, 8, No. 3	Oslø, Norway
Forsøgslaboriet København Beretning	Forsøgslab. København Beretn.	1954, No. 273	Copenhagen, Denmark
Frankfurter Zeitschrift für Pathologie	Frankfurter Ztschr. Pathol.	1954, 65, No. 2	Munich, Germany
Gastroenterologia	Gastroenterologia	1954, 82, No. 1	Basle, Switzerland
Gazzetta Chimica Italiana	Gaz. chim. Ital.	1954, 84, No. 6	Rome, Italy
Geriatrics	Geriatrics	1954, 9, No. 8	Minneapolis, Minn., U.S.A.
Gigiena i Sanitariya	Gigiena Sanit.	1954, No. 4	Moscow, U.S.S.R.
Glasgow Medical Journal	Glasgow Med. J.	1954, 35, No. 7	Glasgow, Scotland
Albrecht von Graefes Archiv für Ophthalmologie	v. Graefes Arch. Ophthalmol.	1954, 155, No. 5	Heidelberg; Berlin; Munich, Germany
Growth	Growth	1954, 18, No. 2	Philadelphia, Pa., U.S.A.
Gunma Journal of Medical Sciences	Gunma J. Med. Sci.	1954, 3, No. 1	Machabai, Japan
Guy's Hospital Reports	Guy's Hosp. Rep.	1954, 103, No. 1	London, England
Health Bulletin	Health Bull., Dept. Health Scot.	1954, 12, No. 3	Edinburgh, Scotland
Helvetica Chimica Acta	Helv. chim. Acta	1954, 37, No. 5	Basle, Switzerland
Helvetica Paediatrica Acta	Helv. paediat. Acta	1954, 8, No. 3	Basle, Switzerland
Helvetica Physiologica Pharmacologica Acta	Helv. physiol. pharm. Acta	1954, 12, No. 2	Basle, Switzerland
Hoppe-Seyler's Zeitschrift für Physiologische Chemie	Hoppe-Seyler's Ztschr.	1954, 297, No. 2	Berlin, Germany
Human Biology	Human Biol.	1954, 26, No. 1	Baltimore, Md., U.S.A.
Human Relations	Human Relations	1954, 7, No. 3	London, England
Indian Farallug	Indian Farming	1954, 4, No. 4	Delhi, India
Indian Journal of Agricultural Science	Indian J. Agric. Sci.	1954, 24, No. 2	Delhi, India
Indian Journal of Dairy Science	Indian J. Dairy Sci.	1954, 7, No. 2	Bangalore, India
Indian Journal of Malariology	Indian J. Malariol.	1954, 8, No. 1	Calcutta, India
Indian Journal of Medical Research	Indian J. Med. Res.	1954, 42, No. 2	Calcutta, India
Indian Journal of Pediatrics	Indian J. Pediat.	1954, 21, No. 86	Calcutta, India
Indian Journal of Physiology and Allied Sciences	Indian J. Physiol. Allied Sci.	1954, 8, No. 1	Calcutta, India
Indian Journal of Veterinary Science and Animal Husbandry	Indian J. Vet. Sci.	1954, 24, No. 2	Delhi, India
Indian Medical Gazette	Indian Med. Gaz.	1954, 89, No. 3	Calcutta, India
Indonesian Journal of Natural Science	Indonesian J. Nat. Sci.	1953, 109, No. 6	Bandung, Indonesia
Instrument Practice: Technology: Instrumentation	Instrument Practice	1954, 8, No. 9	London, England
International Journal of Leprosy	Internat. J. Leprosy	1953, 21, No. 4, Pt. 1	New Orleans, La., U.S.A.
International Labour Review	Internat. Labour Rev.	1954, 70, No. 2	Geneva, Switzerland
Internationale Zeitschrift für Vitaminforschung	Internat. Ztschr. Vitaminforsch.	1953, 25, No. 3	Berne, Switzerland
Iryo	Iryo	1954, 8, No. 6	Tokyo, Japan
Izvestiya Akademii Nauk S.S.S.R. Seriya Biologicheskaya	Izv. Akad. Nauk S.S.S.R. Ser. Biol.	1954, No. 2	Moscow, U.S.S.R.
Japanese Journal of Experimental Medicine	Jap. J. Exp. Med.	1953, 23, No. 4	Tokyo, Japan
Japanese Journal of Medical Science and Biology	Jap. J. Med. Sci.	1954, 7, No. 2	Tokyo, Japan
Japanese Safety Forces Medical Journal	Jap. Safety Forces Med. J.	1954, 1, No. 5	Tokyo, Japan
Journal of Agricultural and Food Chemistry	J. Agric. Food Chem.	1954, 2, No. 11	Washington, D.C., U.S.A.
Journal of Agricultural Science	J. Agric. Sci.	1954, 44, No. 4	Cambridge, England
Journal of Agriculture of the University of Puerto Rico	J. Agric. Univ. Puerto Rico	1954, 38, No. 2	Rio Piedras, Puerto Rico
Journal of Agriculture of Western Australia	J. Agric. W. Austral.	1954, 3, No. 3	Perth, Australia
Journal of the American Chemical Society	J. Amer. Chem. Soc.	1954, 76, No. 17	Washington, D.C., U.S.A.
Journal of the American Dietetic Association	J. Amer. Dietetic Assoc.	1954, 30, No. 8	Baltimore, Md., U.S.A.
Journal of the American Medical Association	J. Amer. Med. Assoc.	1954, 155, No. 18	Chicago, Ill., U.S.A.
Journal of the American Oil Chemists' Society	J. Amer. Oil Chem. Soc.	1954, 31, No. 10	Champaign, Ill., U.S.A.
Journal of the American Pharmaceutical Association	J. Amer. Pharm. Assoc.	1954, 43, No. 9	Washington, D.C., U.S.A.
Journal of the American Veterinary Medical Association	J. Amer. Vet. Med. Assoc.	1954, 124, No. 929	Chicago, Ill., U.S.A.
Journal of Anatomy	J. Anat.	1954, 88, No. 2	London, England
Journal of Animal Ecology	J. Animal Ecol.	1954, 23, No. 1	Cambridge, England
Journal of Animal Science	J. Animal Sci.	1954, 13, No. 3	Manassas, Wis., U.S.A.
Journal of Applied Chemistry	J. Appl. Chem.	1954, 2, No. 12	London, England
Journal of Applied Physiology	J. Appl. Physiol.	1954, 7, No. 1	Washington, D.C., U.S.A.
Journal of the Association of Official Agricultural Chemists	J. Assoc. Off. Agric. Chem.	1954, 37, No. 2	Washington, D.C., U.S.A.
Journal of the Australian Institute of Agricultural Science	J. Austral. Inst. Agric. Sci.	1954, 20, No. 2	Sydney, Australia

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Journal of Aviation Medicine	J. Aviation Med.	1954, 25, No. 3	New Orleans, La., U.S.A.
Journal of Bacteriology	J. Bacteriol.	1954, 68, No. 2	Baltimore, Md., U.S.A.
Journal of Biochemistry	J. Biochem. Tokyo	1954, 41, No. 4	Tokyo, Japan
Journal of Biological Chemistry	J. Biol. Chem.	1954, 209, No. 2	Baltimore, Md., U.S.A.
Journal of the British Grassland Society	J. Brit. Grassland Soc.	1954, 9, No. 2	Aberystwyth, Wales
Journal of Cellular and Comparative Physiology	J. Cell. Comp. Physiol.	1954, 43, No. 3	Philadelphia, Pa., U.S.A.
Journal of the Chemical Society, London	J. Chem. Soc.	1954, August	London, England
Journal of Clinical Endocrinology and Metabolism	J. Clin. Endocrinol.	1954, 14, No. 8	Springfield, Ill., U.S.A.
Journal of Clinical Investigation	J. Clin. Invest.	1954, 33, No. 8	Lancaster, Pa., U.S.A.
Journal of Clinical Pathology	J. Clin. Pathol.	1954, 7, No. 3	London, England
Journal of Comparative Neurology	J. Comp. Neurol.	1954, 100, No. 2	Philadelphia, Pa., U.S.A.
Journal of Comparative Pathology and Therapeutics	J. Comp. Pathol.	1954, 64, No. 3	Croydon, Surrey, England
Journal of Dairy Research	J. Dairy Res.	1954, 21, No. 1	London, England
Journal of Dairy Science	J. Dairy Sci.	1954, 37, No. 8	Lanester, Pa., U.S.A.
Journal of Dental Research	J. Dent. Res.	1954, 33, No. 4	Baltimore, Md., U.S.A.
Journal of the Department of Agriculture, Republic of Ireland	J. Dept. Agric., Republic of Ireland	1952-53, 49	Dublin, Republic of Ireland
Journal of the Department of Agriculture of South Australia	J. Dept. Agric. S. Austral.	1954, 57, No. 11/12	Adelaide, Australia
Journal of the Department of Agriculture, Victoria	J. Dept. Agric., Victoria	1954, 53, No. 7	McBorne, Australia
Journal of Economic Entomology	J. Econ. Entomol.	1954, 47, No. 2	Geneva, N.Y., U.S.A.
Journal of the Egyptian Medical Association	J. Egypt. Med. Assoc.	1954, 37, No. 6	Cairo, Egypt
Journal of Endocrinology	J. Endocrinol.	1954, 11, No. 2	London, England
Journal of Experimental Biology	J. Exp. Biol.	1954, 31, No. 2	London, England
Journal of Experimental Medicine	J. Exp. Med.	1954, 100, No. 2	Baltimore, Md., U.S.A.
Journal of Experimental Zoology	J. Exp. Zool.	1954, 128, No. 1	Philadelphia, Pa., U.S.A.
Journal of the Faculty of Medicine, Baghdad, Iraq	J. Fac. Med. Baghdad	1954, 18, No. 3/4	Baghdad, Iraq
Journal of Farm Economics	J. Farm. Econ.	1954, 36, No. 2	McNastur, Wis., U.S.A.
Journal of the Farmers' Club	J. Farmers' Club	1954, No. 6	London, England
Journal of the Fisheries Research Board of Canada	J. Fish. Res. Board Canada	1954, 11, No. 4	Toronto, Canada
Journal of Genetics	J. Genet.	1954, 52, No. 1	Cambridge: London, England
Journal of General Microbiology	J. Gen. Microbiol.	1954, 11, No. 1	London, England
Journal of General Physiology	J. Gen. Physiol.	1954, 37, No. 5	New York, U.S.A.
Journal of Gerontology	J. Gerontol.	1954, 9, No. 3	Ann Arbor, Mich., U.S.A.
Journal of Helminthology	J. Helminthol.	1954, 28, No. 1/2	London, England
Journal of Hygiene	J. Hygiene	1954, 52, No. 3	London, England
Journal of Immunology	J. Immunol.	1954, 73, No. 2	Baltimore, Md., U.S.A.
Journal of the Indian Institute of Science	J. Indian Inst. Sci.	1954, 36, No. 3	Bangalore, India
Journal of the Indian Medical Association	J. Indian Med. Assoc.	1954, 29, No. 11	Calcutta, India
Journal of Infectious Diseases	J. Infect. Dis.	1954, 94, No. 3	Chicago, Ill., U.S.A.
Journal of the Institute of Brewing	J. Inst. Brewing	1954, 60, No. 3	Cambridge, England
Journal of Laboratory and Clinical Medicine	J. Lab. Clin. Med.	1954, 44, No. 1	St. Louis, Mo., U.S.A.
Journal of Laryngology and Otology	J. Laryngol. Otol.	1954, 68, No. 8	London, England
Journal of the National Cancer Institute	J. Nat. Cancer Inst.	1954, 15, No. 1	Bethesda, Md., U.S.A.
Journal of Neuropathology and Experimental Neurology	J. Neuropathol. Exp. Neurol.	1954, 13, No. 3	Baltimore, Md., U.S.A.
Journal of Neurophysiology	J. Neurophysiol.	1954, 17, No. 3	Springfield, Ill., U.S.A.
Journal of Nutrition	J. Nutrition	1954, 53, No. 2	Philadelphia, Pa., U.S.A.
Journal of Obstetrics and Gynaecology of the British Empire	J. Obstet. Gynaecol. Brit. Empire	1954, 61, No. 3	Altrincham, England
Journal of Organic Chemistry	J. Org. Chem.	1954, 19, No. 8	Baltimore, Md., U.S.A.
Journal of the Osaka City Medical Center	J. Osaka City Med. Center	1952, 2, No. 4	Osaka, Japan
Journal of the Oslo City Hospitals	J. Oslo City Hosp.	1954, 4, No. 9/10	Oslo, Norway
Journal of Parasitology	J. Parasitol.	1954, 40, No. 3	Lancaster, Pa., U.S.A.
Journal of Pathology and Bacteriology	J. Pathol. Bacteriol.	1954, 67, No. 2	London, England
Journal of Pediatrics	J. Pediatr.	1954, 45, No. 2	St. Louis, Mo., U.S.A.
Journal of Pharmacy and Pharmacology	J. Pharm.	1954, 6, No. 9	London, England
Journal of the Pharmaceutical Society of Japan	J. Pharm. Soc. Japan	1954, 74, No. 7	Tokyo, Japan
Journal of Pharmacology and Experimental Therapeutics	J. Pharmacol. Exp. Therap.	1954, 111, No. 3	Baltimore, Md., U.S.A.
Journal of the Philippine Medical Association	J. Philippine Med. Assoc.	1954, 30, No. 6	Manila, Philippines
Journal of Physical Chemistry	J. Phys. Chem.	1954, 58, No. 9	Boston, Pa., U.S.A.
Journal of Physiology	J. Physiol.	1954, 125, No. 2	London, England
Journal de Physiologie	J. Physiol., Paris	1954, 46, No. 2	Paris, France
Journal of the Royal Agricultural Society of England	J. Roy. Agric. Soc. Engl.	1953, 114	London, England
Journal of the Royal Institute of Public Health and Hygiene	J. Roy. Inst. Pub. Health Hyg.	1954, 17, No. 8	London, England
Journal of the Science of Food and Agriculture	J. Sci. Food Agric.	1954, 5, No. 8	London, England
Journal of Scientific Instruments and of Physics in Industry	J. Sci. Instruments	1954, 31, No. 9	London, England
Journal of Tropical Medicine and Hygiene	J. Trop. Med. Hyg.	1954, 57, No. 7	London, England

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Keio Journal of Medicine	Keio J. Med.	1954, 3, No. 1	Tokyo, Japan
Kungl. Lantbruksakademien Tidskrift	Kgl. Lantbruksakad. Tidskr.	1954, 93, No. 2/3	Stockholm, Sweden
Khirurgiya	Khirurgiya	1953, No. 11	Moscow, U.S.S.R.
Kitasato Archives of Experimental Medicine	Kitasato Arch. Exp. Med.	1953, 26, No. 1	Tokyo, Japan
Klinicheskaya Meditsina	Klin. Med., Mosk.	1953, 31, No. 11	Moscow, U.S.S.R.
Klinische Wochenschrift	Klin. Wochenschr.	1954, 35, 35/36	Berlin : Göttingen : Heidelberg, Germany
Kobe Journal of the Medical Sciences	Kobe J. Med. Sci.	1954, 1, No. 3	Kobe, Japan
Konevodstvo	Konevodstvo	1954, No. 1	Moscow, U.S.S.R.
Kumamoto Medical Journal	Kumamoto Med. J.	1953, 6, No. 2/4	Kumamoto, Japan
Kurume Medical Journal	Kurume Med. J.	1954, 1, No. 1	
Kyushu Memoirs of Medical Sciences	Kyushu Mem. Med. Sci.	1953, 4, No. 2/3	Fukuoka, Japan
Laboratory Practice	Laboratory Practice	1954, 3, No. 9	London, England
Le Lait	Lait	1954, 34, No. 337	Paris, France
Lancet	Lancet	1954, No. 835	London, England
Langenbecks Archiv für Klinische Chirurgie	Langenbecks Arch. klin. Chirurg.	1954, 278, No. 3	Berlin : Göttingen : Heidelberg, Germany
Il Lattante	Lattante	1954, 25, No. 6	Parma, Italy
Laval Médical	Laval méd.	1954, 19, No. 7	Quebec, Canada
Lékařské Listy	Lék. listy	1954, 9, No. 16	Brno, Czechoslovakia
Justus Liebig's Annalen der Chemie	Liebigs Ann.	1954, 588, No. 2	Weinheim, Germany
Maandschrift voor Kindergeneeskunde	Maandsehr. Kindergeneesk.	1953, 22, No. 9	Leyden, Holland
Maataloustieteellinen Aikakauskirja	Maataloust. Aikakausk.	1954, 26, No. 2	Helsinki, Finland
Malayan Agricultural Journal	Malayan Agric. J.	1954, 37, No. 2	Kuala Lumpur, Federation of Malaya
Manchester School of Economics and Social Studies	Manchester Sch. Econ. Social Studies	1954, 22, No. 2	Manchester, England
Manx Journal of Agriculture	Manx J. Agric.	1954, 9, No. 1	Peel, Isle of Man
Medical Journal of Osaka University	Med. J. Osaka Univ. (Engl. Ed.) (Jap. Ed.)	1954, 5, No. 1 1954, 6, No. 3	Osaka, Japan
Medical Clinics of North America	Med. Clin. N. Amer.	1954, 38, No. 1	Philadelphia, Pa., U.S.A.
Medicina del Lavoro	Med. del Lavoro	1954, 15, No. 9	Milan, Italy
Medicinal Journal of Malaya	Med. J. Malaya	1954, 8, No. 4	Singapore, Federation of Malaya
Medicamenta	Medicamenta	1954, 22, No. 259	Madrid, Spain
Medicine, Analytical Reviews of General Medicine, Neurology and Pediatrics	Medicine, Baltimore	1954, 33, No. 2	Baltimore, Md., U.S.A.
Medical Officer	Med. Officer	1954, 92, No. 11	London, England
Médecine Tropicale	Méd. trop.	1954, 14, No. 3	Marseille, France
Meldinger fra Norges Landbrukskøleskole	Meld. Norges Landbrukskølesk.	1954, 34, No. 5	Oslo, Norway
Metabolism, Clinical and Experimental	Metabolism	1954, 3, No. 4	New York, U.S.A.
Methods in Medical Research	Methods in Med. Res.	1954, 6	Chicago, Ill., U.S.A.
Mie Medical Journal	Mie Med. J.	1954, 4, No. 1	Tsu, Japan
Mikrobiologiya	Mikrobiologiya	1954, 28, No. 2	Moscow, U.S.S.R.
Milbank Memorial Fund Quarterly	Milbank Mem. Fund Quarterly	1954, 32, No. 3	New York, U.S.A.
Mittellungen aus den Gebieten der Lebensmittel-untersuchung und Hygiene	Mitt. Geb. Lebensmittel. Hyg.	1954, 45, No. 3	Basle, Switzerland
Molochmaya Promyshlennost	Mol. Prom.	1954, 15, No. 4	Moscow, U.S.S.R.
Monatsschrift für Kinderheilkunde	Monatsehr. Kinderheilk.	1954, 102, No. 8	Berlin : Göttingen : Heidelberg, Germany
Monthly Bulletin of the Ministry of Health and the Public Health Laboratory Service	Monthly Bull. Minist. Health and Pub. Health Lab. Serv.	1954, 13, August	London, England
Münchener Medizinische Wochenschrift	Münch. med. Wochenschr.	1954, 96, No. 39	Munich, Germany
The Nagoya Journal of Medical Science	Nagoya J. Med. Sci.	1953, 16, No. 3	Nagoya, Japan
Nagoya Medical Journal	Nagoya Med. J.	1954, 2, No. 1	Nagoya, Japan
Nature	Nature	1954, 174, No. 4429	London, England
Die Naturwissenschaften	Naturwissenschaften	1954, 41, No. 12	Berlin : Göttingen : Heidelberg, Germany
Nederlands Melk en Zuivelijdschrift	Nederlands Melk Zuivelijdschr.	1954, 8, No. 3	The Hague, Holland
Nederlandsch Tijdschrift voor Geneeskunde	Nederlands. Tijdschr. Geneesk.	1954, 98, No. 39	Amsterdam, Holland
Netherlands Journal of Agricultural Science	Netherlands J. Agric. Sci.	1954, 2, No. 1	Wageningen, Holland
New England Journal of Medicine	New Engl. J. Med.	1954, 251, No. 6	Boston, Mass., U.S.A.
New Zealand Agriculturist	N.Z. Agriculturist	1954, 8, No. 5	Fielding, New Zealand
New Zealand Journal of Agriculture	N.Z. J. Agric.	1954, 89, No. 1	Wellington, New Zealand
New Zealand Journal of Science and Technology	N.Z. J. Sci. Technol.	1954, 36, No. 2	Wellington, New Zealand
New Zealand Veterinary Journal	N.Z. Vet. J.	1954, 2, No. 2	Wellington, New Zealand
Nordisk Jordbruksforskning	Nord. Jordbruksforsk.	1953, 35, No. 3/4	Helsinki, Finland
Nordisk Medicin	Nord. Med.	1954, 51, No. 39	Stockholm, Sweden
Nordisk Veterinärmedicin	Nord. Vet.-Med.	1954, 6, No. 9	Stockholm, Sweden
North American Veterinarian	North Amer. Vet.	1954, 35, No. 9	Chicago, Ill., U.S.A.
Le Nourisson	Nourisson	1954, 42, No. 2	Paris, France

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Nutrition, Journal of Dietetics, Food Catering, Child Nutrition	Nutrition	1954, 8, No. 3	London, England
Onderstepoort Journal of Veterinary Research	Onderstepoort J. Vet. Res.	1953, 26, No. 2	Pretoria, South Africa
Ophthalmologica	Ophthalmologica	1954, 133, No. 3	Basle, Switzerland
Organic Reactions	Organic Reactions	1952, 7,	New York, U.S.A.
Österreichische Zeitschrift für Kinderheilkunde und Kinderfürsorge	Öst. Zeitsch. Kinderheilk.	1954, 10, No. 1/2	Vienna, Austria
Parasitology	Parasitology	1954, 44, No. 1/2	London, England
La Pediatria	Pediatrics	1954, 62, No. 5/6	Naples, Italy
Pediatrics	Pediatrics	1954, 14, No. 1	Springfield, Ill., U.S.A.
Pédiatrie	Pédiatrie	1954, 9, No. 6	Lyons, France
Pediatria	Pediatria	1954, No. 1	Moscow, U.S.S.R.
Pflügers Archiv für die Gesamte Physiologie des Menschen und der Tiere	Pflügers Arch.	1954, 259, No. 3	Berlin : Göttingen : Heidelberg, Germany
Pharmaceutical Bulletin	Pharm. Bull.	1954, 2, No. 2	Tokyo, Japan
Pharmazeutische Zentralhalle für Deutschland	Pharm. Zentralhalle	1954, 93, No. 9	Dresden : Leipzig, Germany
Philippine Journal of Animal Industry	Philippine J. Animal Indust.	1952, 13, No. 4	Manila, Philippines
Philippine Journal of Science	Philippine J. Sci.	1953, 82, No. 3	Manila, Philippines
Physiological Reviews	Physiol. Rev.	1954, 34, No. 1	Baltimore, Md., U.S.A.
Physiological Zoology	Physiol. Zool.	1954, 27, No. 3	Chicago, Ill., U.S.A.
Poultry Science	Poultry Sci.	1954, 33, No. 4	Menasha, Wis., U.S.A.
Practitioner	Practitioner	1954, 173, Sept.	London, England
Presna Pediatría	Presna-pediat.	1953-54, 4, No. 25/26	Buenos Aires, Argentina
La Presse Médicale	Presse méd.	1954, 62, No. 58	Paris, France
Priroda	Priroda	1954, No. 2	Moscow, U.S.S.R.
Problema Tuberkuloza	Problemy Tuberk.	1954, No. 1	Moscow, U.S.S.R.
Proceedings of the Helminthological Society of Washington	Proc. Helminthol. Soc. Washington	1954, 21, No. 2	Washington, D.C., U.S.A.
Proceedings of the Indian Academy of Sciences	Proc. Indian Acad. Sci.	1954, 40, No. 1	Bombay, India
Proceedings of the Japan Academy	Proc. Japan Acad.	1954, 30, No. 5	Tokyo, Japan
Proceedings of the National Academy of Sciences	Proc. Nat. Acad. Sci., Washington	1954, 40, No. 8	Washington, U.S.A.
Proceedings of the Nutrition Society	Proc. Nutrition Soc.	1954, 13, No. 2	Cambridge, England
Proceedings of the Royal Society (Series B)	Proc. Roy. Soc. [B]	1954, 142, No. 909	London, England
Proceedings of the Royal Society of Medicine	Proc. Roy. Soc. Med.	1954, 47, No. 6	London, England
Proceedings of the Society for Experimental Biology and Medicine	Proc. Soc. Exp. Biol. Med.	1954, 88, No. 3	New York, U.S.A.
Proceedings of the Staff Meetings of the Mayo Clinic	Proc. Staff Meetings Mayo Clin.	1954, 29, No. 16	Rochester, Minn., U.S.A.
Public Health	Pub. Health	1953-54, 67, No. 11	London, England
Public Health Reports	Pub. Health Rep., Washington	1954, 69, No. 8	Washington, D.C., U.S.A.
Quadern della Nutrizione	Quad. Nutrizione	1952, 12, No. 4	Bologna, Italy
Quarterly Bulletin Michigan Agricultural Experiment Station	Quart. Bull. Michigan Agric. Exp. Stat.	1954, 36, No. 4	East Lansing, Mich., U.S.A.
Quarterly Journal of Experimental Physiology	Quart. J. Exp. Physiol.	1954, 39, No. 3	London, England
Quarterly Journal of Medicine	Quart. J. Med.	1953, 23, No. 90	Oxford, England
Quarterly Journal of Microscopical Science	Quart. J. Microscop. Sci.	1954, 95, No. 2	London, England
Quarterly Journal of Studies of Alcohol	Quart. J. Studies Alcohol	1954, 15, No. 2	New Haven, Conn., U.S.A.
Quarterly Review of Agricultural Economics	Quart. Rev. Agric. Econ.	1954, 7, No. 1	Culberrra, Australia
Queensland Agricultural Journal	Queensland Agric. J.	1954, 79, No. 1	Brisbane, Australia
Queensland Journal of Agricultural Science	Queensland J. Agric. Sci.	1954, 10, No. 3	Brisbane, Australia
Recent Progress in Hormone Research	Recent Progr. in Hormone Res.	1954, 10,	New York, U.S.A.
Recueil de Médecine Vétérinaire Publié par le Corps Enseignant de l'École d'Alfort	Rec. Méd. vét.	1954, 130, No. 6	Paris, France
Recueil des Travaux Chimiques des Pays-Bas et de la Belgique	Rec. Trav. chim. Pays-Bas	1954, 73, No. 8	Amsterdam, Holland
Research	Research	1954, 7, No. 9	London, England
Revista de la Asociación Argentina de Dietología	Rev. Asoc. argent. Dietología	1953, 11, No. 43/44	Buenos Aires, Argentina
Revista de la Asociación Médica Argentina	Rev. Asoc. méd. argent.	1954, 68, No. 774	Buenos Aires, Argentina
Revue Belge de Pathologie et de Médecine Expérimentale	Rev. belg. Pathol. Méd. exp.	1953, 23, No. 2	Brussels, Belgium
Revue Canadienne de Biologie	Rev. canad. Biol.	1954, 13, No. 2	Montreal, Canada
Revista Clínica Española	Rev. clín. española	1954, 54, No. 2	Madrid, Spain
La Revue d'Oka, Agronomie, Médecine Vétérinaire	Rev. d'Oka	1954, 28, No. 4	Canada
Review of Economics and Statistics	Rev. Econ. Statistics	1954, 36, No. 2	Cambridge, Mass., U.S.A.
Review of Economic Studies	Rev. Econ. Studies	1954, 21, No. 3	Cambridge, England
Revue d'Élevage et de Médecine Vétérinaire des Pays Tropicaux	Rev. Élevage Méd. vét. Pays trop.	1954, 7, No. 2	Paris, France
Revista Española de las Enfermedades del Aparato Digestivo y de la Nutrición	Rev. española Enferm. Apar. digest. Nutrición	1954, 13, No. 2	Madrid, Spain
Revista Española de Fisiología	Rev. española Fisiol.	1954, 10 No. 1	Barcelona, Spain
Revista Española de Pediatría	Rev. española Pediat.	1954 10, No. 56	Saragossa, Spain

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Revue des Fermentations et des Industries Alimentaires	Rev. Ferment. Indust. aliment.	1954, 9, No. 2	Brussels, Belgium
Revista Médica de Chile	Rev. méd. Chile	1954, 82, No. 5	Santiago, Chile
Revista Médico-Quirúrgica de Oriente	Rev. méd.-quir. Orient.	1953, 14, No. 3/4	Santiago, Cuba
Revista de Medicina Veterinaria	Rev. Med. vet., Buenos Aires	1954, 36, No. 1	Buenos Aires, Argentina
Revue de Médecine Vétérinaire	Rev. Méd. vét., Toulouse	1954, 105, July	Toulouse, France
Rhodesia Agricultural Journal	Rhodesia Agric. J.	1954, 51, No. 3	Salisbury, Rhodesia
Rivista di Clinica Pediatrica	Riv. Clin. pediat.	1954, 53, No. 5	Florence, Italy
Rivista dell'Istituto Sieroterapico Italiano	Riv. Ist. sieroterap. ital.	1954, 29, No. 3	Naples, Italy
Rivista de Zooteceia	Riv. Zootec.	1954, 27, No. 7/8	Milan, Italy
Roczniki Nauk Rolniczych	Rocz. Nauk rol. [B]	1954, 67, No. 3	Warsaw, Poland
Roczniki Państwowego Zakładu Higieny	Rocz. Państwowego Zakł. Hig.	1954, 5, No. 2	Warsaw, Poland
Royal Sanitary Institute Journal	Roy. Sanit. Inst. J.	1954, 74, No. 9	London, England
Sankhyā, Indian Journal of Statistics	Sankhyā, Indian J. Statistics	1954, 13, No. 4	Calcutta, India
Sapporo Medical Journal	Sapporo Med. J.	1953, 4, No. 3	Sapporo, Japan
Sbornik Československé Akademie Zvědědělské	Sborn. Čsl. Akad. Zvěděd.	1954, 27, No. 3	Prague, Czechoslovakia
Sbornik Lékařský	Sborn. lékař.	1954, 56, No. 1/2	Prague, Czechoslovakia
Sbornik pro Pathofysiologii Trávení a Výživy	Sborn. pathofysiol. trávn.	1954, 8, No. 2	Prague, Czechoslovakia
Sbornik Vysoké školy Zemědělské v Brně	Sborn. vysoké šk. Zvěděd., Brno	1953	Prague, Czechoslovakia
Schweizerische Medizinische Wochenschrift	Schweiz. med. Wochenschr.	1954, 84, No. 39	Basle, Switzerland
Science	Science	1954, 119, No. 3111	Baltimore, Md., U.S.A.
Scientific Proceedings of the Royal Dublin Society	Sci. Proc. Roy. Dublin Soc.	1954, 28, No. 10	Dublin, Republic of Ireland
Scottish Agriculture	Scott. Agric.	1954, 34, No. 1	Edinburgh, Scotland
Scripta Medica	Scripta medica	1954, 27, No. 1/2	Brno, Czechoslovakia
Shikoku Acta Medica	Shikoku Acta Med.	1954, 5, No. 2	Tokushima, Shikoku, Japan
South African Journal of Clinical Science	S. African J. Clin. Sci.	1954, 5, No. 2	Mowbray, C.P., South Africa
South African Journal of Medical Sciences	S. African J. Med. Sci.	1954, 19, No. 1/2	Witwatersrand, South Africa
South African Medical Journal	S. African Med. J.	1954, 23, No. 35	Cape Town, South Africa
Southern Medical Journal	Southern Med. J.	1954, 47, No. 9	Birmingham, Ala., U.S.A.
Sovetskaya Medicina	Sovet. Med.	1954, 18, No. 1	Moscow, U.S.S.R.
Lo Sperimentale	Sperimentale	1953, 103, No. 11/12	Florence, Italy
Lo Sperimentale, Sezione di Clinica Biologica	Sperimentale, Sez. Chim. biol.	1953, 4, No. 5/6	Florence, Italy
Spisak Fakultety Veterinárni	Spisak fak. vet.	1953, 1, No. 22	Brno, Czechoslovakia
State Technology	State Technol.	1954, 29, No. 4	Geneva, N.Y., U.S.A.
Stomatologiya	Stomatologiya	1954, No. 12	Moscow, U.S.S.R.
Surgery	Surgery	1954, 38, No. 2	St. Louis, Mo., U.S.A.
Surgery, Gynecology and Obstetrics	Surg. Gynecol. Obstet.	1954, 99, No. 2	Chicago, Ill., U.S.A.
Tasmanian Journal of Agriculture	Tasmanian J. Agric.	1954, 25, No. 2	Hobart, Tasmania
Terapevtscheskii Arkhiv	Terap. Arkh.	1953, 25, No. 3	Moscow, U.S.S.R.
The Summary	The Summary	1953, 5, No. 2	London, Canada
Tidsskrift for det Norske Landbruk	Tidsskr. norske Landbruk	1954, 61, No. 8	Oslo, Norway
Tijdschrift voor Diergeneeskunde	Tijdschr. Diergeneesk.	1954, 79, No. 18	Utrecht, Holland
Tohoku Journal of Experimental Medicine	Tohoku J. Exp. Med.	1954, 59, No. 4	Sendai, Japan
Transactions of the Faraday Society	Trans. Faraday Soc.	1954, 50, No. 9	Aberdeen, Scotland
Transactions of the Royal Highland Society of Scotland	Trans. Roy. Highl. Agric. Soc. Scot.	1952, 64,	Edinburgh, Scotland
Transactions of the Royal Society of New Zealand	Trans. Roy. Soc. N.Z.	1954, 82, No. 1	Wellington, New Zealand
Transactions of the Royal Society of Tropical Medicine and Hygiene	Trans. Roy. Soc. Trop. Med. Hyg.	1954, 48, No. 4	London, England
Tropical Agriculture. The Journal of the Imperial College of Agriculture, Trinidad	Trop. Agric., Trinidad	1954, 31, No. 3	St. Augustine, West Indies
Vestnik Oftalmologii	Vestn. Oftalmol.	1954, 32, No. 5	Moscow, U.S.S.R.
Vestnik Otorinolaringologii	Vestn. Otorinolaringol.	1953, 15, No. 5	Moscow, U.S.S.R.
Vestnik Venerologii i Dermatologii	Vestn. Venerol. Dermatol.	1954, No. 1	Moscow, U.S.S.R.
Veterinariya	Veterinariya	1954, 31, No. 4	Moscow, U.S.S.R.
Veterinářství	Veterinářství	1953, 3, No. 11	Brno, Czechoslovakia
Veterinary Medicine	Vet. Med.	1954, 49, No. 9	London, England
Veterinary Record	Vet. Rec.	1954, 66, No. 18	London, England
Virchows Archiv für Pathologische Anatomie	Virchows Arch.	1954, 325, No. 5	Berlin: Göttingen: Heidelberg, Germany
Vitamins and Hormones	Vitamins and Hormones	1953, 11	New York, U.S.A.
Vitaminu u. Hormone	Vitaminu u. Hormone	1952, 5, No. 5/6	Leipzig, Germany
Voeding	Voeding	1954, 15, No. 9	Amsterdam, Holland
Voprosy Pitaniya	Vop. Pitan.	1954, No. 3	Moscow, U.S.S.R.
Výživu Lidu	Výž. lidu	1954, 9, No. 3	Prague, Czechoslovakia
West Indian Medical Journal	West Indian Med. J.	1954, 3, No. 2	Jamaica, B.W.I.
Wiener Klinische Wochenschrift	Wien. klin. Wochenschr.	1954, 66, No. 34	Vienna, Austria
Yale Journal of Biology and Medicine	Yale J. Biol. Med.	1954, 27, 1	New Haven, Conn., U.S.A.
Yokohama Medical Bulletin	Yokohama Med. Bull.	1954, 5, No. 1	Yokohama, Japan

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Nu	Yorkshire Bulletin of Economic and Social Research	York. Bull. Econ. Social Res.	1954, 6, No. 1	Hull, England
I	Zhurnal Analiticheskoi Khimii	Zh. Anal. Khim.	1953, 8, No. 6	Moscow, U.S.S.R.
On	Zhurnal Oshchei Biologii	Zh. Oshchei Biol.	1954, 15, No. 2	Moscow, U.S.S.R.
Op	Zoologicheskii Zhurnal	Zool. Zh.	1953, 32, No. 5	Moscow, U.S.S.R.
Or	Zootekhnika. Acta Societatis Internationalis	Zootekhnika	1954, 3, No. 2	Madrid, Spain
Os	Veterinariorum Zootechnicorum	Zootec. Vet.	1954, 9, No. 8	Milan, Italy
I	Zootekhnika e Veterinaria, la Fecondazione Artificiale	Zitschr. ges. exp. Med.	1954, 124, No. 2	Berlin : Göttingen : Heidelberg, Germany
Pa	Zeitschrift für die Gesamte Experimentelle Medizin	Ztschr. ges. inn. Med.	1954, 9, No. 15	Leipzig, Germany
La	Zeitschrift für Hygiene und Infektionskrankheiten	Ztschr. Hyg. Infektionskr.	1464, 140, No. 3	Berlin : Göttingen : Heidelberg, Germany
Pe	Zeitschrift für Immunitätsforschung und Experimentelle Therapie	Ztschr. Immunitätsforsch.	1954, 111, No. 3	Jena, Germany
Pé	Zeitschrift für Kinderheilkunde	Ztschr. Kinderheilk.	1954, 75, No. 2	Berlin : Göttingen : Heidelberg, Germany
Pf	Zeitschrift für Lebensmittel-Untersuchung und -Forschung	Ztschr. Lebensmittel-Untersuch. Forsch.	1954, 99, No. 3	Munich, Germany
Ph	Zeitschrift für Physiologische Chemie			
Ph	(see Hoppe-Seyler's Ztschr.)			
Ph	Zeitschrift für Tierzüchtung und Züchtungsbiologie	Ztschr. Tierzücht. Züchtungsbiol.	1954, 63, No. 1	Berlin : Hamburg, Germany
Ph	Zeitschrift für Tropenmedizin und Parasitologie	Ztschr. Tropenmed. Parasitol.	1954, 5, No. 3	Stuttgart, Germany
Pr	Zeitschrift für Tuberkulose	Ztschr. Tuberk.	1954, 105, No. 1	Leipzig, Germany
Pr	Zeitschrift für Vitamin-, Hormon- und Fermentforschung	Ztschr. Vitamin-, Hormon- Fermentforsch.	1954, 6, No. 2/3	Vienna : Innsbruck, Austria

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Sir CHARLES JAMES MARTIN

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(1866-1955)

THE Editors wish to place on record their appreciation of the valuable services rendered to this Journal by Sir Charles Martin who died on February 15, 1955. Sir Charles's service began with the establishment of the Journal in 1931, when Sir Walter Fletcher, Sir Frederick Hopkins, and he, were appointed the three representatives of the British Medical Research Council to the Committee of Management. In 1937 he replaced Professor J. J. R. Macleod as a co-editor with Sir John Boyd Orr and Dame Harriette Chick. In 1946 he and Sir John retired from the Editorial Board but both retained their connection with the Journal as Consulting Editors.

For more than half a century Sir Charles was an outstanding world figure in Medical research. His work in Australia, 1891 to 1903, and later, 1931 to 1933, helped to lay the foundation of Australian Medical Research and Education. The great contribution he made to the development of research in that continent was recognised at the centenary of Sydney University when the Prime Minister announced the foundation of two Charles James Martin Fellowships in Medicine for post-graduate research overseas. As Director of the Lister Institute in addition to his own important research he gave inspiration and guidance to the distinguished workers in that Institute who made such a notable contribution to our knowledge of the vitamins. Since his retirement in 1933, in addition to his work for this Journal, he continued to direct and take an active part in research in nutrition until a few weeks before he died. His house in Cambridge, part of which he fitted up as a laboratory, was a sort of Mecca for his large circle of admiring friends who came to discuss their research problems.

Sir Charles received many academic and other honours for the great contribution he made to the development of medical science. All who had the great privilege of working with him owe him a debt of gratitude for his unfailing wise counsel and friendship. We salute the passing of a great scientist and a great and good man.





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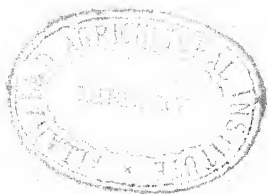
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In *Review Articles* it will be that agreed upon by the Editors of the *Journal of the Chemical Society* and of the *Biochemical Journal* published in *Biochem. J.*, 1948, 42, 1.

In *Abstracts* the nomenclature will be that used in the paper being abstracted.

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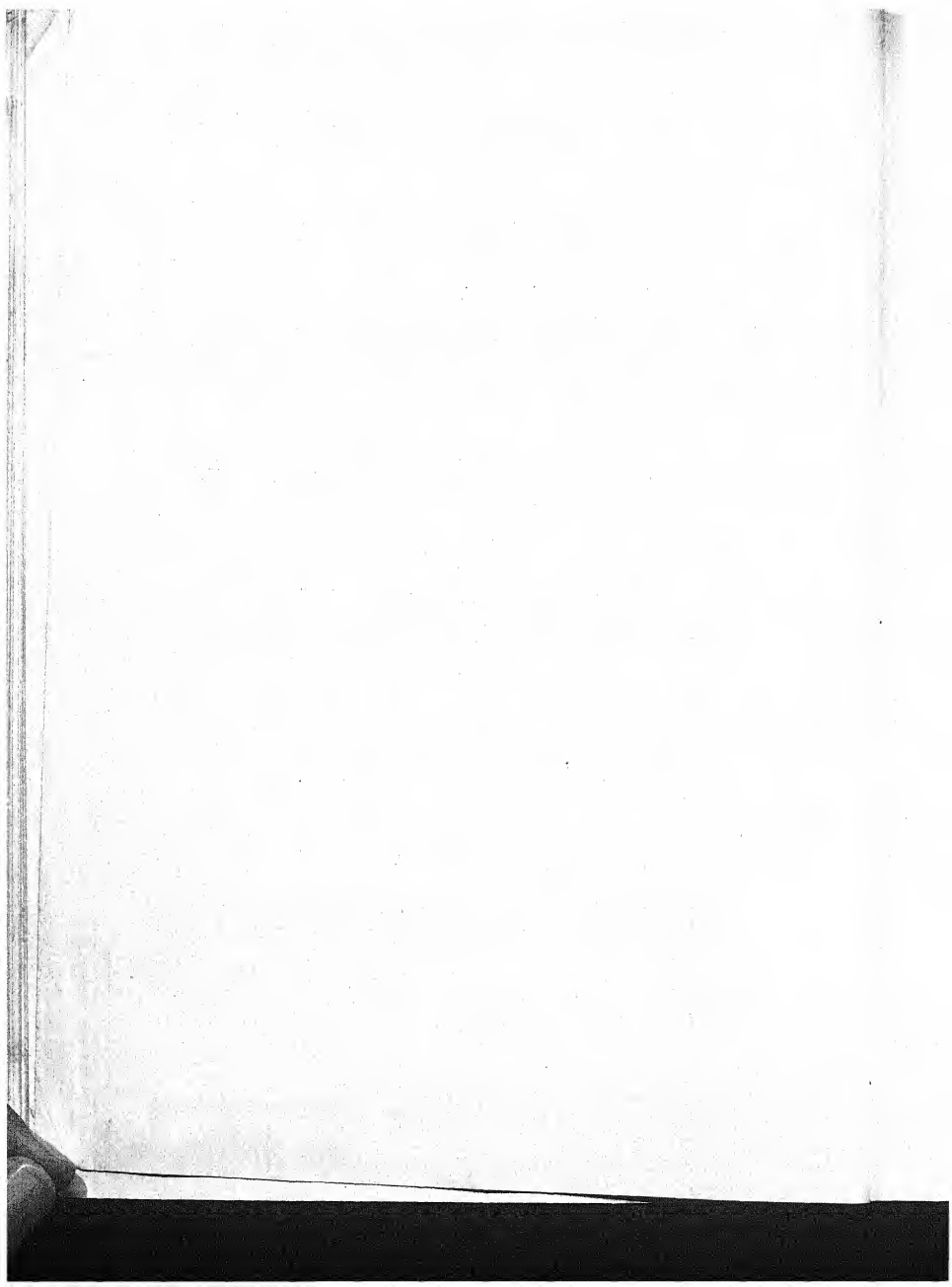


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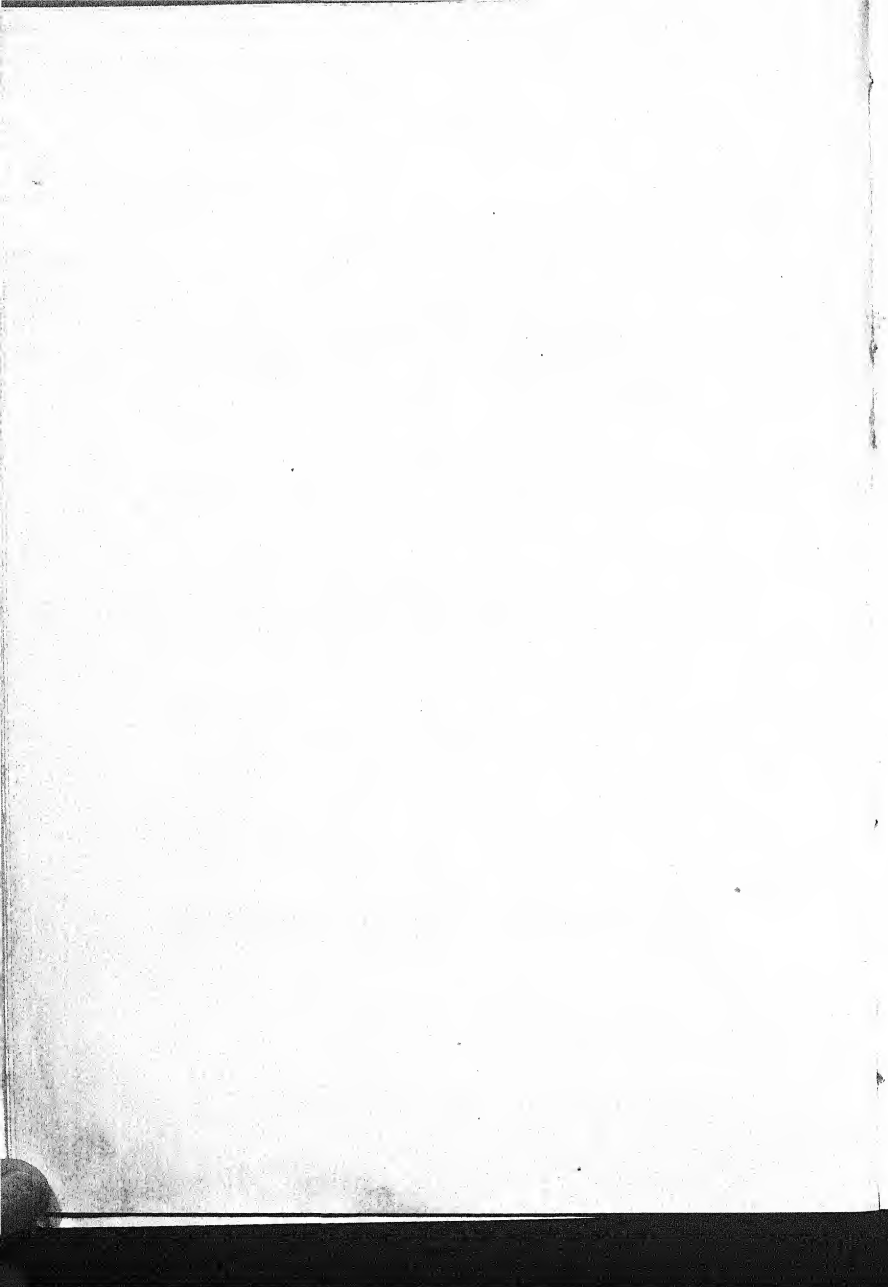
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THE NUTRITION OF THE HORSE

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INTRODUCTION

The rapid advance of mechanisation during the last 40 years has progressively reduced the use of horses for traction and for riding. The result has been a considerable reduction of the number of horses in many countries. The reduction in some European countries, the United States and Canada between 1912 and 1951 is shown in Table 1 (Institut International d'Agriculture, 1911-1912; 1922; 1931-1932; FAO 1947; 1952).

By 1951 the number of horses in the United States

had fallen to 22 per cent. of the number in 1912. In Canada the reduction in the same time was scarcely 50 per cent., and in Great Britain and Ireland about 59 per cent.

Table 2 gives data for the estimated number of horses in Europe, North and Central America and the whole world in 1939 and in the year 1950-51 (FAO, 1947; 1952).

From this it appears that the number of horses in North and Central America fell by considerably more, 39 per cent., than in Europe, 15 per cent.

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TABLE 1

NUMBER OF HORSES IN SOME EUROPEAN COUNTRIES, THE UNITED STATES AND CANADA BETWEEN 1912 AND 1951

Country	1912	1920	1930	1940	1951
Denmark	535,018	601,777	494,465 ¹	575,000 ¹	465,000
France	3,222,140	2,635,350	2,924,230	2,114,700 ²	2,397,000
Sweden	588,485	728,000	653,000	617,100	415,000
Great Britain and Ireland	2,058,565	2,213,053	1,669,672	1,508,600	845,000
United States	23,015,902	19,766,000 ¹	13,165,000 ¹	10,193,000 ¹	4,993,000 ¹
Canada	2,595,912	3,400,352	3,295,000	2,780,000 ¹	1,804,000 ¹

¹ Horses in towns not included.² Army horses not included.

In spite of the great decrease, there are still 61 million horses in the world. Even if agriculture and forestry are further mechanised so that their need for horses is further reduced, the horse will for long have some importance for traction, and it is for that reason that its correct feeding is still important.

TABLE 2

NUMBER OF HORSES IN EUROPE, NORTH AND CENTRAL AMERICA AND THE WORLD, IN MILLIONS

Year	Europe	North and Central America	Whole world
1939	19.9	18.0	74.4
1950/51	17.0	11.0	60.6

For a discussion on the physiology of digestion of the horse reference should be made to Alexander (1954).

Of published reports on the feeding of horses only a few are based on accurate experiments. Most have arisen from practical experience or from revision of older experiments.

DIGESTION IN HORSES AND RUMINANTS

Although the digestive system of the horse is unlike that of the ruminant in anatomical structure, both live on the same feedingstuffs and there is little difference in their capacity to digest them. The horse has a single stomach and does not ruminate; cattle have chambered stomachs and ruminate. Cattle also have longer and roomier intestines, as appears from the following comparison (Crasemann, 1945):

DIGESTIVE CANAL

Length (metres)		Volume (litres)		Distribution of volume (litres)		
Total	Ratio to body length	Total	Per 100 kg. liveweight	Stomach	Intestines total	Caecum
Horse 30	20 : 1	200	40	10	100	30
Cattle 50	30 : 1	310	50	200	110	10

The capacity of both to digest some of the feeds which appear most often in their diets is shown by the digestibility coefficients in Table 3 (Crasemann, 1945).

The organic matter in feedingstuffs of low fibre content, such as cereal grains, is equally well digested by horses and cattle, but the organic matter of feedingstuffs of high fibre content is less well digested by horses. The same is true of nitrogen-free extract. Protein is about equally digested by horses and cattle. Digestibility coefficients for crude fat and fibre are almost always less when a feed is used for horses than when it is used for cattle.

With rising fibre content in a ration, digestibility of organic matter is less for both horses and cattle, but the reduction is greater for horses. The relation between fibre content (x) and coefficient of digestibility of organic matter (y) is shown in the following equations, derived from a summary of 71 feeding experiments on horses with mixed rations and from an analysis of Kellner's digestibility experiments with cattle (Axelsson, 1940a; 1941):

For horses $y = 97.0 - 1.26 x$,For cattle $y = 86.0 - 0.66 x$.

N.A. and R., January 1955

TABLE 3

COMPARISON OF DIGESTION IN HORSES AND CATTLE

Feed	Animal	Digestibility coefficient				
		Organic matter	Crude protein	Ether extract	N-free extract	Fibre
Meadow hay, early . . .	Horse	58	63	22	65	48
(22 per cent. fibre) . . .	Cattle	67	65	57	68	63
Wheat straw	Horse	21	28	—	28	18
(41 per cent. fibre) . . .	Cattle	42	4	31	37	50
Oats	Horse	69	80	71	75	29
(10 per cent. fibre) . . .	Cattle	70	76	80	76	28
Maize	Horse	89	76	61	92	40
(2 per cent. fibre) . . .	Cattle	90	72	89	95	58

The digestibility of organic matter has been studied also with feeds differing in fibre content by Olsson (Larsson *et al.* (1951). The results are shown in Table 4.

TABLE 4

DIGESTIBILITY COEFFICIENTS OF ORGANIC MATTER IN HORSES AND CATTLE

Feed	Approximate fibre content per cent.	Horse	Cattle
Wheat straw	39	35	40
Clover-grass hay	30	50	63
Meadow hay	30	52	59
Pasture	18	64	81
Oats	10	78	72
Fodder cellulose	68	81	80

The discrepancy is smallest for fodder cellulose; but Hvidsten (1945b) records even higher values for ruminants and Edin, Helleday and Nordfeldt (1941) give values of from 63 to 92 per cent. for horses, depending on the nature of the product tested. From the results of roughly 1000 digestion experiments Olsson (1949) has fitted an equation of the third degree to express the relation of digestibility of dry matter to fibre content (see p. 12).

NUTRITIONAL REQUIREMENTS OF HORSES

Requirements for maintenance, work, reproduction and lactation, and growth must be considered separately, and with reference to energy supply and the essential components of food, namely,

protein, minerals and vitamins. Knowledge of metabolism, and especially metabolism of the individual components of feed, is incomplete and in some respects negligible.

A number of rationing systems have been used. Those best known are based on starch equivalent (S.E.), the Scandinavian feed unit (Sc. F.U.), the feed unit for ruminants (F.U.r.) based on metabolisable energy according to Axelsson, the Russian oat feed unit, and total digestible nutrients (T.D.N.). Computations in terms of the Scandinavian unit are based on the net energy value of the feed; the unit is the value of 1 kg. average barley. Olsson (1951) claims that this unit gives a reliable measure of the net energy requirements of the horse.

Requirements for Maintenance

Energy

The energy requirement of the horse for maintenance has been computed by several workers. The mean results are shown in Table 5.

According to some writers (Ehrenberg, 1932; Hansson, 1938) there is a direct relation between the horse's energy requirement for maintenance and its liveweight; others have found a somewhat lower requirement of energy per unit of weight as liveweight rises (Axelsson, 1943; Crasemann, 1945; Jespersen, 1949; Larsson *et al.*, 1951). In these calculations it is assumed that the requirement is proportional to the 5/8 power of liveweight (Axelsson, 1943; Larsson *et al.*, 1951). It has been confirmed in investigations in the United States (Procter, Brody, Jones and Chittenden, 1934) and elsewhere that maintenance energy requirement per unit liveweight decreases as weight increases.

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TABLE 5

DAILY ENERGY REQUIREMENT FOR MAINTENANCE

Authority	Unit of measurement	Liveweight: kg.					
		300	400	500	600	700	800
Kellner and Fingerling (1924)	Starch equivalent (kg.)	2.35	2.8	3.3	3.7	4.1	—
Hansson (1938)	Scandinavian feed unit	2.7	3.6	4.5	5.4	6.3	7.2
Jespersen (1949) ¹	" " "	2.9	3.6	4.3	5.0	5.7	6.3
Crasemann (1945) ²	Starch equivalent (kg.)	2.1	2.6	3.0	3.4	3.75	4.1
Ehrenberg (1932) ³	" " "	—	—	—	3.0	3.5	4.0
Axelsson (1943)	Feed unit for ruminants	4.0	4.8	5.5	6.2	6.8	7.4
Popov (1946)	Russian oat feed unit	4.2	4.8	5.5	6.2	—	—
Morrison (1937)	Total digestible nutrients	—	—	3.8	4.3	4.9	5.5
Larsson <i>et al.</i> (1951)*	Scandinavian feed unit	—	3.9	4.5	5.0	5.5	6.0

¹ Computed from the formula: requirement in Sc. F.U. = $0.03 W^{4/5}$, where W is the liveweight in kg.² Computed from the formula: requirement in kg. cal. metabolisable energy = $179.06 W^{3/2}$, where W is liveweight in kg.; 1 kg. S.E. = 3780 kg. cal. metabolisable energy.³ In the computation it is assumed that the energy requirement for maintenance of heavier horses is 5.0 kg. S.E. per 1000 kg. liveweight.

* Norms recommended by the authors.

Table 6 compares the standards in Table 5, all in Sc. F.U. The comparison is based on the assumption that the fodder used is grass hay harvested before flowering.

TABLE 6

ENERGY REQUIREMENT FOR MAINTENANCE IN SCANDINAVIAN FEED UNITS

Authority	Liveweight: kg.					
	300	400	500	600	700	800
Kellner and Fingerling (1924)	3.2	3.9	4.5	5.1	6.0	—
Hansson (1938)	2.7	3.6	4.5	5.4	6.3	7.2
Jespersen (1949)	2.9	3.6	4.3	5.0	5.7	6.3
Crasemann (1945)	2.9	3.5	4.1	4.6	5.1	5.6
Ehrenberg (1932)	—	—	—	4.1	4.7	5.4
Axelsson (1943)	3.0	3.6	4.1	4.6	5.1	5.5
Popov (1946)	3.5	4.0	4.6	5.2	—	—
Morrison (1937)	—	—	3.5	4.0	4.5	5.1
Larsson <i>et al.</i> (1951)*	—	3.9	4.5	5.0	5.5	6.0

* Norms recommended by the authors.

The highest estimate is that of Popov. Kellner and Fingerling's estimates for light horses and Hansson's for heavy are high. Morrison's standard is relatively low.

Protein

Table 7 shows estimates by different writers for average protein requirements for maintenance.

TABLE 7

PROTEIN REQUIREMENT FOR MAINTENANCE PER 100 KG. LIVELWEIGHT

Authority	Digestible protein g.	Digestible true protein g.
Hansson (1938)	—	65-70
Jespersen (1949)	—	about 52
Crasemann ¹ (1945)	—	02-80
Nitsche (1939)	53-68	48-50
Ehrenberg (1932) (heavy horses)	—	60
Popov (1946)	—	55-65
Morrison (1937)	60-80	—
Axelsson (1943)	about 77-100	—
Larsson <i>et al.</i> (1951)*	—	55-70

¹ Computed from the formula: digestible true protein requirement in g. = $5.8 W^{3/2}$ for horses of 400 to 800 kg. liveweight, where W = liveweight in kg.

* Norm recommended by the authors.

According to most writers, protein requirement is directly proportional to the animal's liveweight. Crasemann (1945), on the other hand, computes that the horse's requirement of true protein for maintenance rises as the $2/3$ power of liveweight, but does not regard the point as sufficiently well established. Most authors give the horse's requirement of protein for maintenance in terms of digestible true protein and the standards vary between 48 and 80 g. per 100 kg. liveweight. Axelsson (1943) and Morrison (1937) express the requirement

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in terms of digestible protein. Axelsson's standard is higher than Morrison's. The expression of the requirement as digestible protein involves the assumption that amides are at least partly utilised.

Requirements for Work

Energy

The energy requirement of working horses depends on several modifying circumstances, namely, the kind of work, the incline of the ground to be worked, the speed of work, the liveweight of the horse, its training and its individuality. In addition, energy requirement may be affected by handling, including harnessing, the care of the hooves and the degree of tiredness, and by climate and weather. Zuntz and Hagemann (1898) studied energy expenditure of horses at work with reference to modifying circumstances. But it is impossible in practice to take account of all such circumstances, especially in such variable work as agriculture. Therefore, energy requirement has been computed for a few classes of work.

Kellner and Fingerling (1924) allocated work to three grades, assuming a horse of 500 kg. weight, and including the cost of moving the body :

Light work :	in a day about	700,000 kg.-metres
Medium (normal) work :	" "	1,300,000 "
Heavy work :	" "	2,250,000 "

Other authors (Crasemann, 1945 ; Hansson, 1938 ; Høie and Tilrem, 1951) have introduced a fourth grade, very heavy work. Wrede (1932) suggests the following grades of performance for a working horse weighing 500 kg. :

Grade	Mean daily work, including movement of the body: million kg.-m.	mean
Light work	0.0-1.0	0.5
Normal work	1.0-2.0	" 1.5
Heavy work	2.0-3.0	" 2.5
Very heavy work:	over 3.0	

Ehrenberg (1932) and Jespersen (1949) divide work performance of horses into five grades : very light, light, medium, heavy and very heavy work.

The energy requirement given by different workers for the standard 500-kg. horse is shown in Table 8, in which 3 or 4 grades of work are assumed.

The standards given in Table 8, re-computed to Scandinavian feed units on the assumption that the horse is fed on oats of normal composition, are shown in Table 9.

It appears from Table 9 that Kellner and Fingerling's standard is highest and Morrison's lowest.

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TABLE 8

ENERGY REQUIREMENT ABOVE MAINTENANCE FOR WORK,
COMPUTED FOR A HORSE OF 500 KG. LIVELWEIGHT

Authority	Unit	Grade of Work			
		Light	Normal	Heavy	Very heavy
Kellner and Fingerling (1924)	S.E. kg.	1.5	2.4	4.2	—
Hansson (1938)	Sc. F.U.	2.0	3.3	4.8	Over 5.5
Crasemann (1945)	S.E. kg.	1.3	2.0	3.25	4.15
Axelsson (1943)	F.U.r.	1.7	3.4	5.1	—
Popov (1946)	Russian (oat) F.U.	1.9	3.6	6.0	—
Morrison (1937)	T.D.N. kg.	0.9	4.4	7.3	—
Larsson <i>et al.</i> (1951) *	Sc. F.U.	1.6	3.2	4.9	—

* Norms recommended by the authors.

TABLE 9

ENERGY REQUIREMENT FOR WORK IN SC. F.U.
COMPUTED FOR A HORSE OF 500 KG. LIVELWEIGHT

Authority	Grade of work			
	Light	Normal	Heavy	Very heavy
Kellner and Fingerling (1924)	2.2	3.6	6.3	—
Hansson (1938)	2.0	3.3	4.8	Over 5.5
Crasemann (1945)	1.9	3.0	4.8	6.1
Axelsson (1943)	1.7	3.4	5.1	—
Popov (1946)	1.7	3.3	5.5	—
Morrison (1937)	1.3	2.6	4.3	—
Larsson <i>et al.</i> (1951) *	1.6	3.2	4.9	—

* Norms recommended by the authors.

Jespersen (1941a) has given the following energy standards for work, by grade and per hour of work :

Grade	Addition per hour of work Sc. F.U.
Very light	0.2
Light	0.3
Medium	0.5
Heavy	0.7
Very heavy	1.0

Protein

According to Nitsche (1939) the true protein requirement of the horse, computed per unit of work

(0.1 million kg.-m.), falls as work output increases. He gives the following allowances:

Million kg.-m. of work	Digestible true protein, g. per 0.1 million kg.-m.
0.5-0.6	80
0.6-0.7	81
0.7-0.8	67
0.8-0.9	65
0.9-1.0	59
1.0-1.1	53
1.1-1.2	—
1.2-1.3	50

Meyer (1944), on the other hand, holds that increase in intensity of work has no effect on protein requirement. Morrison (1937) says that the older protein standards are too high. On the other hand, he believes (p. 68) that if the protein allowance is too low, the digestibilities of other nutrients may be reduced (see also p. 12). He suggests that the micro-organisms in the digestive tract which normally break down cellulose will attack sugars or starch if the ration is rich in these more readily available carbohydrates. The best ratio of nitrogen-containing to nitrogen-free nutrients for working horses is thought to be 1:9-11 and for non-working horses 1:10-12. Axelsson (1943) takes for work the same protein requirement as for maintenance, namely, 75 to 83 g. per F.U.R. Hansson (1938) considered 65 to 70 g. digestible true protein per Sc.F.U. sufficient for working horses.

For different grades of work, Ehrenberg (1932) proposes the following supplements of digestible true protein per 1000 kg. liveweight daily:

Grade of work	Digestible true protein g. daily
Very light	200
Light	300
Medium	600
Heavy	900
Very heavy	1250

Jespersen (1949) gives the true protein requirement of working horses as 60 g. per Sc.F.U. with variations between 56 and 60 g. on the assumption that the energy allowed is not greater than is needed for the work. Larsson *et al.* (1951) assess the working horse's requirement of digestible true protein as 70 to 75 g. per Sc.F.U.

Table 10 gives the mean protein standards recommended by different authors for 3 or 4 grades of work. It is evident that agreement is not complete on the requirements for work. For work alone Popov's are highest and Morrison's lowest.

Objections have been made to the energy and protein standards of Kellner and of Hansson on the basis of German experiments under Ehrenberg's

TABLE 10.

PROTEIN REQUIREMENT IN G. FOR DIFFERENT GRADES OF WORK, COMPUTED FOR A HORSE OF 500 KG. LIVWEIGHT

Authority	Grade of work			
	Light	Normal	Heavy	Very heavy
Kellner and Fingering (1924) ^{1, 2}	500	700	1000	—
Hansson (1938) ¹	145	220	320	Over 370
Axelsson (1943) ^{3, 4}	134	260	403	—
Popov (1946) ^{1, 4}	180	335	500	—
Morrison (1937) ^{3, 4}	113	204	295	—
Larsson <i>et al.</i> (1951) ^{1, *}	115	235	355	—

¹ Digestible true protein.

² Including digestible true protein for maintenance.

³ Digestible protein.

⁴ Computed values.

* Norms recommended by the authors.

guidance. In most of the objections it is argued that both standards are too high (Asam, 1924; Bartsch, 1926; Klose, 1929; Temper, 1927; Teschner, 1927; Wrede, 1932). One of these (Klose, 1929) maintains that Hansson's protein standards are too low.

Requirements for Reproduction

Most statements on requirements for reproduction are based on practical experience and judgment, not on the results of exact experiment.

Pregnant Mares

Energy. During the first half of pregnancy no increase in energy allowance above normal is considered necessary. Additional feed for growth of the foetus is not considered necessary until the seventh month.

Some authors (Axelsson, 1943; Popov, 1946) believe that the energy requirement for foetal growth is related to the liveweight of the mare. Others (Larsson *et al.*, 1951) think that no distinction should be made between mares of different weights and that their requirements for growth of the foetus are almost equal (see Table II). Popov (1946) states the energy requirement for the foetus in terms of the weight increase of the mare in the last months of pregnancy. According to him, the mare puts on 10 to 12 per cent. of weight during pregnancy. He considers that per kg. liveweight the mare needs 4 to 4.5 Russian (oat) feed units (3.2 to 3.6 Sc.F.U.). On that basis the requirements

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TABLE 11

ENERGY REQUIREMENT FOR GROWTH OF THE FETUS

Month of pregnancy	Liveweight of the mare: kg.						Larsson <i>et al.</i> (1951)*
	500		600		700		
	Additional feed in Sc.F.U. daily according to						
	Axelsson ¹ (1943)	Popov ² (1946)	Axelsson ¹	Popov ²	Axelsson ¹	Popov ²	
6-7	0.2		0.2		0.2		0.2
8-9	0.5	} 1.5	0.6	} 1.8	0.7	} 2.1	0.5
10-11	0.8		1.0		1.2		0.9
Additional feed required for the whole pregnancy	90.0	180.0	108.0	220.0	126.0	252.0	96.0

¹ On the assumption that the additional feed consists of the usual concentrates, 1 F.U. = 1 Sc.F.U.² Computed, 1 Russian (cat) F.U. taken as 0.8 Sc. F.U.

* Norms recommended by the authors.

for the foetus according to Popov are twice those proposed by Axelsson and by Larsson *et al.* (1951) (see Table 11). Jespersen (1949) thinks the energy allowance of the pregnant mare should be increased by $\frac{1}{2}$ to 2 Sc.F.U. daily after 6 months. Dobrynin (1950) found that the plane of nutrition affected the duration of pregnancy. With correct feeding it was on the average 333 days, and with restricted diet 352 days.

Protein. As pregnancy advances the protein requirement of the mare increases. Axelsson (1943) considers that the supplementary feed given to the pregnant mare should have 160 g. digestible protein per F.U. Jespersen (1949) recommends 80 to 100 g. digestible true protein per Sc.F.U. of total feed. Popov (1946) suggests 90 to 100 g. digestible true protein per Russian (oat) feed unit as a suitable proportion in the total feed. That corresponds to 112 to 125 g. digestible true protein per Sc.F.U. Olsson (Larsson *et al.*, 1951) recommends from the seventh month of pregnancy 80 to 85 g. digestible true protein per Sc.F.U. of total feed.

The protein content of the ration may affect the mare's fertility. Jespersen (1949) asserts that the mare is less likely to become pregnant if she is given a low-protein diet. He recommends at least 80 g. digestible true protein per Sc.F.U. for the non-pregnant mare.

Lactating Mares

Energy and protein. The requirements of the mare during lactation depend on the milk yield and the composition of the milk. On the assump-

tion that mare's milk contains on the average, per cent., protein 1.98, fat 1.03 and sugar 6.19, and that the energy value of the fat is 9.11, of the protein 5.86 and of the sugar 3.95 Cal. per g., the energy value of mare's milk is about 450 Cal. per kg. (Cow's milk with 4 per cent. fat has an energy value of about 750 Cal. per kg.) That implies that the requirement of energy for production of milk of the above composition is 0.25 Sc.F.U. per kg., if the mare's efficiency is comparable with that of the dairy cow. The protein requirement for milk production may, in the same way, be about 37 g. digestible true protein per kg. milk.

Milk production daily litres	Requirements per 1000 kg. liveweight		
	Digestible true protein kg.	Starch equivalent kg.	Sc.F.U. ¹
1. With light work			
5	1.0	7.5	10.7
10	1.2	8.5	12.2
15	1.4	9.5	13.5
20	1.6	10.5	15.0
25	1.8	11.5	16.4
2. With moderate work			
5	1.4	9.2	13.2
10	1.6	10.2	14.6
15	1.8	11.2	16.0
20	2.0	12.2	17.4
25	2.2	13.2	18.9

¹ Conversion: 1 kg. S.E. = 1.43 Sc. F.U.

According to Axelsson (1943) 0.28 F.U.r. and 45 g. digestible protein are required to produce 1 kg. mare's milk. Popov (1946) computes the energy requirement to be 0.33 Russian feed unit (about 0.26 Sc.F.U.) with 30 to 35 g. digestible true protein per kg. milk. Ehrenberg (1932) and Provovnik (1931) consider that 200 g. starch equivalent (about 0.28 Sc.F.U.) and 40 g. digestible true protein are required to produce 1 kg. mare's milk. Provovnik recommends for the lactating mare doing moderate work about 16.5 kg. S.E., 2.9 kg. digestible true protein and 35 kg. dry matter daily, per 1000 kg. liveweight. On the basis of his own experiments, Ehrenberg (1932) proposed the following standards for the breeding mare, assuming that 200 g. S.E. and 40 g. digestible true protein are required per kg. milk.

Stallions

Energy and protein. The services required of the stud stallion may vary widely and that affects requirements. Axelsson (1943) considers that stud stallions, in addition to the energy for maintenance and work, should have 0.5 to 1.0 F.U.r. daily. During the breeding season, and depending on the demands made, he recommends the following additional allowances:

Light breeding:	0.5 to 1.5 F.U.r.	per head	daily
Moderate "	1.5 to 2.5 "	" "	" "
Heavy "	2.5 to 3.5 "	" "	" "

The total feed should provide 100 to 125 g. digestible protein per F.U.r. and the supplementary feed 200 to 230 g. per F.U.r. According to

Jespersen (1949) a stallion that serves 70 to 100 times in 4 or 5 months requires about as much energy as when working. The protein requirement for a breeding stallion serving once daily he estimates at 700 to 800 g., and for a stallion serving 3 or 4 times daily 1000 g. Popov (1946) recommends 0.95 to 1.2 kg. digestible true protein and 9.5 to 10 Russian F.U. (7.6 to 8.0 Sc.F.U.) daily for stallions of light breeds, with a liveweight of 450 to 500 kg., and regards these amounts as adequate even for intensive breeding for 3 to 5 months. Ehrenberg (1932) proposes for breeding stallions an increase of the daily allowance by 200 g. digestible true protein per 1000 kg. liveweight but only a small increase in energy supply. Olsson (Larsson *et al.*, 1951) estimates for breeding stallions with moderate intensity of breeding an increase of 0.5 to 1.0 Sc.F.U. daily, with 100 to 200 g. digestible true protein per Sc.F.U.

Requirements for Growth

Hansson and Müller (1929) made feeding experiments during the years 1923-28, and recorded rate of growth and feed consumption of foals of light breed. Olsson (1952) has published the results of a study in 1945-50 of the rearing of Ardenne horses. The results of their experiments provide a good guide for the computation of feeding standards for foals of these breeds under Swedish conditions.

Energy. Table 12 gives data for energy requirements of foals according to four different authors. To give comparable values, Axelsson's and

TABLE 12
DAILY ENERGY REQUIREMENT OF GROWING FOAL IN Sc.F.U.¹

Liveweight: kg.	Hansson and Müller (1929)	Axelsson (1943)		Morrison (1937)	Olsson (1952)*	
		Liveweight at 3 years of age 600 kg.	Liveweight at 3 years of age 800 kg.		Liveweight at 3 years of age 600 kg.	Liveweight at 3 years of age 800 kg.
250-300	5.8	6.3	7.8	4.4	4.8	5.4
300-350	6.3	6.5	7.9	4.9	5.1	5.7
350-400	6.8	6.7	8.0	5.5	5.4	6.0
400-450	—	6.9	8.2	6.1	5.7	6.3
450-500	7.2	6.9	8.3	6.6	6.1	6.6
500-550	7.8	7.0	8.4	7.0	6.4	6.9
550-600	—	6.9	8.5	—	6.5	7.2
600-650	8.4	—	8.6	—	6.6	7.5
650-700	—	—	8.7	—	—	7.7
700-750	—	—	8.7	—	—	7.9
750-800	—	—	8.7	—	—	—

¹ Provided that the requirement is met by 65 per cent. grass hay cut at the bud stage and 35 per cent. oats or other cereal.

* Norms recommended by the author.

TABLE 13

ENERGY REQUIREMENT OF FOAL ACCORDING TO AXELSSON IN F.U.F. AND MORRISON IN T.D.N.

Liveweight kg.	Axelsson (1943)		Morrison (1937) kg.
	Liveweight at 3 years: 600 kg.	Liveweight at 3 years: 800 kg.	
250-300	6.90	8.45	3.84
300-350	7.10	8.60	4.33
350-400	7.30	8.75	4.82
400-450	7.45	8.90	5.38
450-500	7.55	9.05	5.78
500-550	7.60	9.15	6.18
550-600	7.55	9.25	
600-650		9.35	
650-700		9.45	
700-750		9.50	
750-800		9.45	

Morrison's standards have been converted to Sc.F.U. The original data are shown in Table 13.

From the data in Table 12 it appears that Axelsson's standards for foals of both light and heavy breeds exceed those of other writers. Hansson's allowances are also above those recommended by Olsson for light breeds. Morrison's standards are less for young foals, up to 300 kg. liveweight, than those proposed by Olsson for foals of light breeds.

According to Jespersen (1949), the energy requirement of the foal in its first winter is, on the average, 5 to 5.5 Sc.F.U., and in its second winter 6 to 6.5 Sc.F.U. daily. Broadly, these allowances correspond with those proposed by Olsson. Popov (1946) recommends the following daily allowances for foals:

Liveweight (kg.)	200	250	300	350	400
Sc.F.U. ¹	4.0	4.6	5.0	5.4	5.8
Digestible true protein (g.)	500	570	630	600	580

¹ 1 Russian (oat) F.U. = 0.8 Sc.F.U.

According to Olsson (1952), foals of the Ardennes breed require the following allowances of energy in Sc.F.U. per kg. weight gained:

Age in months	Mean weight increase (kg.)	Per kg. weight gain (Sc.F.U.)
0-6	229	4.34
7-12	149	7.75
13-18	100	12.10
19-24	79	15.63
25-30	77	21.71
31-36	27	52.30

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From this it appears that the foal's feed consumption per kg. weight gain increases rapidly with age. During the last six months, the 31st to the 36th, it puts on 27 kg., equivalent to about 12 per cent. of the weight gained in the first six months. The continuous increase in feed consumption per kg. weight gained depends chiefly on the rise in maintenance requirement as weight increases.

Protein. The protein requirement of the foal, according to four authors, is shown in Table 14. It will be seen that Morrison's proposed standards are relatively low, Axelsson's relatively high; Hansson's are higher than Olsson's. Axelsson's allowances fall continuously as weight increases and Hansson's and Morrison's rise. According to Olsson, protein requirement is at a maximum at 425 and 575 kg. liveweight, less at the beginning and end of growth. Popov (1946) adopts the same pattern, but holds that protein allowances may be reduced when 300 kg. liveweight has been attained. Derevlev (1946), according to the rate of growth, computes the following allowance for foals 6 to 12 months old:

	Requirements for different rates of weight increase, g. daily		
	1 kg.	0.8 kg.	0.5 kg.
Digestible protein	950-1000	850-900	750-800
Fat	350-370	300-320	250-270
Sugar	350-400	350-400	350-400
Ca.	65-67	60-65	55-60
P.	32-35	30-33	25-30

Minerals

Horses as a rule require more sodium chloride and more of some other inorganic salts than are present in feed.

Salt (sodium chloride). Requirements for Na and Cl depend to some extent on the work done, the temperature and humidity of the air and other circumstances. The need to add salt depends also on how much is already present in the feed. According to experiments in Russia (Popov, 1946) excretion of NaCl by horses increases with the intensity of work. During a pull of 50 km., 50 to 60 g. NaCl was excreted in sweat and 35 g. in the urine, or 85 to 95 g. daily. The diet of 5 kg. hay and 5 kg. oats provided only 30 to 35 g. NaCl and part of that was lost in the faeces. Consequently the salt balance was negative. Kellner and Fingerling (1924) recommend 15 to 25 g. salt daily for grown horses, to be mixed with the feed. They regard salt blocks as unsuitable, since horses take too much. According to Liebscher (1934), sudden death as the result of heavy work with excessive

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TABLE 14
PROTEIN REQUIREMENT OF FOAL: G. DAILY

Liveweight kg.	Hansson and Müller (1929) ¹	Axelsson ² (1943)		Morrison ² (1937)	Olsson ¹ (1952)*	
		Liveweight at 3 years of age 600 kg.	Liveweight at 3 years of age 800 kg.		Liveweight at 3 years of age 600 kg.	Liveweight at 3 years of age 800 kg.
250-300	670	887	1166	500	530	650
300-350	695	866	1161	536	560	655
350-400	750	843	1129	602	570	690
400-450	—	808	1095	647	600	690
450-500	775	770	1063	675	580	725
500-550	820	718	1029	726	550	725
550-600	—	661	994	—	530	760
600-650	880	—	958	—	—	750
650-700	—	—	917	—	—	730
700-750	—	—	874	—	—	710
750-800	—	—	836	—	—	—

¹ Digestible true protein.² Digestible protein.

* Norms recommended by the authors.

sweating is due to loss of chloride. Such a catastrophe may be avoided if the horse has free access to a salt block or is given 30 to 70 g. salt after work. Ehrenberg (1932) suggests 40 g. salt per 1000 kg. liveweight as a suitable allowance, and adds that an extra supplement of salt should be given when molasses is used in the feed. He too does not approve of salt blocks. Dobrynin, Davydova and Skachkov (1949) give the following daily salt allowance for horses:

	Young horses g.	Grown horses g.
Stud horses of light breeds	15 to 30	30 to 50
Stud horses of heavy breeds and working horses	20 to 40	40 to 70

According to Jespersen (1949) horses need 10 to 15 g. salt daily. Olsson (Larsson *et al.*, 1951) recommends the following daily allowances of salt, in g.:

Young horses	15 to 40
Working horses	20 to 40
Pregnant mares	25 to 45
Lactating mares	30 to 45
Stallions in the breeding season	30 to 45

These standards correspond in general with Axelsson's (1943).

Iodine. There is usually enough iodine in a horse's feed to meet its requirements, but in areas where the iodine supply is low, goitre may develop if the horse is not given a supplement with its feed. It is specially important that the needs of pregnant and lactating mares should be satisfied.

Where there is deficiency of iodine, iodised salt should be used for horses. It usually contains 5 mg. potassium iodide per kg.

Calcium and phosphorus. Svanberg and Johansson (1936) maintain that deficiency of Ca or P or both, if large enough, will cause disorders of bone, even in fully grown horses. Where there is plenty of lime, horses are relatively less sensitive than ruminants to lack of phosphorus, but these authors believe that horses' rations are often deficient in phosphorus.

On the basis of experiments by Scheunert, Schattke and Wiese (1923) and Bang (1925), Breirem (1938) computed that daily rations of 12 to 15 g. Ca and 12 to 15 g. P are sufficient for full-grown horses of 500 kg. liveweight. He maintains that the Ca : P ratio should not be less than 0.7. Axelsson (1943), on the other hand, suggests 30 to 40 g. Ca daily for full-grown horses. He considers that the Ca : P ratio for working horses may be less than that recommended for young horses, 1.5 to 1.7.

According to Harvey, Thomas, Culbertson and Collins (1943), the horse's requirement of Ca and P is not affected by the intensity of work. Balance experiments with two Percheron geldings weighing about 760 kg. gave the following results with average daily intakes of Ca and P between 18 and 19 g. per horse:

	Excreted daily: g.		
	Light work	Medium work	Heavy work
Ca	22 to 36	27 to 37	25 to 32
P	25 to 34	27 to 38	26 to 45

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Mitchell and McClure (1939) gave the following Ca and P allowances daily for growing horses :

	Ca in g.	P in g.
For maintenance	4.5	8.9
For growth	9.0	4.7
Together	13.5	13.6

The Ca : P ratio should be about 1.

Dobrynin *et al.* (1949) recommend, when only small amounts of hay are allowed, or the hay is of poor quality, the following daily allowances of Ca :

	Young horses g.	Grown horses g.
Stud horses of light breed	20 to 30	30 to 60
Stud horses of heavy breed and working horses	30 to 50	50 to 100

Ehrenberg (1932) considers that horses given feeds rich in sugar, or potato pulp and similar feeds, should be given daily 100 g. ground chalk per 1000 kg. liveweight. According to Jespersen (1949) a working horse of 600 to 700 kg. weight needs about 20 g. Ca and 20 g. P daily. Mares in late pregnancy, or lactating, should have 1.5 to 3 times as much.

Schecker (1943) thinks that mineral deficiency causes loss of appetite, slow pulse and fall of body temperature.

Axelsson (1943) and Olsson (Larsson *et al.*, 1951) give the following Ca and P allowances :

	g. per head daily	
	Ca	P
Full grown horses on maintenance ration	20-30	14-20
Growing foal : 6 months old	30-40	18-24
12 "	33-45	21-28
24-28 "	30-40	20-27
Working horse	30-40	21-29
Stud mare : late pregnancy	50-70	31-44
lactating	60-75	40-50
Stud stallion	60-75	40-50

Vitamins

Fat-soluble vitamins. Little is known of the vitamin needs of horses, but there are some statements in the literature. For rachitic foals Morrison (1937) recommends about 30 g. fish liver oil daily or an equivalent amount of some other source of vitamin D. Klemola (1933) showed that army horses that had been fed for a long time on hay, oat straw and oat grain without fresh green forage had deformed hooves. The horny layer was unevenly laid down and the horn was brittle. Extra rations of fresh grass, A.I.V. silage or cod liver oil prevented the abnormality, which was regarded as due to deficiency of vitamin A. Scheunert and Schieblich (1934) and Howell, Hart and Ittner (1941) also have shown that horses are sensitive to lack of vitamin A or carotene.

Edwards (1937-38) discusses disorders in horses caused by deficiency of vitamin A. He assesses the requirement of carotene at about 30 μ g. per kg. liveweight daily.

Gulbert, Howell and Hart (1940) fed horses on fodder of low vitamin A content and from the results estimated the requirement of carotene or vitamin A. The first sign of deficiency was night blindness. If vitamin A was not given then, the signs increased gradually for 3 or 4 months. The coat became rough, the cornea became opaque and daylight vision also was impaired. Instead of xerophthalmia, there was lachrymation. The animal was restless and resentful of handling. Within a month of treatment with vitamin A most of the signs had disappeared. The horse's requirement of vitamin A is estimated at 4.2 to 5.3 μ g. per kg. liveweight daily or 20 to 30 μ g. carotene, for instance, in dried alfalfa. These quantities correspond to 14 to 18 I.U. vitamin A (alcohol) or 33 to 50 I.U. carotene and are considered sufficient for growth and to prevent deficiency, but not enough to give any storage in the body. Further, 3 or 4 times as much was thought to be necessary for reproduction and lactation.

Crasemann (1945), on the basis of the requirements of other domestic animals, computes the requirement of a 500-kg. horse as 10.0 to 12.5 mg. carotene daily. In the same way, he computes the vitamin D requirement as 0.04 to 0.08 mg. daily.

According to Popov (1946), deficiency of vitamins A and D causes low fertility in mares and abortion or premature birth of weakly foals. Young mares are believed to be more sensitive than older ones to deficiency of vitamins.

The studies of Galichnikova and Kulikova (1951) showed that deficiency of vitamin A produced keratinisation of the mucosa of the digestive canal and so reduced glandular secretions. In addition the hydrochloric acid of gastric juice was abnormally low, so that digestion could not proceed normally.

Sokolov and Sekulov (1951) found that a supplement of 50 mg. carotene dissolved in 100 ml. oil improved the digestibility of a carotene-free ration and the balances of N, Na, Ca and P.

Olsson (Larsson *et al.*, 1951) gives the following allowances for vitamin A :

	Per 100 kg. liveweight daily Vitamin A : I.U. Carotene: mg.
Foals and young horses	5000 to 7500 or 12 to 15
Working horses	10 to 12
Pregnant mares and stud stallions	15 to 20
Lactating mares	100 to 150

Rjabov (1946) gave vitamin E experimentally as wheat germ, 0.5 kg. per head daily for 3 or 4 days.

The result was oestrus in barren mares and better quality of semen in stallions.

Water-soluble vitamins. It is not certain to what extent micro-organisms in the intestine of the horse can synthesise B vitamins as they do in cattle and other ruminants. That deficiency disease could not be demonstrated in horses fed on forage of low vitamin B content under certain circumstances suggests that intestinal synthesis is possible. Under other circumstances deficiency of vitamin B₁ has been demonstrated, but that does not prove that there is no possibility of intestinal synthesis in the horse.

Carlström and Hjärre (1939) have shown that deficiency of vitamin B₁ can occur in horses fed on grain and hay, both of poor quality. The deficiency was characterised by emaciation in spite of good appetite; the coat became dull and there was anaemia and disturbance of heart action. The emaciation was thought to arise from faulty carbohydrate breakdown, resulting from vitamin B₁ deficiency. Health was restored when a supplement of 250 g. dried yeast was given daily.

Reports of bracken (*Pteris aquilina*) poisoning in the horse responding to injections of vitamin B₁ have appeared (Roberts *et al.* 1949; Carpenter *et al.* 1950).

Westerlund (1938; 1941) insists that it is important that horses have plenty of vitamin B₁ and nicotinic acid. Kjos-Hansen (1944) found that a foal that had convulsions recovered after a week's intravenous injection of vitamin B₁ and simultaneous administration by mouth of "vitamin B". According to Olsson (Larsson *et al.*, 1951), vitamin B₁ deficiency in horses will not occur if 40 to 50 g. dried yeast is given daily in their feed. Pearson, Sheybani and Schmidt (1944) have found that the riboflavin requirement of horses is met by 44 µg. per kg. liveweight daily. Horses synthesise nicotinic acid in the body and special supplies of that vitamin are not needed (Pearson and Luecke, 1945).

DIGESTIBILITY OF FEED

The number of digestion experiments made on horses is much less than on ruminants, and still too low to afford a firm basis for the evaluation of feedingstuffs for horses. They provide information on the digestibility of some single feedingstuffs. Table 15 shows the averages for chemical composition and coefficients of digestibility of nutrients in 577 published digestion experiments with horses in which single feeds were studied.

Circumstances which Affect Digestion in the Horse

Individuality. The individuality of the horse to some extent determines the digestibility of feed.

Edin and Eriksson (1929) and Olsson (1943) found that individual differences in digestion of a particular feed were large. In addition, several outside influences affect digestion.

Chemical Composition of Feed. It is known that the digestion of feed depends partly on its chemical composition. At the National Animal Experiment Station, the results of 1094 published digestion experiments have been summarised (Olsson, 1949). From these it appears that the relation of the digestibility coefficient for organic matter (*y*) to percentage of fibre in dry matter (*x*) of the feeding-stuff may be expressed by a curve with the equation

$$y = 99.71 - 3.066x + 0.0679x^2 - 0.00056x^3.$$

With increase of fibre in dry matter the digestibility of other nutrients is reduced. In the feeds represented, fibre content ranged from 2 to 48 per cent. of dry matter. No account was taken of differences in chemical composition of fibre.

From this collection of experimental data it appeared also that digestibility coefficients for protein rose with increase of protein in the feed to about 20 per cent. and then fell (*cf.* p. 14). With rising protein content, the digestibility coefficient of N-free extract rose and that for ether extract fell. As the percentage of crude fat in dry matter rose, the digestibility coefficient rose also, as did the coefficients for protein and N-free extract.

Digestibility of organic matter, like that of the several nutrients, depends not only on the gross fibre content of the feed, but in large degree on the composition of the fibre, as was shown by Nordfeldt (1954) in experiments on pigs. It is not known to what extent this is true for horses, but there is much evidence in favour of it.

Axelsson (1943) recommends the following limits to fibre in dry matter for growing horses of different ages, breeding stock and working horses:

Fibre in dry matter: per cent.		
Young horses	6-12 months	20-23
	12-18 "	22-25
	18-24 "	24-27
	24-30 "	25-29
	30-36 "	25-30
Breeding stock		
Mares in late pregnancy (light work)		25-28
Lactating mares (light work)		18-21
Stud stallions		18-22
Working horses		
Maintenance		27-31
Light work		26-29
Normal work		22-25
Heavy work		18-21

N.A. and L., January 1955

Feed Capacity. The digestion of feed depends partly on the amount of feed given. In experiments on heavy work horses Hansson (1924) found that hay was better digested when only 6 to 8 kg. per head was given daily. Edin and Eriksson (1929) showed that the amount of feed dry matter has no definite effect on digestion until it exceeds 2 kg. per 100 kg. liveweight daily.

Rate of Working. From experiments made it appears that digestion may be affected in horses by work or exercise in such a way that it is improved by light exercise and may be inhibited by heavy work. That is true for instance of the studies of Grandeau and Le Clerc (1884). With digestibility at rest as 100, relative values for different amounts of work were:

Rest	100
Walking without load	106
Walking with load	101
Trotting without load	98
Trotting with load	97

Kellner (1880), on the other hand, could find no difference in the digestion of organic matter by horses doing light and heavy work; but Edin and Eriksson (1929) found that the digestibility of organic matter was less when horses moved very quickly.

Grinding, Water Content and Time of Transit through the Digestive Tract. Grinding feed (crushing or milling) under certain circumstances improves digestion. Morrison (1937) considers that the nutritive value of oats for horses, young and old, is improved by milling. The chopping of roughage seems to have no effect on digestibility (Axelsson, 1940b) or on nutritive value (Hofman-Bang, 1910). According to Ehrenberg (1932) and Jespersen (1949), fodder should not be chopped shorter than 3 cm. or it may cause disturbances of digestion.

The water content of feed may affect digestion. Taubert (1934) showed that horses digest feed less well if the water content is high. Wittig (1938) found that much energy is lost in sweating if the intake of water is much in excess of what is normally eliminated in urine and faeces.

Time of transit through the digestive tract has been studied by Edin and Eriksson (1929) and at the National Animal Experiment Station (Olsson, Kihlén and Cagell, 1949). The latter study was made with meadow grass or hay and oat straw with crushed oats as supplement; chromic oxide was used as indicator. The results are shown in the following summary. (See next Column.)

From this it appears that freshly cut grass passes through the digestive tract of the horse more rapidly than hay of the same cut. The difference depends, probably, on the difference in water

content. Straw moves at approximately the same rate as hay. Hill (1952) confirmed the great variation in time of transit of feed by X-ray with a barium feed.

Bulk. This is determined chiefly by the amount of fodder in the ration and particularly by the fibre present. The more fibre there is in the dry matter of a ration, the greater the bulk.

Time Interval: day	Percentage marker recovered in faeces		
	Fresh grass and oats	Hay and oats	Straw and oats
0-1	16.8	6.5	10.6
1-2	76.1	66.7	72.0
2-3	6.4	24.0	15.2
3-4	0.4	2.45	1.7
4-5	0.3	0.3	0.45
5-6	0.1	0.1	0.1

IMPORTANCE OF DIFFERENT FEEDINGSTUFFS

The views of different writers about the importance and use of different feedingstuffs in rations for horses differ widely.

Coarse Fodder

Kellner and Fingerling (1924) give the daily allowance of roughage for horses doing light work as 10 to 15 kg. per 1000 kg. liveweight. Hansson (1938) recommends 7 to 8 kg. roughage (straw and hay) daily.

For horses doing an average amount of work Simms and Williams (1931) compared the following rations of hay: 3.6, 5.4 and 7.3 kg. per head daily, with 5 to 7 kg. oats or oats and ground maize. The weights of the horses were between 540 and 770 kg. From the results, 3.6 kg. hay, corresponding to 0.5 to 0.7 per cent. of the liveweight of the horses, appeared to be the minimum desirable amount per day.

Harvey (1935) investigated the reaction of horses to different amounts of roughage in the ration, and found that 0.2 kg. hay per 100 kg. liveweight was insufficient for horses doing moderate amounts of work, but that 0.6 kg. was suitable when the horses had, at the same time, 0.6 to 1.2 kg. oats per 100 kg. liveweight daily. More recently other writers (Bünger, 1944; Crasemann, 1945; Hvidsten, 1945a; Karlsen, 1946; Schirch, 1943) have experimented with varying and sometimes very large daily rations of roughage for working horses. The results are not sufficiently clear to indicate the best amount of roughage for horses. According to Earle, Ellis and Greer (1943), the minimum amount of roughage (hay) a horse should have daily is 0.4 kg. per 100 kg. liveweight.

TABLE 15
SUMMARY OF THE RESULTS OF DIGESTION TRIALS WITH HORSES

Feedingstuff	No. of experiments	Dry matter per cent.	Chemical composition of dry matter: per cent.						Coefficient of digestibility				
			Organic matter	Crude protein	Crude fat	N-free extract	Fibre	Ash	Organic matter	Crude protein	Crude fat	N-free extract	Fibre
<i>Green fodder</i>	40	21.0	89.8	17.5	2.6	40.4	29.3	10.2	64.1	77.9	—3.6	77.1	47.2
<i>Hay</i>													
Meadow hay	141	85.3	92.1	10.1	2.6	51.4	28.0	7.9	50.1	52.2	13.5	54.9	42.6
Timothy hay	12	88.8	94.9	6.2	2.5	52.0	34.2	5.1	47.2	40.6	10.2	52.2	42.5
Clover hay	5	89.9	91.6	13.7	2.9	35.9	39.1	8.4	51.5	56.0	28.6	63.7	37.7
Alfalfa and alfalfa mixture													
hay	28	86.7	91.2	17.4	1.9	41.1	30.8	8.8	57.3	73.0	—14.1	67.0	39.8
Cereal hay	28	90.4	93.2	6.4		58.2	28.6	6.8	52.9	58.9		60.8	34.7
<i>Straw</i>													
Oat straw	20	88.0	92.1	4.7	2.6	43.3	41.5	7.9	43.2	24.6	23.9	41.2	47.7
Wheat straw and chaff	15	84.3	92.2	3.9	1.6	42.8	43.9	7.8	32.0	21.5	79.2	29.8	33.0
Rye straw	6	85.5	92.4	2.5	2.2	42.4	45.3	7.6	47.6	—23.8	78.8	42.6	52.2
<i>Potatoes and roots</i>													
Potatoes	11	22.0	95.1	9.0	0.5	82.7	2.9	4.9	90.9	59.0	—	96.4	48.3
Fodder sugar beet and sugar beet	7	18.6	93.0	7.1	0.3	78.7	6.9	7.0	83.8	74.1	—	90.7	11.6
Turnips	6	8.4	91.3	16.5	1.9	61.2	11.7	8.7	74.5	112.7	—85.1	45.7	116.0
Carrots	6	14.8	92.5	9.1	1.4	71.0	11.0	7.5	97.4	72.5	33.8	82.7	102.8
<i>Industrial residues</i>													
Beet pulp	7	84.5	92.0	12.2	0.5	65.5	13.8	8.0	72.6	54.7	—	87.9	30.7
Potato pulp, dried	8	86.3	94.9	4.3	0.5	69.0	21.1	5.1	82.1	—8.5	102.8	92.7	65.8
Sulphate and sulphite cellulose	14	91.9	99.5	0.1	0.6	21.6	77.2	0.5	81.1	—	—	73.1	90.5
<i>Cereals</i>													
Oats	132	86.5	96.1	13.2	5.5	65.1	12.3	3.9	70.0	81.0	70.5	75.5	24.4
Barley	7	85.3	97.0	12.5	2.2	76.9	5.4	3.0	82.7	80.8	34.7	88.3	31.0
Mixed oats and barley	18	85.1	96.7	11.9	3.0	76.0	5.8	3.3	79.8	79.1	30.1	87.8	3.5
Maize	16	85.4	98.4	11.1	4.5	79.9	2.8	1.6	87.7	71.2	62.2	91.3	—48.4
<i>Legumes (beans, sweet lupine, peas)</i>	13	87.3	96.1	35.1	2.1	46.7	12.7	3.9	86.0	87.0	17.0	90.4	67.5
<i>Milling offal</i>													
Wheat bran and wheat feed	15	88.4	92.8	16.0	4.9	60.6	10.4	7.2	54.6	75.3	31.4	60.8	—7.0
Oat bran, oat chaff and oat feed	8	91.4	93.5	4.9	1.8	56.7	30.1	6.5	35.0	77.9	68.9	30.6	34.6
Barley feed	4	89.8	95.2	15.5	3.8	64.7	11.2	4.8	57.8	80.0	—15.1	73.6	—39.8
<i>Oilseeds</i>													
Cottonseed cake meal	4	91.8	93.1	39.4	7.9	29.6	16.2	6.9	65.2	85.8	93.9	56.4	36.3
Linseed cake meal	4	89.7	94.1	36.7	6.8	41.9	8.7	5.9	51.5	84.5	34.8	53.0	—65.7
Soya bean meal	2	87.4	93.7	50.9	0.6	36.7	5.5	6.3	85.8	96.2	—	76.1	84.8

REFERENCES TO TABLE 15

- Green fodder: Ehrenberg *et al.* (1935); Müntz and Girard (1898); Olsson *et al.* (1949); Taubert (1934); Winkler (1941b); Wittig (1938).
 Meadow hay: Engler (1933); Grandeau and Le Clerc (1886); Grandeau and Alekan (1904); Hagemann (1911a, b); Hofmeister (1866); Hötzel (1931); Lindsey *et al.* (1926); Müntz (1882); Müntz and Girard (1882); Olsson *et al.* (1949); Tangl (1902, 1905); Tangl and Weiser (1906); Weiser (1906); Wolff (1877, 1878, 1879, 1881, 1884, 1887); Wolff and Kreutzthage (1895).

Timothy hay : Lindsey *et al.* (1926) ; Patterson (1879).
 Clover hay : Wolff (1881, 1884).
 Alfalfa and alfalfa mixture hay : Lindsey *et al.* (1926) ; Müntz and Girard (1898) ; Winkler (1940, 1941a) ; Wolff (1878, 1884).
 Cereal hay : Perkins *et al.* (1914).
 Oat straw : Dunbar (1925) ; Olsson *et al.* (1949) ; Wolff and Kreutzhage (1895).
 Wheat straw and chaff : Müntz (1882) ; Olsson *et al.* (1949) ; Wolff (1877, 1879).
 Rye straw : Hötzel (1931) ; Weiser and Zaitschek (1921).
 Potatoes : Engler (1933) ; Naumann (1940) ; Nieschling (1934) ; Olsson *et al.* (1949) ; Wolff (1884) ; Wrede (1932).
 Fodder sugar beet and sugar beet : Olsson *et al.* (1949) ; Scholz (1933).
 Turnips : Günther (1934) ; Olsson *et al.* (1949).
 Carrots : Müntz and Girard (1883) ; Nieschling (1935) ; Olsson *et al.* (1949) ; Wolff (1884).
 Beet pulp : Olsson *et al.* (1949).
 Potato pulp dried : Bizer (1940) ; Ehrenberg and Lachmann (1942) ; Newerla and Müller (1943).
 Sulphate and sulphate cellulose : Olsson (1943b).
 Oats : Grandean and Le Clerc (1888) ; Lindsey *et al.* (1926) ; Müntz (1882) ; Müntz and Girard (1883) ; Nitsche (1939) ; Olsson *et al.* (1949) ; Patterson (1879) ; Tangl (1902, 1905) ; Wolff (1877, 1879, 1884, 1887) ; Wolff and Kreutzhage (1895).
 Barley : Lindsey *et al.* (1926) ; Müntz and Girard (1884) ; Patterson (1879).
 Mixed oats and barley : Olsson *et al.* (1949).
 Maize : Lindsey *et al.* (1926) ; Müntz (1882) ; Patterson (1879) ; Winkler (1940) ; Wolff (1879, 1887).
 Legumes (beans, sweet lupins, peas) : Müntz (1882) ; Müntz and Girard (1883) ; Toepsh (1937) ; Wolff (1879, 1881).
 Wheat bran and wheat feed : Hagemann (1911a) ; Lindsey *et al.* (1926) ; Müntz (1882) ; Olsson *et al.* (1949).
 Oat bran, oat chaff and oat feed : Lahtorp and Bohstedt (1938) ; Lindsey *et al.* (1926).
 Barley feed : Hötzel and Müller (1933).
 Cottonseed cake meal : Lindsey *et al.* (1926).
 Linseed cake meal : Lindsey *et al.* (1926).
 Soya bean meal : Olsson *et al.* (1949).

On the basis of extensive studies on Ardennes working horses, Olsson (1951) found that when they were doing no work or light work they were not satisfied with 5 to 6 kg. roughage (hay and straw) ; but when they did moderate to heavy work and had more concentrates they were satisfied with that amount of roughage, which corresponds to 0.6 to 0.7 kg. per 100 kg. liveweight. Olsson recommends not less than 7 kg. for rest or light work.

Pasture and Green Fodder

According to Blechschmidt (1933) a 2-year-old horse of heavy breed in dry weather can eat 40 kg. pasture grass. Nietsch (1935) says that a year-old foal on the average will eat 21 to 38 kg. grass daily. But the amount eaten on free grazing may vary within wide limits, depending on air temperature and other climatic differences. According to Schmidt, Patov and Kleisch (1945), working horses will eat 80 to 110 kg. green fodder harvested at an early stage of growth, or 50 to 60 kg. at a later stage of development.

Silage

Morrison (1937) says that grass silage can with advantage replace a third or a half of the ration of hay. Popov (1946), on the basis of Russian experiments, states that 6 to 12 kg. is a suitable amount of grass silage for working horses, and 20 kg. of maize silage. Axelsson (1943) thinks that the amount of silage should be restricted to 5 to 6 kg. daily ; Jespersen (1949) recommends 10 to 15 kg. and Chaljuk (1946) 12 to 20 kg.

Potatoes and Roots

These may be of great importance for feeding horses. The amount will obviously depend on the total bulk and on the work to be done. Kellner and Fingerling (1924) recommend 1.5 to 2.5 kg. raw potatoes per head daily for horses doing intensive and heavy work. For horses doing lighter work and moving slowly, and for 3- to 4-year-old horses, 12 kg. potatoes per 1000 kg. liveweight daily is a suitable ration. Hansson (1938) gives 5 to 7 kg. potatoes as suitable. On the other hand, according to some writers (Galichnikova and Kusnetsova, 1951 ; Pärn, 1949) both grown and half-grown horses may be given up to 16 kg. per head daily. More may be given of cooked potatoes ; Hansson recommends 12 to 15 kg. boiled potatoes daily and Wrede (1932) 40 kg. steamed ensiled potatoes per 1000 kg. liveweight daily.

The most suitable roots are those relatively high in dry matter. Löwe (1943) uses roots as a substitute for cereal (oat) meal from weaning to 3 years of age without any unfavourable result. Büniger (1944) recommends 20 to 25 kg. roots as the daily maximum for working horses. According to Jespersen (1949), half the ration for horses doing heavy work may be sugar beet, provided the protein content is 50 g. per Sc.F.U. From other Danish experiments (Jespersen, 1939) the conclusion has been drawn that the amount of fodder beet per head daily should be restricted to 25 kg. Hansson (1923) believes that the feeding value of sugar beet for horses is greater when the daily allowance is limited to 10 or 12 kg. Popov (1946)

is more cautious with roots and proposes for heavy horses 6 to 8 kg. carrots or other roots, or at most 15 to 20 kg. Working horses doing light to moderate work, according to Asam (1924) may be given 20 kg. fodder beet or more. He reckons that 5 kg. beet can replace 1 kg. oats.

Root Tops

These too have been given to working horses. Bartsch (1926) says that up to 20 kg. sugar beet leaves can be given to horses doing strenuous work. If the protein requirement is met, 5 kg. sugar beet leaves can replace 1 kg. oats. Temper (1927) came to the same conclusion regarding the use of tops and leaves of roots.

Molasses

Molasses is a valuable feed for horses, especially when it is given with straw as roughage. Popov (1946) approves of the use of molasses, apart from the risk of colic. Views differ on suitable daily allowances. Axelsson (1943) recommends 1.5 to 2 kg. and says that larger amounts cause increased sweating and are laxative. According to Danish experiments (Hofman-Bang, 1917) up to 2.5 kg. molasses can be given to working horses, and 4 parts by weight of molasses can replace 5 of oats. In Germany distiller's potato wash has sometimes been used to feed horses; according to Müller (1931), 40 litres may be given daily.

Cereals

Oats are the concentrate most used for horses and are more important in the feeding of horses than any other feedingstuff. But barley also and other cereals may be used. Jespersen (1949) says the prices of cereals should decide which will be used. Rye should perhaps be excepted because it causes colic. According to Kellner and Fingerling (1924), rye may be used to feed horses but should be mixed with 2 or 3 parts of oats, and Morrison (1937) agrees. On the other hand, Teschner (1927) records that rye in experiments caused no trouble, even when 4.5 to 6 kg. was used for working horses. In his view, rye is a valuable feedingstuff of which 1 kg. can replace 1.20 to 1.25 kg. oats.

Sprouted oats or other germinated grains, at least 1 kg. daily, are believed to have a good effect on stud stallions (Skatkin, 1950).

Oilseeds

Views on the use of oilseeds in rations for horses vary. Jespersen (1949) advises against rapid change to oilseeds since they may cause digestive disturbances. Sunflower seed cake is thought to be the best for horses but, if too much is given, it may cause disorders. Mustard seed cake and cottonseed cake are considered unsuitable for horses and so is hempseed cake. But there are other views: Grigorjev and Feodorov (1946) found that 40 per cent. of the concentrate ration might be of cottonseed cake without ill effect. Of the concentrate mixture in question, 6 to 10 kg. was given daily for 6 months.

Fodder Cellulose

In many countries fodder cellulose was used to feed horses during the second world war. From the studies made it appears that cellulose is an excellent feed and may be used in relatively large amounts, provided the requirements for protein, vitamins and minerals are met. Digestibility coefficients for crude fibre in fodder cellulose, varying from 88.1 to 93.6, are considerably higher than in untreated cellulose (Olsson, 1943a). Edin (1918) found that 0.95 kg. fodder cellulose could replace 1 kg. oats. According to Jespersen (1941b), 3 kg. fodder cellulose is a suitable daily ration, but Olsson (1943b) found in extensive experiments that medium-weight working horses could without harm be given 4.7 kg. fodder cellulose daily and Hvidsten (1945a) states that working horses of 600 kg. live-weight were given up to 5 kg. fodder cellulose daily.

MAXIMUM DAILY ALLOWANCES OF DIFFERENT FEEDINGSTUFFS

Of different feedingstuffs, Popov (1946) gives the following maximum daily quantities for heavy working horses, on the assumption that the feeds are of good quality:

	kg.		kg.
Oats . . .	8.0	Wheat bran . .	4.0
	or more	Malt culms . .	1
Maize, barley . .	6.0	Brewer's draff, dried . . .	3
Rye, wheat . .	4.0		
Sorghum . . .	4.0	Distiller's wash, dried . . .	2
Vetches . . .	2.0	Potatoes . . .	8
Linseed and sunflower seed cake	3.5	Fodder beet . .	12
Hempseed cake	2.5	Carrots . . .	10
Cottonseed cake	1.5	Draff, fresh . .	12 litres
		Silage . . .	8

A similar table has been compiled by Davydova (1946).

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1. TECHNIQUE

CHEMICAL

APPARATUS

1 MILTON, R. F. and DUFFIELD, W. D. The use of the Cavett apparatus in micro-analysis. *Lab. Practice*, 1954, 3, 318-323.

The use of the apparatus (Cavett, *J. Lab. Clin. Med.*, 1937, 23, 543) for microdiffusion methods for the estimation of ammonia, total N, urea, nitrate and nitrite, chloride, bromide, iodide, CO₂, glucose, acetone, alcohol, chloroform and CO in urine and body fluids is described.—H. G. Bray.

2 SIMMONDS, D. H. Improved electrolytic desalter. *Anal. Chem.*, 1954, 26, 1253-1254. [Biochem. Unit, Wool Textile Res. Lab., C.S.I.R.O., Melbourne.]

An all-glass apparatus is described.—H. G. Bray.

3 DIXON, M. A thermostat cell-holder for the Beckman spectrophotometer. *Biochem. J.*, 1954, 58, 1-3. [Dept. Biochem., Univ. Cambridge.]

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A motor-driven syringe was used in conjunction with the Schlieren method of analysis in a standard electrophoretic cell for fractionation of small quantities of material.—A. Hepburn.

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ANALYTICAL METHODS

General

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CRAMPTON, E. W., FARMER, F. A. and SHAW, R. K. An improved method for determining bomb calorimeter values. *J. Animal Sci.*, 1954, 13, 658-659. [Fac. Agric., McGill Univ., Macdonald Coll., Que.]

The improvement consists in equipping the calorimeter with a manganin-nickel thermocouple and, with a recording potentiometer, making a permanent record of the temperature during the estimation. With 95 samples so examined the standard deviation was 3.0 per cent. of the mean; for about 900 samples with the ordinary type of thermometer it was 3.4 per cent. of the mean.

D. Harvey.

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The drops from a chromatographic column are applied directly to a horizontal filter paper circle so that the separated fractions give rise to concentrated rings in which the compound under investigation can be estimated.—H. G. Bray.
- 16
GANGULI, N. C. Modified unidimensional paper chromatography. *Naturwissenschaften*, 1954, **41**, 282. [Dept. Appl. Chem., Univ. Coll. Sci. Technol., Calcutta.]
Rectangular cuts, 2.5 cm. \times 5 mm., are made at equal intervals across the paper strip and the solutions to be tested are applied to the paper between the cuts.—H. G. Bray.
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The technique described reduces the running time to about 2 hr.—H. G. Bray.
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TAPERNOUX, A., MAGAT, A. and GONNET, M. Les principes de la méthode électrophorétique. Applications aux sérums des animaux domestiques. [Principles of the electrophoretic method. Application to sera of domestic animals.] *Rev. Méd. vét.*, 1954, **105**, 402-412. [Lab. Phys. Chim., Ecole Nat. Vét., Lyons.]
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WOLFF, R. and MAGNIN, P. Remarques sur l'emploi de l'amidoschwarz B comme révélateur des fractions de protéides obtenus par électrophorèse sur papier. [Use of amido-black B to reveal protein fractions obtained by paper electrophoresis.] *Bull. Soc. Chim. biol.*, 1954, **36**, 925-926. [Lab. Chim. Biol., Fac. Méd., Nancy.]
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STAUB, H. Ca⁴⁵ bei Stoffwechseluntersuchungen. [⁴⁵Ca in metabolism investigations.] *Schweiz. med. Wochenschr.*, 1954, **84**, 499-506. [Basle.]
French and English summaries.
A review.
See also Abst. 1.
- Carbohydrate Constituents
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ZIFF, R. E. and WALDO, A. L. Spectrophotometric analysis of carbohydrates and study of anthrone reagent. *J. Lab. Clin. Med.*, 1952, **39**, 497-502. [Biochem. Lab., Miami Valley Hosp., Dayton, Ohio.]
A macro- and micro-spectrophotometric analysis specific for carbohydrate was made on body fluids, with an adaptation of Dreywood's anthrone reagent method. The colour formation was due to the complex formed between the carbohydrate-furfural derivative and the reactive enol tautomer anthranol.—A. Hepburn.
- 26
JOHANSON, R. Anthrone in the estimation of hexose sugars with special reference to pentose interference. *Anal. Chem.*, 1954, **26**, 1331-1333. [Plant Indust., C.S.I.R.O., Canberra.]

Some errors in the method are eliminated by controlling mixing by means of a simple spinning disc apparatus. The use of less concentrated H_2SO_4 , 81 vol. per cent. instead of 96.4 vol. per cent., and weaker sugar solutions reduces interference from pentoses.—H. G. Bray.

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YOUNG, M. K. and PRUDDEN, J. F. Simultaneous determination of sucrose and inulin in biologic fluids. *J. Lab. Clin. Med.*, 1954, **44**, 160-165. [Surg. Res. Unit, Brooke Army Med. Centre, Fort Sam Houston, Tex.]

Inulin and sucrose are estimated together by means of an anthrone reagent and inulin alone after treatment of the mixture with an invertase preparation which removes the chromogen from sucrose.—H. G. Bray.

28

HANDELSMAN, M. B. and DRABKIN, J. Use of anthrone reagent to estimate inulin in the presence of glucose. *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 356-360. [Long Island Coll. Hosp., New York.]

If all heating is eliminated during the reaction, glucose gives no colour. The sample to be estimated is cooled and diluted with cold concentrated H_2SO_4 before the addition of the reagent. Subsequent heating at $56^\circ C$. gives maximum colour formation with inulin but no significant colour with glucose. Control experiments in which inulin was estimated in the presence of glucose gave recoveries greater than 98 per cent.

H. G. Bray.

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VAN DER VIES, J. Two methods for the determination of glycogen in liver. *Biochem. J.*, 1954, **57**, 410-416. [Dept. Pharmacol. Res., N.V. Organon, Oss, Holland.]

Glycogen is extracted by trichloroacetic acid, and may be estimated approximately with an iodine and potassium iodide reagent, the intensity of the colour of the glycogen-iodine complex being measured. A more accurate method with anthrone is described, alkali being present to prevent interference by glucose.—H. G. Bray.

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GRANDE, F., UTRERA, A. and DE OYA, J. C. Anthrone reaction in estimation of carbohydrates. *Bull. Inst. Med. Res., Univ. Madrid*, 1953, **6**, 67-81. [Dept. Physiol.]

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ISHERWOOD, F. A. Separation of carbohydrates and phosphoric esters on paper chromatograms. *Brit. Med. Bull.*, 1954, **10**, 202-210. [Low Temp. Res. Stat., Univ. Cambridge.]

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JAAERMA, M. The use of ^{110}Ag in quantitative paper chromatography of sugars. *Acta chem. scand.*, 1954, **8**, 860-862. [Inst. Inorgan. Chem. and Biochem., Högsk., Stockholm.]

The developed chromatogram is treated with an acetone solution of silver nitrate labelled with ^{110}Ag and, after drying, with ethanolic NaOH followed by 6 N NH_4OH . The paper is then washed with water and dried and the radioactivity of the spots is measured. It was found that there was a linear relation between counts per min. and sugar content.—H. G. Bray.

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GIRI, K. V. Preparative circular paper chromatography. *Nature*, 1954, **178**, 1194-1195. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

The use of large thick filter paper circles (Whatman No. 3, 35 cm. diameter) enables 300 to 500 mg. quantities of sugars to be separated and isolated.—H. G. Bray.

35

BAAR, S. Quantitative estimation of glucose by paper partition chromatography. *Biochem. J.*, 1954, **58**, 175-176. [Med. Res. Coun. Indust. Injuries and Burns Res. Unit, Birmingham Accident Hosp.]

Separation is by ascending paper chromatography with *n*-propanol:ethyl acetate:water (7:1:2) as the solvent system. The spots are revealed by aniline hydrogen phthalate. The stained areas are cut out and eluted with glacial acetic acid and the colour intensities of the eluates are measured spectrophotometrically at 480 m μ .

H. G. Bray.

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SMITH, F. and SPRIESTERSBACH, D. The separation of D-glucose and D-fructose from invert sugar or sucrose. *J. Amer. Chem. Soc.*, 1954, **76**, 4191-4192. [Div. Agric. Biochem., Univ. Minnesota, St. Paul.]

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WHITE, J. W. (Jr.) and MAHER, J. Selective adsorption method for determination of the sugars of honey. *J. Assoc. Off. Agric. Chem.*, 1954, **37**, 466-478. [E. Utilization Res. Branch, Agric. Res. Serv., Philadelphia 18, Pa.]

38

GLEGG, R. E. and EIDINGER, D. **Hydrolysis of polysaccharides by a cation exchange resin and identification of monosaccharide components by paper chromatography.** *Anal. Chem.*, 1954, 26, 1365-1367. [Dept. Anat., McGill Univ., Montreal.]

Saccharides are heated at 100° C. in a sealed tube with acid-regenerated Permutit Q. Monosaccharides, with the exception of ketoses, are detectable after 48 hr. of this treatment. N-acetyl hexosamines are deacetylated by the treatment. The resulting hexosamines must be eluted with HCl. Monosaccharides of carbohydrate-protein complexes are liberated by resin treatment.

H. G. Bray.

39

HARWOOD, V. D. **Analytical studies on the carbohydrates of grasses and clovers. 5. Development of a method for the estimation of cell-wall polysaccharides.** *J. Sci. Food Agric.*, 1954, 5, 270-275. [Dept. Chem., Univ. Edinburgh.]

For previous parts see Abst. 27, Vol. 22; *J. Sci. Food Agric.*, 1952, 3, 494; Absts. 1677, 4047, Vol. 24.

A method is described for the estimation of cell-wall polysaccharides which involves two-stage hydrolysis with H_2SO_4 : pre-treatment with $N H_2SO_4$ to dissolve and hydrolyse the greater part of the hemicellulose fraction, and subsequent treatment with 72 per cent. H_2SO_4 . The resulting monosaccharides are estimated chromatographically. At most 7 per cent. of the monosaccharides was destroyed by the pre-treatment; the agreement in the second stage hydrolysis was within 5 per cent.—D. M. Walker.

40

CHARLET-LÉRY, G., FRANÇOIS, A. and LEROY, A. M. **L'analyse des aliments destinés aux animaux et l'interprétation des résultats qu'elle fournit. [Analysis of feeds destined for animals and interpretation of the results.]** *Ann. Zootech.*, 1952, 1, No. 3, 45-61. [Lab. Zootech., Inst. Nat. Agronom., Paris.]

Defects in the classical system of analysis of feedingstuffs are discussed, particularly those referable to the estimation of indigestible fibre by the Weende method. To overcome them modifications of the system by the use of the following methods for particular constituents are proposed: (1) true cellulose, Kürschner's method (*Tech. Chem. Papier-Zellstoff-Fab.*, 1929, 26, 125), (2) lignin, the method of Mahood and Cable (*J. Indust. Eng. Chem.*, 1922, 14, 933), (3) hydrolysable carbohydrates, by boiling with H_2SO_4 and estimation of glucose, (4) pentosans, by hydrolysis and precipitation of furfural as described by Unger and

Jager (*Chem. Ber.*, 1903, 36, 1222), (5) fraction insoluble in formic acid, by a method based on the work of Guillemet and Jacquot (Abst. 1017, Vol. 15), (6) total pectic substances, as pectic acid, by a method which is briefly summarised.

Analytical data are given in 2 main tables. In the first, comparison is made between values for the fraction insoluble in formic acid (IF) and for the true cellulose (C) and lignin (L) contents of a number of single and mixed feeds. For 20 feeds the mean value of the ratio C + L : IF was 0.98 ± 0.14 , and (IF) is concluded to be a good measure of (C) + (L).

In the second table analytical and digestibility data are given for 31 trials, 9 on cattle, 19 on sheep and 3 on pigs. Of these, 3 on cattle and 10 on sheep were with alfalfa hay alone; the others were with bran or beet pulp or combinations of these. The trials on pigs were with prepared mixed feeds. From the analytical data the contents of "substances organiques ternaires dégraissées" (MTD) were calculated as the differences between total organic matter and the sum of the crude protein ($N \times 6.25$) and fat contents. When the indigestible fibre content (Weende) was plotted against digestibility of organic matter the dispersion was wide, the coefficient of correlation being -0.73 ± 0.06 . If, on the other hand, the ratio lignin content $\times 100$: MTD was used, its coefficient of correlation with digestibility of organic matter was -0.89 ± 0.03 . From the data the equation

$$y = \frac{167}{x} + 52$$

was derived, where y = digestibility of organic matter and x = lignin $\times 100$ / MTD. For all three species and for values of x between 4.8 and 26.6 agreement between calculated and measured digestibility coefficients was good. It is concluded that such estimations give a good measure of the digestibility of a feedingstuff and preclude the making of digestibility trials.—D. Harvey.

41

HELLSTRÖM, N. **The total composition of hay. 2. A study in hemicellulose and cellulose determinations.** *Acta Agric. scand.*, 1954, 4, 209-223. [Inst. Org. Chem., Royal Agric. Coll. Sweden, Uppsala.]

The composition of a G-product of hay, a material almost free from protein, fat and soluble sugars, is reported. The G-product was extracted with alkali varying in strength from 1 to 18 per cent. and also hydrolysed with 2.5 $N H_2SO_4$. The product was analysed for ash, protein and pentosans. The yields and composition of cellulose obtained by the method of Kürschner and Hoffer and of the residues after hydrolysis with acid were estimated.

N.A. and R., January 1955

X-ray investigations of the fat-extracted hay, the G-product and the G-product treated with alkali were made. Cellulose I was shown to be present. The results are compared with previous results obtained with birch wood.—D. M. Walker.

42

MOON, F. E. and ABOU-RAYA, A. K. The lignin fraction of animal feeding-stuffs. 4. The preparation of 'reference' lignin by extraction with ethyl acetoacetate. *J. Sci. Food Agric.*, 1954, 5, 319-323. [Edinburgh and East Scotland Coll. Agric., 13 George Sq., Edinburgh 8.]

For previous parts see Absts. 27, 1206, Vol. 23.

A "reference" lignin was prepared by extraction of the sample with ethyl acetoacetate after pre-treatment with ethanol-benzene and, for young plant materials, acid pepsin. Subsequently, a preliminary treatment with alkali was included also. The purity of the lignin preparation was judged on a high methoxyl and low nitrogen content. Many different plant materials were tested and it was concluded that lignin from young plants is the same as that in mature plants; the greater degree of contamination in young plants causes an apparently low methoxyl content. It is therefore suggested that lignin content can be estimated from total methoxyl content when the conversion factor for different species has been found; this ranged from 5.27 to 5.64, average 5.5, for Gramineae.—D. M. Walker.

See also Absts. 84, 301.

Nitrogenous Constituents

43

McKENZIE, H. A. and WALLACE, H. S. The Kjeldahl determination of nitrogen: a critical study of digestion conditions—temperature, catalyst, and oxidizing agent. *Austral. J. Chem.*, 1954, 7, 55-70.

As a result of the experiments described, a rapid and precise method for the estimation of from 0.2 to 2 mg. N in amino-acids and proteins was developed, and an account of it is given.

H. G. Bray.

44

YUEN, S. H., and POLLARD, A. G. Determination of nitrogen in agricultural materials by the Nessler reagent. 2. Micro-determinations in plant tissues and in soil extracts. *J. Sci. Food Agric.*, 1954, 5, 384-389. [Dept. Agric. Chem., Imp. Coll. Sci. Technol., London, S.W.7.]

Methods of digestion of plant material, treatment of soil samples and spectrophotometric estimation of the Nessler colour are discussed.—H. G. Bray.

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45

BERNHARD, E. Colorimetrische Bestimmung des Ammoniakstickstoffes im Käse. [Colorimetric estimation of ammonia nitrogen in cheese.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 115-122. [Milchtech. Inst., Eidg. Tech. Hochschule, Zürich.] French and English summaries.

The Nessler reaction is applied to an extract of cheese with sodium citrate and trichloroacetic acid.

H. G. Bray.

46

MELLETT, S. J., BRODSKY, W. A. and PALMER, L. A rapid modification of the brucine method for determination of nitrates in biological fluids. *J. Lab. Clin. Med.*, 1953, 41, 963-967. [Dept. Paediat., Inst. Med. Res., Sch. Med., Univ. Louisville, Ky.]

Spectrophotometric measurement of the colour developed when a concentrated acid solution of brucine reacted with nitrate enabled amounts of 5 to 30 µg. of the latter per aliquot to be estimated in urine or plasma. Optical density was strictly proportional to the amount of nitrate. The colour was thought to be an oxidation product of brucine.

Nitrite had a similar effect, but as it is generally present in small amounts this was unimportant. Urea did not interfere at the high dilutions used.

It was found possible to estimate nitrate in the presence of nitrite by adding ammonium sulphamate to remove the latter. This method was less sensitive. Nitrite alone could be estimated by a diazotisation process which was unaffected by nitrate.—A. Hepburn.

47

NELSON, J. L., KURTZ, L. T. and BRAY, R. H. Rapid determination of nitrates and nitrites. *Anal. Chem.*, 1954, 26, 1081-1082. [Dept. Agronom., Univ. Illinois, Urbana.]

Nitrite is estimated by diazotising sulphanilic acid and coupling with *l*-naphthylamine, and nitrate by reduction to nitrite with Zn and manganous sulphate.—H. G. Bray.

48

KATZ, J. J. Anhydrous hydrogen fluoride as a solvent for proteins and some other biologically important substances. *Arch. Biochem. Biophys.*, 1954, 51, 293-305. [Chem. Div., Argonne Nat. Lab., Lemont, Ill.]

Anhydrous HF (m.p. -63°, b.p. 19.5° C.) was shown to be a powerful solvent for amino-acids and for proteins, including silk fibroin, collagen, bovine plasma albumin and globulin, egg albumin, cytochrome *c*, ribonuclease, deoxyribonuclease, urease, uricase, pepsin, rennin, trypsin, chymotrypsin, catalase, α -amylase, Hb, insulin and ACTH, chlorophyll and vitamin B₁₂. Hair and keratin were the proteins most resistant to solution.

Most basic groups of bovine plasma albumin recovered from solution appeared to bind 1 molecule of HF. This explained why some proteins recovered from HF dissolved in water to give acid solutions. The solubility and biological properties of these proteins at their isoelectric points are still unknown, and the possibility of denaturation cannot be overlooked.

Many other proteins recovered from solution, including pepsin, bovine plasma globulin, catalase, urease, uricase and silk fibroin, were completely insoluble in water. The addition of hide collagen, glycine, aspartic acid or lysine to an HF solution of bovine plasma albumin conferred water solubility on the product.

Chlorophyll could not be recovered unchanged from solution in HF and catalase and cytochrome c had also lost their biological properties. Vitamin B₁₂ was recovered in a modified form, probably as fluorocobalamin, which retained most of its activity. Insulin retained most of its activity and ACTH appeared to be recovered intact.

A. Hepburn.

49

PORTER, R. R. Chromatography of proteins. *Brit. Med. Bull.*, 1954, 10, 237-240; 241. [Nat. Inst. Med. Res., Mill Hill, London.]

50

SOBER, H. A. and PETERSON, E. A. Chromatography of proteins on cellulose ion-exchangers. *J. Amer. Chem. Soc.*, 1954, 76, 1711-1712. [Lab. Biochem., Nat. Cancer Inst., Nat. Insts. Health, Bethesda, Md.]

Alkaline cellulose treated with chloroacetic acid or N'-2-chloro-N : N-diethylethylamine forms cation- and anion-exchangers, respectively.—H. G. Bray.

51

POLIMENI, R. and TURITTO, P. Determinazione comparativa della frazioni protidemiche con la elettroforesi e con i metodi di salatura. Significato delle differenze. [Comparative estimation of blood protein fractions by electrophoresis and by salting out. Significance of the differences.] *Riv. Ist. sieroterap. ital.*, 1954, 29, 225-242. [Ist. Patol. Med., Univ. Rome.] English summary.

Estimation of the serum protein fractions in 19 healthy subjects with blood protein within normal limits, in whom it might be assumed that the separate protein fractions were of normal physico-chemical composition, showed that there were statistically significant differences between the values obtained by electrophoresis and those obtained by salting out with sodium or ammonium sulphate. Such discrepancies must be attributed to the different methods of fractionation. Examination of 3 groups of pathological cases, 16 with

infectious diseases, 9 with hepatic cirrhosis, and 3 with nephrosis, showed that the discrepancies in the values found by the 3 methods for one particular fraction in healthy subjects could differ from those found for the same fraction in pathological subjects. Moreover, they could show further variations according to the type of disease. Since these discrepancies between the methods in relation to pathological condition are probably based on physico-chemical anomalies of the protein molecule, the simultaneous use of two or three of the methods is advised for a more profound study of the proteins.—M. B. Richards.

52

MACKAY, I. R., VOLWILER, W. and GOLDSWORTHY, P. D. (with ERIKSEN, N. and WOOD, P. A.) Paper electrophoresis of serum proteins: photometric quantitation and comparison with free electrophoresis. *J. Clin. Invest.*, 1954, 33, 855-866. [Dept. Med., Univ. Washington, Seattle.]

53

FRANGLÉN, G. T. and MARTIN, N. H. The interaction of dyes with proteins on paper with special reference to paper electrophoresis. *Biochem. J.*, 1954, 57, 626-630. [Dept. Chem. Pathol., St. George's Hosp. Med. Sch., London.]

On the basis of experiments on the dye-binding characteristics of human albumin and γ -globulin, it is concluded that a re-assessment of quantitative paper strip electrophoresis of proteins should be made.—H. G. Bray.

54

KUTÁČEK, M. and KRATOCHVÍL, L. Elektroforesa na papíře ve službách zemědělské biochemie. 2. Dělení a kvantitativní vyhodnocování kaseinu připraveného podle Hammarstena. [Paper electrophoresis in agricultural biochemistry. 2. Separation and quantitative estimation of fractions of casein prepared by Hammarsten's method.] *Sborn. Čsl. Akad. Zéméd.*, 1954, 27 [A], 355-362. Russian and English summaries.

The proteins of whey were easily separable by paper electrophoresis. Conditions suitable for the fractionation of casein were evolved and the existence of the third γ -form was confirmed. Quantitative evaluation of these electropherograms gave results for the proportions of the 3 forms similar to those reported in the literature as obtained with standard electrophoresis procedures. (From English summary.)—D. Harvey.

55

BRADISH, C. J. and SMART, N. V. Fractionation of serum proteins by zone electrophoresis in

N.A. and R., January 1955

glass powder. *Nature*, 1954, **174**, 272-273. [Res. Inst. (Animal Virus Dis.), Pirbright, Surrey.]

An account of modifications of the method and apparatus of Svansson and Brattsten (*Ark. Kemi*, 1949, **1**, 401).—H. G. Bray.

56

DREVON, B. Perfectionnement à l'électrophorèse sur papier des protéines sériques: décoloration des bandes par extraction au Kumagawa. [Improvement of paper electrophoresis of serum proteins: decoloration of the bands by extraction according to Kumagawa's method.] *Bull. Soc. Chim. biol.*, 1954, **36**, 921-923. [Lab. Pharm., Fac. Méd., Lyons.]

The excess dye is eluted with methanol: acetic acid (9:1).—H. G. Bray.

57

ROBOZ, E., HESS, W. C. and TEMPLE, D. M. Paper electrophoretic estimation of proteins in cerebrospinal fluid. *J. Lab. Clin. Med.*, 1954, **43**, 785-790. [Dept. Neurol., Sch. Med., Georgetown Univ., Washington, D.C.]

Protein is precipitated by ice-cold acetone, separated by centrifuging, treated with versene and dissolved in saline. After electrophoresis the protein fractions are stained with bromophenol blue and the excess dye is removed with acetic acid. The strips are read in an electric densitometer. Under the conditions described no conversion factor for γ -globulin is needed.

H. G. Bray.

58

CARLSON, L. A. Electrophoretic studies of serum lipoproteins. 1. A description of apparatus and technique for their separation in starch medium. *Acta chem. scand.*, 1954, **8**, 510-520. [King Gustav Res. Inst., Stockholm.]

The components of blood serum were separated on a column containing starch impregnated with water. The serum was driven by pressure into the starch column which was then filled with buffer. The latter was connected by siphon to an electrode vessel, and another electrode in a buffer-filled vessel which surrounded the starch column completed the electrical circuit.

To keep the protein zone narrow for good separation during electrophoresis the protein concentration had to be 2 per cent. or less. The addition of bromothymol blue which coloured the faster-moving albumin enabled the migration to be followed. After electrophoresis the starch column was taken out of the vessel and under a pressure of 10 cm. Hg fractions of constant volume were collected.

The protein, cholesterol and phospholipin contents of the fractions were estimated. The re-

covery of lipids was in all cases 95 to 105 per cent. Neither lipids nor proteins were adsorbed on the starch except in phosphate buffer, and pH and salt concentration had no effect when proteins were forced through the column.

Five distinct lipoprotein components, one slightly faster than albumin, α_1 -lipoprotein, β_1 -lipoprotein, β_2 -lipoprotein and a small component in the γ -globulin fraction in order of decreasing mobility were revealed.—A. Hepburn.

59

ÅGREN, G., DE VERDIER, C. and GLOMSET, J. A study of the phosphorus-containing proteins of cells. 1. The isolation of phosphoserine from the liver proteins of calf and rat. *Acta chem. scand.*, 1954, **8**, 503-509. [Inst. Med. Chem., Univ. Upsala.]

Homogenised calf liver after extraction with cold 10 per cent. trichloroacetic acid had lipids and nucleic acids removed to give the Schneider protein residue. After hydrolysis with HCl and the removal of the acid by evaporation, the hydrolysate was purified by passage through charcoal before separation on a chromatographic column with 0.01 N HCl as eluting agent. An automatic conductivity recording device followed the fractionation and two-dimensional paper chromatography was employed for further study of the fractions.

The livers from 6 adult rats 4 hr. after injection with 1 μ C. 32 P-phosphate per g. bodyweight were treated similarly, but fractionation was followed by means of the radio-activity of the effluent. By evaporating 1 ml. aliquots from each fraction on Al discs and counting the impulses per min. with a Tracerlab's SC-18 Superscaler a more sensitive indication of the fractionation was obtained.

From a fraction of the calf liver protein hydrolysate and a fraction similarly prepared from casein, phosphoserine was crystallised. Rotating crystal photographs from the 2 preparations established their identity. A fraction was obtained probably containing phosphothreonine. Other fractions from paper chromatographic examination contained P compounds, some of which were ninhydrin-positive.

Four main fractions were obtained from the rat liver hydrolysate, the first containing inorganic phosphate, the second peptide-bound P containing both glutamic acid and serine, the third phosphoserine and the fourth very likely phosphothreonine plus small amounts of other P compounds. The amount of phosphoserine P, though $\frac{1}{3}$ rd of the total amount of inorganic P, had a specific activity 5.4 times greater.

The method of phosphoserine preparation is limited because of the hydrolysis of the substance itself presumably along with other more labile P compounds.—A. Hepburn.

- 60
BLANQUET, L., CUVELLIER, R. and BERGER, J. A. Recherches sur le relargage des protéides du serum sanguin par le sulfite de sodium. [Salting-out of serum proteins by sodium sulphite.] *Bull. Soc. Chim. biol.*, 1954, **36**, 641-653. [Inst. Hydrol., Clermont-Ferrand.] The application of the procedure is discussed. Results comparable with those from electrophoresis are possible.—H. G. Bray.
- 61
NITSCHMANN, HS., KISTLER, P. and LERCHER, W. Vereinfachtes Verfahren zur Gewinnung von humanen Albumin und γ -Globulin aus Blutplasma mittels Alkoholfällung. [Simplified processes for obtaining human albumin and γ -globulin from blood plasma by alcohol precipitation.] *Helv. chim. Acta*, 1954, **37**, 866-873. [Theodor-Kocher Inst., Univ. Berne.] English summary.
- 62
ZWEIG, G. and BLOCK, R. J. Studies on bovine whey proteins. 3. The preparation of crystalline α -lactalbumin and β -lactoglobulin from ferrilactin. *Arch. Biochem. Biophys.*, 1954, **51**, 200-207. [Biochem. Res. Labs., Special Products Div., The Borden Company, Yonkers, N.Y.]
For Parts 1 and 2 see Absts. 2042 and 4760, Vol. 24.
- 63
LAMPITT, L. H., BAKER, L. C. and BROWN, K. P. Connective tissue of meat. 4. Comparison of methods for determining collagen in meat. *J. Sci. Food Agric.*, 1954, **5**, 343-350. [Lyons Labs., 149 Hammersmith Rd., London, W.14.]
- 64
WIERBICKI, E. and DEATHERAGE, F. E. Meat assay. Hydroxyproline as an index of connective tissue in muscle. *J. Agric. Food Chem.*, 1954, **2**, 878-882. [Dept. Agric. Biochem., Ohio State Univ., Columbus.]
- 65
GRAT, R. and HAMM, R. Über die Proteolyse der Fleischproteine. 2. Die Bestimmung des Bindegewebes in verarbeitetem Rohfleisch durch enzymatische Hydrolyse. [Proteolysis of meat proteins. 2. Estimation of connective tissue in prepared raw meat by enzymic hydrolysis.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, **98**, 425-429. [Bundesforschungsanst. Fleischwirtsch., Kulmbach.]
- 66
PIHAR, O. Kvantitativní stanovení sulfhydrylových skupin v bílkovinách. [Quantitative estimation of sulphhydryl groups in proteins.] *Chem. listy*, 1953, **47**, 1647-1651. [Cent. Inst. Endocrinol., Prague.]
A method for the estimation of SH groups, based on the chloromercuribenzoate reaction and on potentiometric titration of excess of chloromercuribenzoate with cysteine, is described.
M. Prokšová (Czechoslovakia).
- 67
FLESCH, P., GOLOMB, S. and SATANOVE, A. Colorimetric determination of protein-bound, water-insoluble sulphhydryl groups with the Barnett-Seligman reagent. *J. Lab. Clin. Med.*, 1954, **43**, 957-959. [Dept. Dermatol., Sch. Med., Univ. Pennsylvania, Pa.]
The dried protein, passed through a 200-mesh sieve, is treated with a 2:2'-dihydroxy-6:6'-dinaphthyl disulphide reagent at 50°C. The supernatant is treated with sodium lauryl sulphate and tetra-azotised di-*o*-anisidine and the purple colour formed is measured spectrophotometrically.
H. G. Bray.
- 68
CAMPBELL, P. N. and WORK, T. S. Chromatography of peptides. *Brit. Med. Bull.*, 1954, **10**, 196-201. [Nat. Inst. Med. Res., Mill Hill, London.]
- 69
EDMUNDS, H. and REITH, W. S. Studies of protein biosynthesis. 1. A method of isolation and identification of peptides. *Biochem. J.*, 1954, **57**, xviii. [Dept. Botany, Univ. Leeds.]
- 70
PARTRIDGE, S. M. Separation of amino acids and lower peptides by displacement chromatography by the use of ion-exchange resins. *Brit. Med. Bull.*, 1954, **10**, 241-246. [Low Temp. Res. Stat., Univ. Cambridge.]
- 71
CHIBNALL, A. C. Quantitative determination of amino acids. *Brit. Med. Bull.*, 1954, **10**, 183-186. [Dept. Biochem., Univ. Cambridge.]
- 72
COCKING, E. C. and YEMM, E. W. Estimation of amino acids by ninhydrin. *Biochem. J.*, 1954, **58**, xii. [Dept. Botany, Univ. Bristol.]
- 73
SPIER, H. W. and PASCHER, G. Zur quantitativen Mikroanalyse freier Aminosäuren mittels einer einfachen Cu-Komplexmethode. [Quantitative micro-estimation of free amino-acids by a

simple copper complex method.] *Hoppe-Seyler's Ztschr.*, 1954, **296**, 147-154. [Dermatol. Klin., Univ. Munich.]

The solution is treated with Cu phosphate at pH 7.4, the excess is removed by centrifuging and the supernatant is treated with sodium diethyl-dithiocarbamate. The yellow colour produced is measured photometrically.—H. G. Bray.

74

LISSITZKY, S., CÉSAIRE, G. and MASSONET, R. Une technique simple d'extraction des acides aminés libres des liquides et extraits biologiques, en vue de leur séparation chromatographique. [A simple technique for extracting free amino-acids from biological fluids and extracts with a view to chromatographic separation.] *Bull. Soc. Chim. biol.*, 1954, **36**, 655-657. [Lab. Chim. Biol., Fac. Méd., Algiers.]

A drop of serum or plasma is placed on chromatography paper and allowed to dry. The spot is cut out and extracted with acetone and the extract is centrifuged and evaporated, the residue being extracted with chloroform. This extract is shaken with dilute HCl to give an extract which is concentrated and used for paper chromatography.

H. G. Bray.

75

DE WAELE, J. and DIAZ CADAVIECO, R. Séparation des aminoacides par chromatographie ascendante monodimensionnelle et leur dosage par photométrie directe sur le papier. [Separation of amino-acids by ascending one-dimensional chromatography and their estimation by direct photometry on the paper.] *Rec. Trav. chim. Pays-Bas*, 1954, **73**, 333-346. [Lab. Vet. Biochem., Univ. Utrecht.]

A quantitative method for amino-acid analysis by the photometric measurement of colour density on a one-dimensional paper chromatogram is described. Phenol at pH 12.0, *m*-cresol and a 1 : 1 mixture of benzyl alcohol and butanol at pH 8.4 were used separately as solvents for 3 different groups of amino-acids. With the same kind of filter paper, the R_F values were approximately constant. A study of optimum conditions was made. The method was found reproducible with a mean error of 4.1 per cent. Results from hydrolysates of egg albumin and horse serum albumin agreed well with those of other methods.—A. Hepburn.

76

CLAYTON, R. A. and STRONG, F. M. New solvent system for separation of amino acids by paper chromatography. *Anal. Chem.*, 1954, **26**, 1362-1363. [Dept. Biochem., Univ. Wisconsin, Madison 6.]

The mixture is methyl ethyl ketone : propionic acid : water (75 : 25 : 30), the time of development

20 hr., with the ascending technique. Ninhydrin followed by copper nitrate is the detecting reagent. H. G. Bray.

77

ISHERWOOD, F. A. and CRUICKSHANK, D. H. A new method for the colorimetric estimation of amino-acids on paper chromatograms. *Nature*, 1954, **174**, 123-126. [Low Temp. Res. Stat., Univ. Cambridge.]

The solvents recommended are, for neutral amino-acids, a single-phase *n*-propanol-water (80 : 20) mixture, and for acidic amino-acids propionic acid : *tert*-butanol : water (60 : 30 : 10). After use of the second solvent mixture, propionic acid can be removed from the paper by steaming. The amino-acids on the paper after separation are sprayed with a fluoro-dinitrobenzene reagent and heated at 80° C. for 30 min. The spots are then cut out and eluted with an ethanolic borate buffer (pH 8.4), the extract is evaporated and the residue is treated with 91 per cent. H_2SO_4 and the solution extracted with benzene to remove dinitrophenol. The acid layer is cooled with ice and extracted with a mixture of amyl alcohol and benzene. The amino-acid derivatives are extracted into $NaHCO_3$ solution for photo-electric estimation.

H. G. Bray.

78

LEVY, A. L. A paper chromatographic method for the quantitative estimation of amino-acids. *Nature*, 1954, **174**, 126-127. [Hormone Res. Lab., Univ. California, Berkeley.]

Amino-acids are run as dinitrophenyl derivatives, with a two-dimensional technique. The first solvent, used in the ascending method, is toluene : chloroethanol : pyridine : 0.8 *N* ammonia (5 : 3 : 1.5 : 3) and the second, used in the descending method, 1.5 *M* aqueous phosphate buffer ($M NaH_2PO_4$, 0.5 *M* Na_2HPO_4). The spots are cut out and eluted with water and the colour of the eluate is measured spectrophotometrically.

H. G. Bray.

79

ÅKERFELDT, S. A spot area method for quantitative determination of amino acids on two-dimensional paper chromatograms. *Acta chem. scand.*, 1954, **8**, 521-522. [Inst. Res. Org. Chem., Univ. Stockholm.]

The logarithmic relation between concentration and spot area found in one-dimensional paper chromatography by Fisher *et al.* (Abst. 1574, Vol. 18) was proved valid also for 2-dimensional chromatography. The following expression was derived :

$$\log \frac{100 C}{M} = A \cdot F_p$$

where C = spot concentration of amino-acid in $\mu g.$, M = molecular weight of amino-acid, A = spot area in sq. cm., F_p = molar spot area constant.

The last was constant for each amino-acid examined within the investigated range of spot concentrations (10 to 50 $\mu\text{g.}$), but depended on the solvent and filter paper used.

The amino-acids were divided into group A, which contained *isoleucine*, *leucine*, *methionine*, *phenylalanine*, *tyrosine* and *valine*; and group B, containing the remainder. Special solvents were used with each group.

The spots were redrawn on a homogeneous paper and their areas were found by weighing. As different interpretations of spot edges are possible it was recommended that F_p be estimated by each investigator.

The error range of this spot area method for 2 estimations was 2 to 5 per cent.—A. Hepburn.

80

WAHI, P. N. and NIGAM, R. G. S. Double-dimensional paper-partition chromatography of amino acids: spot chart of thirty-one known amino acids. *Indian J. Med. Res.*, 1954, 42, 261-266. [Liver Dis. Res. Unit, Dept. Pathol., Med. Coll., Agra.]

The solvents used were phenol saturated with 6.3 per cent. sodium citrate and 3.7 per cent. NaH_2PO_4 , followed by *n*-butanol saturated with acetic acid and water (4:1:5).—H. G. Bray.

81

BOSE, H. Eine exakte, für Bausteinanalysen geeignete Aminosäurebestimmung auf Papierchromatogrammen. [An accurate method of estimating constituent amino-acids by paper chromatography.] *Hoppe-Seyler's Ztschr.*, 1954, 296, 10-18. [Diabetikerheim, Karlsruhe, Kreis Greifswald.]

A procedure based on the Cu phosphate method of Woivod (Abst. 4350, Vol. 19).—H. G. Bray.

82

REINDEL, F. and HOPPE, W. Über eine Färbemethode zum Anfärben von Aminosäuren, Peptiden und Proteinen auf Papierchromatogrammen und Papier-electropherogrammen. [On a dye method for colouring amino-acids, peptides and proteins on paper chromatograms and electropherograms.] *Chem. Ber.*, 1954, 87, 1103-1107. [Inst. Landwirt. Technol., Weihenstephan Tech. Hochschule, Munich.]

The procedure is described, in which the compounds on paper after separation are chlorinated by KMnO_4 and HCl and treated with KI and either *o*-tolidine or benzidine to give dark blue spots.

H. G. Bray.

83

KELLNER, W., HELLMUTH, H. and MARTIN, H. Verbesserung des Nachweises geringster Aminosäuremengen in Papierchromatogrammen.

[Improvement in the demonstration of minute amounts of mixed amino-acids in chromatograms.] *Naturwissenschaften*, 1954, 41, 304-305. [Hyg. Inst., Stadt Nürnberg.]

Streaks of the solution to be examined are applied to the paper and after development and removal of the solvent the paper is treated with water as for the second phase of two-dimensional chromatography. The amino-acids are collected from the edge of the paper.—H. G. Bray.

84

LAKSHMINARAYANAN, K. Microchromatography. 1. A technique for separation and identification of traces of amino acids, sugars, etc. *Arch. Biochem. Biophys.*, 1954, 51, 367-370. [Botany Lab., Univ. Madras.]

Quantities of about 0.25 $\mu\text{g.}$ are applied to filter-paper circles 2.3 cm. in diameter and irrigated through fine capillary tubes. Developed chromatograms are examined by microscope.

H. G. Bray.

85

GORDON, S. and NARDI, G. L. Paper chromatography of free amino-acids in blood plasma. *J. Lab. Clin. Med.*, 1954, 43, 827-830. [Dept. Surg., Harvard Med. Sch., Boston, Mass.]

Plasma dried *in vacuo* over H_2SO_4 is treated with acetone and HCl to precipitate protein, which is removed by centrifuging. The supernatant fluid is evaporated to dryness at 37° C. and lipids are extracted with ether. The remaining solution is evaporated again over H_2SO_4 and diluted as required for paper chromatography. A map of amino-acids found in normal human plasma is given.—H. G. Bray.

86

BLASS, J., LECOMTE, O. and POLONOVSKI, J. Sur une technique d'électrophorèse associée à la chromatographie sur papier, "chromatoionophorèse" appliquée aux amino-acides et bases aminées. [An electrophoretic technique associated with paper chromatography, "chromatoionophoresis," applied to amino-acids and amino-bases.] *Bull. Soc. Chim. biol.*, 1954, 36, 627-640. [Serv. Chim. Biol., Inst. Pasteur, Paris.]

One-dimensional paper chromatography with a mixture of butanol and acetic acid is followed by electrophoresis in a direction perpendicular to that used for chromatography.—H. G. Bray.

87

IYER, G. Y. N. Studies on human serum amino acids. 1. Separation and identification by paper chromatography. *Indian J. Med. Res.*, 1954, 42, 225-229. [Med. Coll., Trivandrum.]

The incorporation of ethanol in pyridine and

phenol-water systems renders preliminary desalting of serum unnecessary. Solvent mixtures recommended are phenol saturated with 50 per cent. aqueous ethanol, and pyridine:ethanol:water (50:35:15).—H. G. Bray.

88

GRASSMANN, W., HÖRMANN, H. and ENDRES, H. Säulenchromatographische Trennung von Dinitrophenyl - aminoalkoholen zum Zwecke der Bestimmung carboxylständiger Aminosäuren in Peptiden und Proteinen. [Separation by chromatography on columns of dinitrophenylamino-alcohols for the purpose of estimating terminal carboxyl amino-acids in peptides and proteins.] *Hoppe-Seyler's Ztschr.*, 1954, **296**, 208–213. [Forschungsinstitut für Biochemie, Max-Planck-Gesellschaft, Regensburg.]

For previous work see Abstr. 2738, Vol. 24.

Dinitrophenyl derivatives of the primary alcohols produced by the lithium borohydride reduction of leucine, valine, phenylalanine, alanine, proline, glycine and glutamic and aspartic acids are separated on a silicic acid and Celite column by means of 5 solvent mixtures containing ligroin, acetic acid, acetone and ethyl acetate.

H. G. Bray.

89

KIESSLING, H. and PORATH, J. A method of detection of N-dimethylamino acids on paper. *Acta chem. scand.*, 1954, **8**, 859–860. [Inst. Biochem., Univ. Upsala.]

After development the chromatogram is dried and kept in contact with methyl iodide vapour at 35° to 40° C. for 2 hr. The paper is then dried at 100° C. and immersed in ammoniacal 0.1 N silver nitrate and the excess reagent is removed by washing with water. Spots are developed by means of a rapid photographic developer. It is possible to detect unmethylated amino-acids with ninhydrin before detection of methylated acids as described.—H. G. Bray.

90

KORITZ, S. B. and COHEN, P. P. Colorimetric determination of carbamylamino acids and related compounds. *J. Biol. Chem.*, 1954, **209**, 145–150. [Dept. Physiol. Chem., Univ. Wisconsin, Madison.]

The reaction between diacetylmoxime and a ureide group in the presence of an aromatic amine was utilised.

Six ml. of 50 per cent. H_2SO_4 , 0.1 ml. of 1 per cent. aqueous Na diphenylamine-*p*-sulphonate and 0.25 ml. of diacetylmoxime were added to 3 ml. of the unknown and the tube was placed in a boiling-water bath for 10 min. After cooling, 0.25 ml. of 1 per cent. K persulphate was added, the tube was returned to the water bath for 1 min.

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and then cooled immediately. Colour developed in the absence of direct sunlight and the optical density was measured at 550 m μ . after 10 min. In this way carbamylamino-acids, citrulline, arginine, hydantoin, urea and other related compounds were estimated colorimetrically.

The colour from carbamyl-L-glutamic acid alone was increased in the presence of histidine or ornithine, possibly because of transcarbamylation, whereby a compound with greater chromogenic value was produced. Sulphur compounds, including cysteine, cystine and methionine, inhibited colour formation.—A. Hepburn.

91

HARRIS, H. and WARREN, F. L. Separations of basic amino acids by ionophoresis in filter paper. *Biochem. J.*, 1954, **57**, xxxii–xxxiii. [Dept. Biochem., London Hosp. Med. Coll.]

92

BARETT, D. W. Electrophoretic separation of plasma lipoproteins. *Biochem. J.*, 1954, **57**, xxxv. [Dept. Med., Univ. Bristol.]

93

NORTON, D. R. and FURMAN, N. H. Polarographic determination of amino acids. *Anal. Chem.*, 1954, **26**, 1116–1119. (George Washington Univ., Washington 6, D.C.)

The method depends on the suppression of the second phthalaldehyde wave by amino-acids. This is a general reaction for compounds of this type. Amino-acids may be separated before estimation and should be freed from such interfering substances as ammonia and gelatine.—H. G. Bray.

94

CHIGLIONE, C. and BOZZI-TICHADOU, M. Sur le microdosage de la cystéine dans les protéines. [Micro-estimation of cysteine in proteins.] *Bull. Soc. Chim. biol.*, 1954, **36**, 659–666. [Lab. Chim., Fac. Méd., Marseilles.]

The method depends on the decomposition of the amino-acid with NaOH to give H_2S which is converted to cadmium sulphide. The sulphide ion is estimated iodimetrically, in pure aqueous solutions directly and after previous separation of cysteine by a cadmium reagent in protein hydrolysates. The method is applicable to from 0.25 to 0.6 mg. cysteine.—H. G. Bray.

95

WINTER, H. Kritische Überprüfung verschiedener Methoden zur Glykokollbestimmung. [Critical examination of different methods of estimating glycine.] *Ztschr. Lebensmittel - Untersuch. Forsch.*, 1954, **99**, 34–42. [Inst. Lebensmittelchem., Tech. Univ., Berlin-Charlottenburg.]

The method of Klein and Linser (Abst. 7, Vol. 2) as modified by Brecht and Grundmann (Abst. 2633, Vol. 9) depending on the reaction with phthalaldehyde is recommended. It is advisable to remove interfering amino-acids by means of a resin, especially for proteins containing little glycine. Ninhydrin and 1-fluoro-2:4-dinitrobenzene methods were also studied.—H. G. Bray.

96

SCHWABET, R. S. The quantitative determination of proline and pipecolic acid with ninhydrin. *J. Biol. Chem.*, 1954, **205**, 603-613. [Kerckhoff Labs. Biol., California Inst. Technol., Pasadena.]

97

WENNER, V. Die colorimetrische Tryptophanbestimmung in Proteinen und Proteinhydrolysaten nach Nicols und Eckert. [Colorimetric estimation of tryptophan in proteins and protein hydrolysates by the method of Nicols and Eckert.] *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 315-316. *Proc. [La Tour-de-Peilz.]*

98

ANKER, R. M. The determination of creatine and creatinine in urine. A correction factor for the determination of twenty-four hour urinary excretion values. *J. Lab. Clin. Med.*, 1954, **43**, 798-801. [Lab. Endocrinol., Dept. Obstet. Gynaecol., Univ. Colorado Sch. Med., Denver.] A procedure based on the Jaffe reaction is described.—H. G. Bray.

99

TAUSSKY, H. H. (with KURZMANN, G.) A micro-colorimetric determination of creatine in urine by the Jaffe reaction. *J. Biol. Chem.*, 1954, **205**, 853-861. [Dept. Med., Russell Sage Inst. Pathol., Cornell Univ. Med. Coll., New York.]

See also Absts. 162, 609.

Lipid Constituents

100

BERNHARD, K. Isotope als Indikatoren zur Erforschung des Lipidstoffwechsels. [Isotopes as indicators in research on lipid metabolism.] *Schweiz. med. Wochenschr.*, 1954, **84**, 506-508. [Physiol. Chem. Inst., Univ. Basle.]

The subject is reviewed with special relation to the author's own work.—E. M. Hume.

101

BARTCH, H. and CHAIKOFF, I. L. A simplified method for determination of lipide- C^{14} in liver. *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 97-99. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Liver slices are incubated in a 50-ml. Erlenmeyer flask with a centre well fused to the bottom; the flask is sealed with a rubber cap. At the end of the incubation period 30 per cent. KOH is introduced into the centre well to absorb CO_2 and immediately afterwards 5 *N* H_2SO_4 is added to the medium to inactivate the tissue. The incubation medium is then removed by filtration and the tissue is saponified with 1 *M* Na ethylate. After acidification with H_2SO_4 the lipids are extracted with chloroform. For counting, an aliquot of the chloroform solution is mounted directly on an aluminium disc and the solvent is gently evaporated.

The method was examined with a biologically synthesised C^{14} -fatty acid mixture, cholesterol- $4^{14}C$, tripalmitin- $1^{14}C$, alanine- $1^{14}C$, acetate- $1^{14}C$ and glycerol- $14C$ added to separate 500-mg. portions of liver slices; the results obtained were in good agreement with other more laborious procedures. The simplified analysis can be completed within 2 hr.—G. A. Garton.

102

CORDES, W. A., EDMONDSON, J. E., HEDRICK, T. I., HERREID, E. O., LAMBERT, L. M., WILLINGHAM, J. J. and HEINEMANN, B. Standardized procedures for the Babcock test for milk. *J. Dairy Sci.*, 1954, **37**, 761-768. [National Dairy Products Co., Inc., New York.]

103

DEMONT, P. Extension de l'emploi de la liqueur Neusal au dosage de la matière grasse de produits au lait sucrés, du chocolat et du cacao dans d'autres butyromètres que celui à lait. [Extension of the use of Neusal solution for the estimation of fat in sweetened milk products, chocolate and cocoa in butyrometers other than that for milk.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, **45**, 104-108. [Stat. Lait., Grangeneuve, near Fribourg.] German and English summaries.

Neusal solution was prepared as described in *Molkerei-Lexikon*, 3rd ed., 1952, 452: 100 g. trisodium citrate and 100 g. sodium salicylate were dissolved in 480 ml. distilled water; 172 ml. isobutanol and about 750 ml. distilled water containing 0.1 to 0.2 g. methylene blue were added to make a final volume of 1500 ml., which was filtered if necessary.

Neusal solution dissolves sugar and protein without colour change or precipitation and was used in 2 different butyrometers for the rapid and easy estimation of fat in dried milk, condensed milk, sweetened milk powder, ice-cream, ice-herbet, chocolate and cocoa.—A. Hepburn.

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104

LEHNER, R. and ESTOPPEY, A. Dosage de la graisse dans les farines, en particulier celles contenant du lait, d'après une modification de la méthode Roesse-Gottlieb. [Estimation of fat in flours, especially those containing milk, by a modification of the Rösse-Gottlieb method.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, **45**, 183-185. [Lab. Nestlé, Vevey.] German and English summaries.

105

SPEIRY, W. M. A method for the determination of total lipides and water in brain tissue. *J. Biol. Chem.*, 1954, **209**, 377-386. [Dept. Biochem., New York State Psychiat. Inst.]

Brain tissue is homogenised in a special disintegrator. About 500 mg. of the homogenate is weighed from a 2 ml. syringe and added to about 10 ml. acetone in a tared flask; the solvent is removed in a stream of inert gas on a warm-water bath and the drying is completed in a desiccator: the loss of weight represents the water content of the tissue. The lipids are then extracted from the dried tissue with about 10 ml. chloroform-methanol (2:1). After filtration, the solvent extract is freed from water-soluble components by a modification of the washing procedure of Folch *et al.* (*J. Biol. Chem.*, 1951, **191**, 833). The lipid extract is then filtered, the solvents are removed and the residue is dried to constant weight.—G. A. Garton.

106

DOUSTE-BLAZY, L. Fractionnement des lipides du sérum par distribution à contre-courant. [Fractionation of serum lipids by counter-current distribution.] *C.R. Acad. Sci.*, 1954, **239**, 460-462.

Lipid extracts of human serum were fractionated by counter-current distribution in an apparatus of the Craig type. Fifty transfers were made using a mixture of light petroleum and chloroform, 45.5 volumes and 9.1 volumes, respectively, as the hyperphase and a mixture of acetic acid, methanol and water, 21.6, 21.6 and 2.2 volumes, respectively, as the hypophase. The lipids were separated into 9 main fractions of which 6 contained phospholipins; most of the cholesterol was found in one fraction. Esterified fatty acids appeared in most fractions.—G. A. Garton.

107

SILK, M. H., SEPHTON, H. H. and HAHN, H. H. South African pilchard oil. 2. Concentrates of highly unsaturated fatty acids and alcohols derived from South African pilchard oil.

SILK, M. H. and HAHN, H. H. 3. The fatty acid composition of South African pilchard oil. 4. The isolation and structure of a hexadeca-tetraenoic acid from South African pilchard oil.

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Biochem. J., 1954, **57**, 574-577; 577-582; 582-587. [Nat. Chem. Res. Lab., S. African Com. Sci. Indust. Res., Pretoria.]

For part 1, see Abst. 2753, Vol. 24.

2. Total fatty acids were obtained from the body oil of the South African pilchard (*Sardinia ocellata*, Jenyns) and the corresponding fatty alcohols were prepared by reduction of the intact glycerides with lithium aluminium hydride. The acids were fractionated by the lithium soap and acetone procedure and also by successive removal of more saturated components by formation of urea complexes in ethanol; the second method was also applied to the alcohols.

Urea complex formation yielded an efficient fractionation resulting in a concentrate of acids of high mean unsaturation, rich in the shorter-chain C_{16} and C_{18} acids. The lithium soap and acetone technique resulted in a concentrate of lower mean unsaturation, though it was relatively richer in C_{20} and C_{22} fatty acids. Urea fractionation of the alcohols afforded a concentrate of high average unsaturation rich in C_{16} and C_{20} components.

3. A concentrate of the more highly unsaturated fatty acids of pilchard oil was prepared by the lithium soap and acetone procedure and distilled in a three-stage falling-film molecular still to yield 6 fractions. Portions of each of the fractions were then chromatographed on non-wetting kieselguhr supporting liquid paraffin as the stationary phase, with 60 per cent. aqueous acetone as the developing solvent. Chain length distribution in other portions of the molecular still fractions was determined by reversed-phase partition chromatography (Abst. 2753, Vol. 24) after hydrogenation of the acids over Pd-BaSO₄ catalyst. Urea complex fractionation of a part of the first molecular distillate yielded 4 fractions and a residue, which were examined by reversed-phase chromatography.

A consideration of all the results obtained permitted calculation of the fatty acid composition of one of the fractions which apparently contained a C_{16} tetraenoic acid. The procedures used can reasonably be supposed to have occasioned little or no modification of the acids originally present and further work on these lines should yield information less empirical than that given by traditional ester-fractionation techniques in the evaluation of the composition of marine oils.

4. With the techniques outlined in the preceding abstracts, the C_{16} tetraenoic fatty acid was isolated and characterised as hexadeca-6:9:12:15-tetraenoic acid. That conjugated double bonds were not present was shown by the absence of any selective absorption in the region 220 to 320 m μ . after alkali isomerisation. Oxidation of the acid with KMnO₄ yielded adipic acid and a little glutaric acid. Infrared absorption analysis showed the presence of a terminal vinyl group.—G. A. Garton.

108

GERRITSMA, K. W. Quantitatieve bepaling van de lagere vetzuren in faeces door verdelingschromatographie. [Quantitative estimation of lower fatty acids in faeces by partition chromatography.] *Centraal Inst. Voedingsonderzoek T.N.O., Utrecht*, 1954, *Publ. No. 186*, pp. vi + 86. English summary.

Section 1 of this thesis briefly reviews the history of partition chromatography, section 2 the estimation by that method of the lower fatty acids. The methods of Hiscox and Berridge (Abst. 4623, Vol. 20) and of Reid and Lederer (Abst. 4488, Vol. 21) were tested. Neither was found satisfactory.

In section 3 the literature of colour chromatography is reviewed and tests of the methods of Moyle *et al.* (Abst. 71, Vol. 19), Fairbairn and Harpur (Abst. 3060, Vol. 21) and James and Martin (Abst. 77, Vol. 22) are described. For the estimation of acids from acetic to caprylic Moyle's method is suitable, apart from the long time required for elution and the dependence of the accuracy on the type of silica. That of Fairbairn and Harpur is quick and accurate with lower fatty acids if the silica is good. Methods of preparing silica were next examined. Gas chromatography by the method of James and Martin is an advance in that it includes also in its range formic acid and isomers of the lower fatty acids. The column is of Celite.

Section 4 deals with the isolation of the lower fatty acids by solution in water, treatment with $\text{Ca}(\text{OH})_2$ and filtration, distillation from the acidified filtrate and collection in chloroform or ether. Section 5 deals more specifically with their isolation from faeces and section 6 sets forth the whole process of estimation as applied to faeces. A table, No. 21, gives the content and distribution of lower fatty acids in the faeces of 18 infants fed on breast milk (5), whole acidified cow's milk (9), cow's milk (2) or buttermilk (2). The outstanding differences are the high proportion of lactic acid in the faeces of breast-fed infants and relatively but not so consistently high proportion of acetic and propionic acids in faeces from those fed on cow's milk.

The last section is devoted to the estimation of lactic acid in faeces. Long's method (Abst. 1331, Vol. 16) is chosen and adapted. The oxidation must take place in an atmosphere of nitrogen.

I. Leitch.

109

CROMBIE, W. M. L., COMBER, R. and BOATMAN, S. G. A chromatographic method for the estimation of oleic and linoleic acids in the presence of straight-chain saturated fatty acids. *Nature*, 1954, **174**, 181-182. [Dept. Botany, Univ. Southampton.]

The method is based on the reversed-phase chromatographic technique described by Howard

and Martin (Abst. 1353, Vol. 20). A mixture of pure linoleic and oleic acids was effectively separated on the column, but in mixture with saturated acids linoleic acid was eluted along with myristic acid and oleic acid with palmitic acid. By oxidatively destroying the unsaturated acids with alkaline KMnO_4 (Bertram oxidation) and estimating the remaining saturated acids it was possible to deduce the composition of artificial mixtures containing oleic and linoleic acids.—G. A. Garton.

110

SAVARY, P. Contribution à l'étude de la chromatographie sur papier des acides gras. [Paper chromatography of fatty acids.] *Bull. Soc. Chim. biol.*, 1954, **36**, 927-932. [Lab. Chim. Biol., Fac. Sci., Marseilles.]

The separation of palmitic, myristic, lauric, oleic, capric, stearic and linoleic acids is considered. Untreated filter paper (Whatman No. 1, Schleicher and Schüll Nos. 602 and 598) may be used with different methanol-water mixtures. Permanganate, copper acetate, potassium ferrocyanide and Rhodamine B may be used for revealing the spots, but all are not suitable for use with all papers. Silicone-treated paper may be used with solvent mixtures containing acetone, water and cyclohexane or hexane. For these chromatograms copper acetate and Rhodamine B may be used as detecting agents.—H. G. Bray.

111

PASQUALLI, W. La determinazione degli acidi arachidonico, linolenico e linoleico (vitamina F) nel latte e nel sangue. 2. Dosaggio nel latte. [Determination of arachidonic, linolenic and linoleic (vitamin F) acids in milk and in blood. 2. Estimation in milk.] *Acta vitaminol.*, 1954, **8**, 113-120. [Ist. Clin. Pediat., Univ. Bologna.] French, English, German and Spanish summaries.

After investigation of sources of error, and comparison with a method involving removal of unsaponifiable matter, the following "direct" method was adopted for estimating arachidonic, linolenic and linoleic acids in milk. The unsaturated acids are estimated by extracting them from 5 ml. milk with ether and isomerising their double bonds into conjugated double bonds by heating at 180°C . for 30 min. with KOH in ethylene glycol. They are then dissolved in purified absolute alcohol, and their concentrations are estimated by measuring the absorption at $316\text{ m}\mu$. (arachidonic acid), $268\text{ m}\mu$. (arachidonic and linolenic acids), and $234\text{ m}\mu$. (sum of the 3 acids). The method gives constant and reproducible results, the average errors for single measurements being for linoleic acid 2.5, linolenic acid 25 and arachidonic acid 12 per cent. As the concentration of linoleic acid in milk is relatively

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much greater than that of the other 2 acids, its estimation is influenced in a smaller degree by the sources of error previously outlined.

M. B. Richards.

112

CLÉMENT, G., CLÉMENT, J. and LOUEDEC, A. Sur la séparation des esters de cholestérol à partir d'extraits lipidiques de tissus animaux. [Separation of cholesterol esters in lipid extracts of animal tissues.] *Arch. Sci. physiol.*, 1954, 8, 233-250. [Dept. Physiol., Inst. Recherches Cancer Gustave Roussy, C.N.R.S., Univ. Paris.]

Attempts were made to separate cholesteryl esters and glycerides by solvent precipitation of the esters, by selective hydrolysis of the glycerides with castor oil bean lipase and pancreatic lipase and by chromatography on alumina columns. Quantitative separation was achieved only by the chromatographic technique, with light petroleum or carbon tetrachloride as the eluting solvent on alumina activated by heating at 120° C. and benzene on alumina activated by heating at 180° C. Artificial mixtures and the lipids of rat liver, rabbit liver, pig and human sera were effectively resolved into their glyceride and cholesteryl ester components by these methods.—G. A. Garton.

See also Abst. 608.

Other Organic Constituents

113

BÖHME, H. and WINKLER, O. Zur photometrischen Bestimmung geringer Mengen Aceton insbesondere in Blut und Harn. [Photometric estimation of small amounts of acetone, especially in blood and urine.] *Hoppe-Seyler's Ztschr.*, 1954, 296, 274-279. [Pharmazeut.-Chem. Inst., Univ. Marburg a.d. Lahm.]

A 2:4-dinitrophenylhydrazone method is described.—H. G. Bray.

114

LUGG, J. W. H. Chromatography of organic acids. *Brit. Med. Bull.*, 1954, 10, 192-195. [Dept. Biochem., Univ. Malaya.]

115

NORDMANN, R., GAUCHERT, O., DU RUISSEAU, J. P., THOMAS, Y. and NORDMANN, J. Détermination des acides organiques de l'urine par chromatographie sur papier. [Estimation of organic acids in the urine by paper chromatography.] *C.R. Acad. Sci.*, 1954, 238, 2459-2461.

Interfering substances are removed by the anionic exchange resin Dowex 2, eluted with 6 N formic acid. The eluate is evaporated and subjected to two-dimensional paper chromatography first with ethanol: ammonia (22° Baume): water

(80:5:15) and then with moist propanol: eucalyptol: formic acid (50:50:20). The detecting agent is bromocresol green or universal indicator. Acetic acid is completely lost during preparation of the sample, and lactic and β -hydroxybutyric acids partly. Other acids detected are aconitic, α -ketoglutaric, citric, glutamic, glycolic, hippuric, malic, succinic, and tartaric. Four other acids were not identified.—H. G. Bray.

116

KALBE, H. Papierchromatographie aliphatischer Dicarbonsäuren. [Paper chromatography of aliphatic dicarboxylic acids.] *Hoppe-Seyler's Ztschr.*, 1954, 297, 19-44. [Biochem. Abt., Med. Forschungsanst., Max-Planck-Gesellschaft, Göttingen.]

A detailed investigation was made of a number of solvent mixtures, of which 7 are listed for C_2 - C_{12} acids. Three basic mixtures are given for C_7 - C_{11} acids, tetrahydrofuran: 3N- NH_4OH (4:1) being especially suitable for C_3 - C_8 acids. Methyl red in borate buffer pH 8 is used for detection. An apparatus is described.—H. G. Bray.

117

SMITH, F. and SPRIESTERSBACH, D. Paper chromatography of organic acids. *Nature*, 1954, 174, 466-467. [Univ. Minnesota, St. Paul.]

118

OSTEUX, R. and LATURAZE, J. Chromatographie sur papier des acides organiques fixes de l'urine. [Paper chromatography of fixed organic acids of urine.] *C.R. Acad. Sci.*, 1954, 239, 512-513.

119

DAGLEY, S. and DAWES, E. A. Enzymic estimation of citric acid. *Enzymologia*, 1954, 16, 226-230. [Dept. Biochem., Univ. Leeds.]

Citric acid is converted by a preparation of *Aerobacter aerogenes* to pyruvic acid, which is estimated colorimetrically as its 2:4-dinitrophenylhydrazone.—H. G. Bray.

120

ELSDEN, S. R. and GIBSON, Q. H. The estimation of lactic acid using ceric sulphate. *Biochem. J.*, 1954, 58, 154-158. [Agric. Res. Coun. Unit Microbiol., Dept. Microbiol., Univ. Sheffield.]

Lactic acid is oxidised by ceric sulphate to acetaldehyde, which is distilled in steam into sodium bisulphite solution. The bisulphite compound is decomposed by bicarbonate and acetaldehyde is estimated iodimetrically.—H. G. Bray.

121

WIERZCHOWSKI, Z. and OBUCHOWSKA, I. Ono-
wych metodach oznaczania alkaloidów w
lubinach pastewnych. [New methods for the
estimation of alkaloid content in fodder lupins.]
Rocz. Nauk Rol., 1952, **61**, 159-192. Russian
and English summaries.

Two methods are described. In the first the
alkaloids are removed with a mixture of ether and
chloroform and sparteine is precipitated, dried and
weighed as triplicate. Lupinine is then precipi-
tated with silicotungstic acid and its concentration
is calculated from the amount of silica and tung-
sten trioxide obtained by ashing at 800° C. In the
second method extraction is as in the first but the
alkaloids are both precipitated by silicotungstic
acid and are estimated together.

Slight modifications are suggested when *Lupinus
angustifolius* or *L. albus* is being examined, for
these were found to contain lupanine and appreci-
able amounts of hydroxylupanine. (From English
summary).—D. Harvey.

122

BUSH, I. E. Chromatography of steroids and
sterols. *Brit. Med. Bull.*, 1954, **10**, 229-236.
[Med. Unit Lab., St. Mary's Hosp., London.]

123

SWIFT, C. E. The diethylstilbestrol content of tissues
of treated steers, lambs, and poultry. *Food
Res.*, 1954, **19**, 402-409. [Agric. Res. Serv.,
U.S. Dept. Agric., Agric. Res. Centre, Belts-
ville, Md.]

A method, based on the nitrosophenol method of
Gottlieb (*J. Amer. Pharm. Assoc., Sci. Ed.*, 1947,
28, 379; 1948, **27**, 147), was developed for the
estimation of diethylstilbestrol in concentrated
extracts of fat, liver and muscle from treated
animals; the chemical and chromatographic
methods of extraction are described in detail.
Average percentage recovery of known amounts
of diethylstilbestrol was 89.1, 75.3 and 64.2 for
fat, liver and muscle, respectively.

There was no evidence of free diethylstilbestrol
in any of the tissues from a bullock which had had
2 implants of 120 mg. 30 days apart and was
killed 109 days after the first, or from 3 wether
lambs which had had 2 implants of 15, 30 or 60
mg. 30 days apart and were killed 60 to 90 days
after the first, or from cockerels given one 15-mg.
implant in the neck at 6 weeks and killed about a
month later. Small but increasing amounts of
free and combined diethylstilbestrol were found
in the liver and skin, but not the muscle, of
cockerels given one implant of 30, 60 or 12 mg.

Lest diethylstilbestrol bound so as not to be
extracted or estimated by chemical methods should

be present, further work, possibly with radio-active
diethylstilbestrol, is recommended.

W. M. Deans.

Inorganic Constituents

124

BONTING, S. L. (with BLOEMENDAL, H.) Improved
total base determination in serum, urine, and
tissue ash by ion exchange. *J. Lab. Clin. Med.*,
1953, **41**, 968-972. [Netherlands Inst. Nutrit.,
Amsterdam.]

The sulphonic acid cation exchange resin
Amberlite IR 120 in the hydrogen form was found
suitable for the chromatographic estimation of a
total base concentration of 0.005 to 0.01 N in
biological materials.

The resin was kept immersed in water before
and during percolation (0.8 ml. per min.) of the
diluted fluid. The eluate was boiled to remove
CO₂ and titrated with 0.02 N NaOH against
bromothymol blue. No reliable estimation of base
bound to carbonic acid was found possible. The
same column could be used 30 times without
regeneration.

Urine, after preliminary neutralisation, required
a procedure similar to that just described.

The total base of tissues was most accurately
estimated by ashing in a platinum crucible, dis-
solving in HCl and applying the same technique to
the neutralised solution.—A. Hepburn.

125

TERRIER, J. A propos de la volatilité du NaCl et
du dosage du sel et des cendres dans le pain
ordinaire. [Volatility of NaCl and estimation
of salt and of ash in plain bread.] *Mitt. Geb.
Lebensmittel. Hyg.*, 1954, **45**, 111-115. [Lab.
Cantonal, Geneva.] German and English
summaries.

NaCl is not lost below 375° C.; in the presence
of flour its loss during ashing may be prevented by
the addition of sodium carbonate. Procedures are
described for the estimation of salt and of ash in
bread.—H. G. Bray.

126

DENSON, J. R. Flame photometric determination
of electrolytes in tissue and of calcium in
serum. *J. Biol. Chem.*, 1954, **209**, 233-240.
[Dept. Biochem., Army Med. Res. Lab., Fort
Knox, Ky.]

Calcium, Mg, Na and K in tissue were estimated
by measuring the luminosity of the spectra with a
spectrophotometer and a hydrogen burner.

Ashed tissue in 0.1 N HCl was applied to a cation
exchange column so that anions, including phos-
phate, which decreases the luminosity of Ca and
Mg, passed through, and the absorbed cations were

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then eluted with 6 N HCl. A correction had to be made for Ca, which was eluted in greater quantity than that added. After evaporation to dryness the eluate was dissolved in 0.1 N HCl and examined spectrophotometrically. By comparison with graphs obtained from a standard solution Ca, Mg, Na and K were estimated. The analysis for each cation was unaffected by the presence of the other 3 in amounts ranging from 5 to 100 times that normally found. Fe, which in certain amounts interferes with the spectra, can be removed by the addition of cupferron to an acid solution of the dissolved ash and subsequent ether extraction of the complex formed.

Serum diluted 1:10 with water and passed through the cation exchange column was similarly analysed, but new standard graphs were required, as the composition of serum differed considerably from that of tissue. The Mg content was too low to be estimated in this way.—A. Hepburn.

127

SZUŻEWSKA, L. and MAZUR, H. Oznaczenie małych ilości kadmu. [Estimation of small quantities of cadmium.] *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 171-178. Russian and English summaries.

A gravimetric method for estimating Cd as the insoluble complex formed with diantiprylmethane in presence of Br is described. Its sensitivity is 0.5 mg. Cd. In foods prepared and stored in cadmium-plated containers the Cd content was found to range from 0.63 to 83 mg. per 100 g. The danger associated with the use of such foods is indicated. (From English summary).—D. Harvey.

128

HILGERS, A. Erfahrungen bei flammenphotometrischen Natrium-, Kalium- und Calcium-Bestimmungen im Blutserum. [Estimation by flame photometry of sodium, potassium and calcium in blood serum.] *Hoppe - Seyler's Ztschr.*, 1953-54, 294, 61-74.

129

LEYTON, L. Phosphate interference in the flame-photometric determination of calcium. *Analyst*, 1954, 79, 497-500. [Dept. Forestry, Univ. Oxford.]

With an air-acetylene flame the interference can be corrected for if the phosphate content of the sample is known or, if all the Ca is present as phosphate, by the use of a calcium phosphate calibration curve. With a coal-gas flame, phosphate should first be removed by a cation-exchange resin column.—H. G. Bray.

130

KÁČL, K., LEDVINA, M. and BÍNA, K. Ultramikrostanovení vápníku komplexonovou tit-

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raci. [Ultramicro-estimation of calcium by titration with complexon.] *Čas. Lék. čes.*, 1954, 93, 629-630. [Inst. Med. Chem., Karl's Univ., Prague.]

131

TEERI, A. E. Semi-micro colorimetric determination of calcium in blood serum. *Chemist-Analyst*, 1954, 43, 43-44. [Dept. Agric. Chem., Univ. New Hampshire, Durham.]

Calcium oxalate is precipitated and separated by centrifuging. A suspension of the precipitate in water is treated with chloranilic acid, the excess of which is estimated colorimetrically in the supernatant solution.—H. G. Bray.

132

KENNY, A. D. and TOVERUD, S. U. Noninterference of phosphate in an ethylenediamine tetraacetate method for serum calcium. *Anal. Chem.*, 1954, 26, 1059. [Biol. Res. Lab., Harvard Sch. Dent. Med., Boston, Mass.]

Conditions are described under which there is no interference by phosphate even when the P:Ca ratio is as high as 8.—H. G. Bray.

133

SCHOLTIS, R. J. H. De serumkoperbepaling met behulp van natriumdithyldithiocarbamaat. [Estimation of serum copper with sodium diethyldithiocarbamate.] *Nederland. Tijdschr. Geneesk.*, 1954, 98, 1795-1798. [Clin. Chem. Lab., St. Josephziekenhuis, Heerlen.]

This is an extension of the method described for estimation of Fe with phenanthroline (*ibid.*, 1954, 98, 1636). Serum is diluted and acidified with HCl. Protein is precipitated with trichloroacetic acid and removed. Fe is eliminated with citric acid, an alcoholic solution (50 per cent.) of ammonia is added and Cu is estimated with Na diethyldithiocarbamate solution at 430 mμ. in a photoelectric colorimeter. The preparation of the necessary calibration curve is described. Both Fe and Cu can be estimated in 6 ml. serum.

I. Leitch.

134

ABBOTT, D. C. and POLHILL, R. D. A. The determination of copper in oils and fats by means of dibenzylidithiocarbamic acid and its salts. *Analyst*, 1954, 79, 547-550. [Dept. Govt. Chem., Govt. Lab., Clement's Inn Passage, Strand, London.]

The procedure described is applicable to 0.02 to 2.0 p.p.m. Cu. Organic material is removed from the sample or destroyed by heating and treatment with sulphuric and nitric acids. The Cu in an aqueous solution of the residue is extracted as its dibenzylidithiocarbamate complex and estimated spectrophotometrically.—H. G. Bray.

- 135
CHATAGNON, C. and CHATAGNON, P. Microméthode de dosage de cuivre dans le tissu cérébral. [Micromethod for estimating copper in cerebral tissue.] *Bull. Soc. Chim. biol.*, 1954, **36**, 911-920. [Hosp. Maison-Blanche, Neuilly-sur-Marne (Seine-et-Oise).]
- 136
SHAW, W. M. Colorimetric determination of fluorine in waters and soil extracts. *Anal. Chem.*, 1954, **26**, 1212-1214. [Agric. Exp. Stat., Univ. Tennessee, Knoxville.]
Turbidity and colour are removed from waters by shaking with calcium sulphate and carbon before the estimation of fluoride by means of a zirconium-alizarin reagent.—H. G. Bray.
- 137
HARDIN, L. J., MACINTYRE, W. H. and TURB, M. E. The use of potassium hydroxide as a fusion agent in the determination of the fluorine content of vegetation. *J. Assoc. Off. Agric. Chem.*, 1954, **37**, 552-553. [Agric. Exp. Stat., Univ. Tennessee, Knoxville 16.]
KOH was shown to be as satisfactory as NaOH in this estimation.—H. G. Bray.
- 138
VENKATESWARLU, P. and NARAYANA RAO, D. Ashing agents for estimation of fluorine in biological material. *Indian J. Med. Res.*, 1954, **42**, 197-200. [Dept. Biochem., Med. Coll., Trivandrum.]
Calcium acetate was found to be a more satisfactory ashing agent than magnesium acetate. The preparation of fluoride-free calcium acetate is described.—H. G. Bray.
- 139
KATHEN, H. Die Bestimmung kleinster Eisenmengen in biologischem Material mit o-Phenanthrolinhydrochlorid unter Zusatz von Weinsäure. [Estimation of minute amounts of iron in biological material with o-phenanthroline hydrochloride and added tartaric acid.] *Biochem. Ztschr.*, 1954, **325**, 491-496. [Bundesanst. Pflanz. Erzeug., Geisenheim, Rheingau.]
The material is dry ashed and treated with tartaric acid to give a soluble Fe complex before application of the o-phenanthroline method.
H. G. Bray.
- 140
JOSEPHS, H. W. Determination of iron in small amounts of serum and whole blood with the use of thiocyanate. *J. Lab. Clin. Med.*, 1954, **44**, 63-74. [Dept. Paediat., Sch. Med., Johns Hopkins Hosp., Baltimore, Md.]
- The procedure described is suitable for use with 0.5 ml. serum or 0.1 ml. blood.—H. G. Bray.
- 141
RAMSAY, W. N. M. An improved technique for the determination of plasma iron. *Biochem. J.*, 1954, **57**, xvii. [Dept. Biochem., Univ. Edinburgh.]
- 142
SOCIETY OF ANALYTICAL CHEMISTRY, ANALYTICAL METHODS COMMITTEE. The determination of lead in footstuffs. *Analyst*, 1954, **79**, 397-402.
A standard dithizone procedure is described in detail.—H. G. Bray.
- 143
ANDREWS, J. and HARRISON, G. A. F. Colorimetric determination of trace metals in beer and in brewing materials. 7. Determination of nickel.
- STRINGER, W. J. 8. Determination of arsenic. *J. Inst. Brewing*, 1954, **60**, 133-135; 249-255. [Arthur Guinness, Son and Co. (Dublin), Ltd., St. James's Gate Brewery, Dublin.]
- 144
OKAMOTO, M. and THOMAS, J. W. Magnesium determination in bovine blood serum. *Anal. Chem.*, 1954, **26**, 1072-1073. [Bur. Dairy Indust., U.S. Dept. Agric., Washington, D.C.]
Three methods were compared, namely, those using Titan yellow and 8-hydroxyquinoline and that involving the precipitation of ammonium magnesium phosphate.—H. G. Bray.
- 145
POMERANZ, J. Detection and estimation of inorganic phosphate in wheat products. *Chemist-Analyst*, 1954, **43**, 37. [Food Testing Lab., Haifa, Israel.]
A phosphomolybdate procedure is described.
H. G. Bray.
- 146
KÜHNS, K. and MÜLLER, G. Ergebnisse und Fehlerquellen flammenphotometrischer K- und Na-Analysen in Serum und Organen mit einer modifizierten Apparatur von B. Lange. [Results and sources of error in the estimation by flame photometry of potassium and sodium in serum and organs by a modified apparatus of B. Lange.] *Hoppe-Seyler's Ztschr.*, 1953-54, **294**, 86-92. [Med. Klin., Univ. Göttingen.]
- 147
GAZMURI, R., CANESSA, M. and GARCIA, H. Determinación del sodio y potasio del suero en individuos normales por la fotometría de llama. [Estimation of sodium and potassium

in serum in normal subjects by flame photometry.] *Rev. méd. Chile*, 1954, **82**, 49-51. [Serv. Med., Hosp. del Salvador.]

148

CHOMSE, H. and AREND, I. Notiz zur Kaliumbestimmung im Blutserum nach dem Verfahren von Kramer und Tisdall. [Note on the estimation of potassium in blood serum by the method of Kramer and Tisdall.] *Hoppe-Seyler's Ztschr.*, 1954, **297**, 45-46. [Inst. Vet.-Chem., Humboldt Univ., Berlin.]

Results become progressively low as the volume from which potassium cobaltinitrite is to be precipitated increases. In this modification the solution to be estimated is concentrated to 1 ml. in a simple apparatus.—H. G. Bray.

149

KEITEL, H. G. and KEITEL, N. B. Rapid simple method for determination of serum potassium. *J. Amer. Med. Assoc.*, 1953, **153**, 799-800. [Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

150

O'SULLIVAN, M. Rapid determination of urinary sodium. *J. Lab. Clin. Med.*, 1953, **41**, 959-962. [Biochem. Lab., St. Michael's Hosp., Toronto.]

Urinary Na was simply and rapidly estimated by direct measurement in a special centrifuge tube of the volume of precipitate from the reaction with uranyl zinc acetate. At room temperature the K salt was not precipitated. Protein and phosphate were previously precipitated by dilute reagent. A standard calibration curve was used and the accuracy was within $\frac{1}{2}$ g. per litre. Results agreed with those by flame photometer, and the method was faster and required less skill.—A. Hepburn.

151

DESCHREIDER, A. R. and VAN COILLIE, L. Le dosage de l'étain dans les conserves alimentaires. [Estimation of tin in preserved foods.] *Lab. Central, Ministère Affaires Econ., Belgium*, *Publ.* 134, pp. 14. English summary.

The method of Ciesleszky and Lindner (Abst. 123, Vol. 22) for the polarographic estimation of Sn was applied to a number of foodstuffs and found much more accurate, simple and rapid than previous analytical methods.

Cu, Fe and Zn in concentrations of 10 to 20 μ g. per ml. did not affect the estimation of Sn. Pb in the normal small concentrations found in food, 1 to 2 p.p.m. or even up to 5 to 10 p.p.m., did not affect the estimation when Sn was present in normal quantities. When Pb exceeded 5 p.p.m. and Sn was less than 50 p.p.m., 2 methods could be applied: either a standard curve from Pb in 12

per cent. HCl and a colorimetric estimation of Pb by dithizone enabled the concentration of Sn to be estimated from the curve of a mixture containing Sn and Pb, or the Sn could be completely eliminated from the curve by the action of ammonia and ammonium citrate.—A. Hepburn.

152

JONES, G. B. The polarographic determination of zinc and manganese in plant and animal tissues and soils. *Anal. chim. Acta*, 1954, **11**, 88-97. [Div. Biochem., C.S.I.R.O., Univ. Adelaide.] French and German summaries.

The material is wet ashed and Fe and Cu are removed with cupferron. Zn and Mn are then removed together by sodium diethyldithiocarbamate, the complexes are decomposed and the metals are estimated polarographically by a procedure described. Interference by Co and Ni can be prevented by the use of dimethylglyoxime before extraction.—H. G. Bray.

153

HINSVARE, O. N., HOUFF, W. H., WITTEW, S. H. and SELL, H. M. Polarographic determination of zinc in plant materials. *Anal. Chem.*, 1954, **26**, 1202-1204. [Dept. Hortic., Michigan State Coll., East Lansing.]

The zincate wave is used, tetrasodium versenate (ethylenediamine tetra-acetate) being present to prevent co-precipitation of zinc.—H. G. Bray.

See also Abst. 656.

Enzyme Activity

154

CHAUNCEY, H. H., LIONETTI, F., WINER, R. A. and LISANTI, V. F. Enzymes of human saliva. 1. The determination, distribution, and origin of whole saliva enzymes. *J. Dent. Res.*, 1954, **33**, 321-334. [Dept. Dent. Res., Tufts Coll. Dent. Sch., Boston, Mass.]

155

PLACER, ZD. Trávicé enzymy 1. Jodometrické stanovení aktivity pankreatické amylázy. [Digestive enzymes 1. Iodimetric estimation of the activity of pancreatic amylase.] 2. Kolorimetrické stanovení aktivity proteolytických enzymů, sledované po oxydaci kobalt-natého substrátu. [2. Colorimetric estimation of the activity of proteolytic enzymes after oxidation of a cobalt substrate.] 3. Jednoduché kolorimetrické stanovení proteolytické aktivity duodenální šťávy s aminokomplexy měďnaté suspence. [3. A simple colorimetric estimation of proteolytic activity of pancreatic juice with amino-complex of copper suspension.] *Sborn. pathofys. tráv.*, 1954, **8**, 68-72. [Res. Inst. Human Nutrit., Prague.]

A method for estimating the digestive activity of pancreatic amylase is described. The action of amylase splits the aldehydic group from the starch. In alkaline solution this group reduces iodine. The remaining I is titrated with thiosulphate after acid is added.

A method of estimating the proteolytic activity of pepsin colorimetrically is described. Cobalt-casein, prepared by mixing equal volumetric parts of 1 per cent. casein (Hammarsten) in 0.1 N HCl with 0.005 M solution of $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ or $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$, is used as a substrate. After incubation for 15 min. 0.15 N HCl and 0.005 M $\text{K}_3\text{Fe}(\text{CN})_6$ are added and the intensity of the colour developed is measured colorimetrically.

A 5 per cent. suspension of dried milk in alkaline acetate is used as substrate for the estimation of the proteolytic activity of pancreatic juice. After incubation for 15 min. 0.15 N NaOH and 0.2 M CuSO_4 are added and the intensity of the colour of the filtered solution is measured colorimetrically.—A. Jančařík (Czechoslovakia).

156

DHUNGAT, S. B. and SREENIVASAN, A. The use of pyrophosphate buffer for the manometric assay of xanthine oxidase. *J. Biol. Chem.*, 1954, 208, 845-851. [Dept. Chem. Technol., Univ. Bombay.]

An improved technique for the estimation of xanthine oxidase in rat tissue homogenates is described. The use of pyrophosphate buffer at pH 8.6 eliminated endogenous respiration without affecting the enzyme activity.—A. Hepburn.

157

PIHAR, O. and FISCHER, K. Nové enzymologické metody. 2. Fotometrické stanovení aktivity xanthinoxidázy. [New enzymological methods. 2. Photometric estimation of xanthine oxidase activity.] *Chem. listy*, 1953, 47, 1862-1864. [Cent. Inst. Endocrinol., Prague.]

A new method for estimating the activity of purified preparations of xanthine oxidase by means of 2 : 6-dichlorophenolindophenol is described.

A. Jančařík (Czechoslovakia).

158

GROSSBERG, A., GUTH, P., KOMAROV, S. and SHAY, H. A phototurbidimetric method for determination of lipase in canine pancreatic juice. *Rev. canad. Biol.*, 1953, 12, 495-508. [Samuel S. Fels Res. Inst., Sch. Med., Temple Univ., Philadelphia, Pa.] French summary.

159

SEGOVIA GARCÍA, F. Causas de error en la determinación de fosfatasa. Técnica de elección. [Causes of error in estimation of phosphatase.

Technique of choice.] *Rev. clín. española*, 1954, 52, 8-13. [Clin. Méd., Univ. Seville.] English, German and French summaries.

Methods of estimation of phosphatase and sources of error are discussed critically. It is concluded that the method of Bodansky (Abst. 1405, Vol. 3) is most reliable when inorganic P is estimated by the method of Brigg (*J. Biol. Chem.*, 1924, 59, 255).—D. Duncan.

160

POWELL, M. E. A. and SMITH, M. J. H. The determination of serum acid and alkaline phosphatase activity with 4-aminoantipyrine (A.A.P.). *J. Clin. Pathol.*, 1954, 7, 245-248. [Dept. Chem. Pathol., King's Coll. Hosp. Med. Sch., London.]

Use is made of the reaction between phenols and 4-aminoantipyrine to give red or purple colours.

H. G. Bray.

161

SIEGENTHALER, E. Reaktivierte Phosphatase in hochpasteurisiertem Schlagsahne und deren Nachweis. [Re-activated phosphatase in whipping cream pasteurised at a high temperature and its detection.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 84-92. [Lab. Verbands-molkerei, Berne.] French and English summaries.

Ordinary phosphatase and re-activated phosphatase in samples of pasteurised cream could be distinguished by heating the cream at 55°C. for 5 min. under standard conditions; this destroys over 75 per cent. of re-activated phosphatase, but at most 25 per cent. of ordinary phosphatase. The phosphatase estimations were by the method of Sanders and Sager (Titles 3899, Vol. 16; 2999, Vol. 17).

W. M. Deans.

Miscellaneous

162

RAYMOND, W. F. and HARRIS, C. E. The laboratory drying of herbage and faeces, and dry matter losses possible during drying. *J. Brit. Grassland Soc.*, 1954, 9, 119-130. [Grassland Res. Inst., Hurley, Berks.]

Conditions influencing the yield of dry matter from herbage samples were studied. Drying in warm air resulted in losses of up to 5 per cent. as against efficient drying at 100°C. in an oven of new design. In the new oven hot air enters the drying chamber through holes in the shelves on which the sample trays stand. This oven can dry ninety 400 g. herbage samples (80 per cent. moisture) to constant weight in under 6 hr. The size of the sample affects the dry matter yield, since the rate of removal of moisture is more important than the drying temperature.

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A "true" dry matter content was estimated by the use of "radio-frequency" heat. With this method the moisture content of 300 g. herbage can be reduced from 80 to from 10 to 20 per cent. in 15 min., the temperature of drying being below 80° C. Comparison of "radio-frequency" heat with the new type of oven showed dry matter losses of 1 per cent. with the latter.

To study losses of nitrogen in the laboratory drying of faeces, a macerated cream of the faeces was made with toluene and water and samples were taken for analysis. A loss of from 5 to 10 per cent. of the N in faeces on oven-drying at 100° C. was found.

The nature of the chemical constituents lost on drying is discussed.—D. M. Walker.

163

GARDNER, S. D. and FARMILOE, F. J. Design and operating technique of a vacuum drying oven. 2. Solids in cane molasses. *Analyst*, 1954, **79**, 447-453. [Tate and Lyle Res. Lab., West- ham Rd., Keston, Kent.]

164

BABAD, J., PINSKY, A. and SHARON, N. Calculation of total solids in milk of cows in Israel by Richmond's formula. *Indian J. Dairy Sci.*, 1954, **7**, 98-100. [Agric. Res. Stat., Rehovoth, Israel.]

This paper describes work done to test the applicability of Richmond's formula in Israel over that period of the year when subtropical conditions prevail. A number of samples were taken from individual cows and total solids were estimated by evaporation. The results obtained by this method were used as a criterion to test Richmond's formula, and indicated that the formula tended to over-estimate total solids under the conditions described, on the average by 0.35 per cent.—A. W. Boyne.

165

HEINEMANN, B., COSIMINI, J., JACK, E. L., WILLINGHAM, J. J. and ZAKARIASEN, B. M. Methods of determining the per cent. total solids in milk by means of the lactometer. *J. Dairy Sci.*, 1954, **37**, 869-876. [Producers Creamery Co., Springfield, Mo.]

166

BISHOP, S. J. and MITCHELL, J. H. (Jr.) Determination of the solubility index of spray dried eggs. *Food Res.*, 1954, **19**, 367-372. [Quartermaster Food and Container Inst. Armed Forces, Chicago, Ill.]

An improved method used at the Quartermaster Food and Container Institute since 1947 is described. Egg powder, 1.5 g., is added to 50 ml. of

0.9 per cent. NaCl solution, shaken thoroughly and centrifuged in a 16-in. centrifuge at 2000 r.p.m. for 10 min. Five ml. of the supernatant solution are mixed with 10 ml. Esbach reagent (20 g. citric acid and 10 g. picric acid in 1 litre of water) and centrifuged at 2000 r.p.m. for 10 min.; the volume of precipitate is read and recorded as the solubility index. Tests with 8 samples in 2 laboratories showed better reproducibility than the method previously in use, and the results were in closer agreement with those of organoleptic tests; also, the time required was halved.—W. M. Deans.

167

HISZPAŃSKA, C., ZAŁĘSKI, J. and PŁOŃSKA, H. Kasze. Oznaczanie przemian i kwasowości. [Groats: estimation of degree of extraction and acidity.] *Rocz. Państwowego Zakł. Hig.*, 1954, **5**, 179-186. Russian and English summaries.

Samples numbering 120 of groats from different grains were examined. The upper limits recommended for ash content as a percentage of dry matter are for semolina 0.6, crushed barley groats 1.5, roasted buckwheat groats 2.2 and millet groats 1.4. The upper limit for total acidity is 3° for semolina and 5° for barley and buckwheat groats. For the estimation of total acidity an extract with boiling water was most suitable, and for buckwheat a mixture of bromothymol blue with phenolphthalein as indicator gave the best colour change. (From English summary.)—D. Harvey.

168

STORHEER, R. W. and HOLLEY, K. T. Feed analysis. Determination of free gossypol in mixed feeds. *J. Agric. Food Chem.*, 1954, **2**, 745-747. [Dept. Chem., Georgia Exp. Stat., Experiment.]

169

ASKÖE, E. and MADSEN, J. A chemical test for estimating oily and fishy off-flavour in bacon. *Acta Agric. scand.*, 1954, **4**, 266-271. [Slagteriernes Lab., Roskilde, Denmark.]

The fat is treated with a thiobarbituric acid reagent in a boiling-water bath for 1 hr. and the intensity of the red colour due to the presence of oxidised unsaturated fatty acids is measured at 533 m μ .—H. G. Bray.

170

WENGER, F. Potentiometrische Titration von Antioxydantien mit Cer(IV)-sulfat. [Potentiometric titration of anti-oxidants with cerium (IV) sulphate.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, **45**, 184-200. [Lab. Eidg. Gesundheitsamt, Berne.] French and English summaries.

The fat or oil is dissolved in light petroleum and the solution is extracted with 72 per cent. ethanol. The ethanolic extracts may be titrated with ceric sulphate either directly or after concentration, using potentiometry or a redox indicator such as tri-*o*-phenanthroline and ferrous sulphate.

H. G. Bray.

MICROBIOLOGICAL

172

FERNELL, W. R. and ROSEN, G. D. Microbiological assay of protein quality. 1. Growth of *Tetrahymena pyriformis* and assessment of response.

ROSEN, G. D. and FERNELL, W. R. 2. Comparison of nutritive values of proteins. *Proc. Nutrition Soc.*, 1954, 13, xviii-xix; xix-xx. [Res. Dept., J. Bibby and Sons, Ltd., King Edward Street, Liverpool 3.]

173

CHEVILLARD, L., FAUCONNEAU, G. and ROCHE, J. Dosage microbiologique de la cystine. Application aux produits végétaux utilisés dans l'alimentation du bétail. [Microbiological estimation of cystine. Application to plant pro-

171

EGLI, R. H., OSTWALT, U., TRABER, W. and MOTTU, F. Bestimmung des Einflusses von Antioxydanten auf die Haltbarkeit eines animalischen Fettes. [Estimating the effect of anti-oxidants on the keeping quality of an animal fat.] *Internat. Ztschr. Vitaminforsch.*, 1954, 25, 311-313. *Proc.* [La Tour-de-Peilz.]

ducts used in cattle feeding.] *Ann. Zootech.*, 1952, 1, No. 3, 31-44. [Lab. Biochim. Gén., Coll. France.]

A highly specific method utilising the growth of *Leuconostoc mesenteroides* P-60 was successfully applied to the estimation of from 0.3 to 3 μ g. cystine per sample in such materials as fresh and dry alfalfa, groundnut meal, linseed cake and yeast. A. Hepburn.

174

SIBALIC, S. and RADEJ, N. Un nouveau milieu de culture pour le dosage microbiologique du tryptophane. [A new culture medium for the microbiological estimation of tryptophan.] *Ann. Inst. Pasteur*, 1954, 86, 793-797. *Proc.* [Inst. Hyg., Serv. Chim. Biol., Belgrade.]

CLINICAL AND EXPERIMENTAL

175

POOLE, J. C. F. Haemoglobin standard. *Lancet*, 1954, 267, 116-117. [Sir William Dunn Sch. Pathol., Oxford.]

The estimate by Bernhart and Skeggs (Abst. 344, Vol. 13) of the percentage of Fe in Hb is considered the best of existing estimates and at 0.340 per cent. can alone be regarded correct to 3 significant figures. The British Standards Institution Haldane Hb colour standard recalculated from this figure instead of 0.334 is 14.5 g. per 100 ml. blood instead of 14.8 and this new value is recommended.—A. Hepburn.

176

FLOOD, F. T., MANDEL, E. E., OWINGS, R. H. and FEDERSPIEL, C. F. Newer standards in hemoglobinometry. *J. Lab. Clin. Med.*, 1954, 43, 897-904. [Communicable Dis. Centre, Pub. Health Serv., U.S. Dept. Health.]

Drabkin's method for estimating oxyhaemoglobin, based on the empirical finding that the ratio of optical densities of 2 independent colour standards is reasonably constant for all photoelectric photometers of the same type, was investi-

gated with 19 instruments of 3 different makes. (For details of the method see Drabkin, *Spectroscopy: Photometry and Spectrophotometry*, "Medical Physics", Vol. II, pp. 1039-1089, Year Book Publishers, Inc., Chicago, 1950.)

The use of the cupric ammonium sulphate standard is recommended for filter photometers, but not for spectrophotometers because of the inherent greater width of the spectral band.

G. F. Garton.

177

VAN KAMPEN, E. J., VOLGER, H. C. and ZIJLSTRA, W. G. De bepaling van het haemoglobinegehalte van bloed. [Estimation of the haemoglobin content of blood.] *Nederl. Tijdschr. Geneesk.*, 1954, 98, 2442-2446. [Lab. Physiol. Chem., Rijks Univ., Groningen.]

The following methods of estimating Hb were compared: by estimation of Fe by digestion with H_2O_2 , not H_2O , as catalyst and titration in CO_2 against $TiCl_3$ with HCNS as indicator; by estimation as cyan-methaemoglobin or oxyhaemoglobin in the Beckman spectrophotometer; by the Sahli method; and in the Sica haemoglobinometer. The Sahli method involves a relatively large error,

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standard deviation 1.2 g. per cent.; the Sica method, if the instrument is accurately calibrated, is better, S.D. 0.50 g. per cent. as compared with oxyhaemoglobin 0.38 and TiCl_3 0.44 with cyanmethaemoglobin as standard.—I. Leitch.

178

GEMZELL, C. A. and SÖSTRAND, T. Method for determination of total amount of haemoglobin and blood volume in small animals. *Acta physiol. scand.*, 1954, 30, 369-374. [Dept. Clin. Physiol., Karolinska Sjukhuset, Stockholm.]

The animal is placed in a glass chamber of about 1 litre capacity and a known volume of carbon monoxide (about 0.4 ml.) is introduced. Ten min. later 5 litres of CO-free air are passed through the chamber and collected and the CO content is estimated. The Hb content of the animal is calculated in terms of its CO-combining power and the blood volume, using a factor. No sample of blood is taken.—H. G. Bray.

179

BOER, H. H. Blood volume determination by means of radioactive phosphate with special regard to clinical applications. *Danish Med. Bull.*, 1954, 1, 58-59. [Sygehuset, Kolding.]

A summary of the author's thesis (*Bestemmelse af blodvolumenet med radioaktivt fosfat*, 1954, J. H. Schultz Forlag, Copenhagen). He investigated the original method of Hahn and Hevesy (*Acta physiol. scand.*, 1940, 1, 3) with labelled red cells, and the results obtained with it in certain diseases.

E. M. Hume.

180

SIMPSON, A. M., EZROW, L. and SAFIRSTEIN, L. A. Measurement of plasma volume with Rose Bengal (tetraiodo-tetrabrom-fluorescein). *Amer. J. Physiol.*, 1954, 177, 319-324. [Dept. Physiol., Med. Centre, Ohio State Univ., Columbus.]

In plasma volume estimations on dogs the volume of distribution of Rose Bengal in the plasma was closely similar to that of the blue dye T-1824. Rose Bengal was easily estimated colorimetrically, mixed with plasma almost instantaneously and was eliminated so rapidly that negligible quantities remained in the plasma 30 min. after injection. This rapid excretion made repeated measurements of plasma volume possible.

G. F. Garton.

181

CASTER, W. O., SIMON, A. B. and ARMSTRONG, W. D. An Evans Blue method for the determination of plasma volume in the soft tissues of the rat. *J. Appl. Physiol.*, 1954, 6, 724-726. [Dept. Physiol. Chem., Univ. Minnesota, Minneapolis.]

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One per cent. Evans Blue solution, 1 to 2 ml., is injected into the heart and the blood volume is estimated in the usual way. Tissue samples are minced and weighed and the dye is extracted and estimated spectrometrically. The plasma volume of the tissue in ml. plasma per g. tissue is obtained by dividing the concentration of dye in the tissue by that in the plasma.—H. G. Bray.

182

SWISHER, S. N. and IZZO, M. J. A photographic method of recording red cell counts. *J. Lab. Clin. Med.*, 1953, 41, 953-958. [Dept. Med., Sch. Med. Dent., Univ. Rochester, N.Y.]

Red cell counts made by a photographic method, which is described, were slightly lower and more variable than by direct microscopic vision. Where many counts in a short interval were necessary the photographic technique was considered better.

A. Hepburn.

183

READ, R. C. Studies of red-cell volume and turnover using radio-chromium: description of a new "closed" method of red-cell-volume measurement. *New Engl. J. Med.*, 1954, 250, 1021-1027. [Lab. Surg. Res., Peter Bent Brigham Hosp., Boston, Mass.]

The conditions under which ^{51}Cr is taken up by whole blood are considered and results obtained with human subjects are described.—H. G. Bray.

184

DEMPSEY, M. E. and WILSON, R. H. Normal human oxygen saturation of the arterial blood as determined by gasometric analysis. *J. Lab. Clin. Med.*, 1954, 43, 790-797. [Veterans Admin. Hosp., Minneapolis, Minn.]

Arterial blood samples from normal men were used for gasometric analysis by several different techniques to estimate blood oxygen content and oxygen capacity, and sources of error were investigated.

The neutral ferricyanide method was found to give a more accurate measure of oxygen content than the alkaline ferricyanide technique, since the latter solution does not absorb the CO_2 completely. A tonometer coated with silicone gave results for oxygen capacity similar to those obtained in the Van Slyke chamber, but the latter method is considered less subject to error.

By the neutral ferricyanide content and chamber capacity methods the normal arterial oxygen saturation is estimated as 97.9 per cent. with S.D. ± 1.14 and range 96.1 to 99.9, and with neutral ferricyanide and tonometer capacity the corresponding figures are 97.8 ± 1.15 , 96.3 to 100 per cent.—D. Duncan.

185

BOYD, W. C. Error in calibration of commercial BMR machines. *J. Appl. Physiol.*, 1954, 6, 711-715. [Dept. Biochem., Sch. Med., Boston Univ., Mass.]

Methods are discussed for correction for the error of 0.5 to 0.6 per cent. which is caused by the assumption, in calibrating B.M.R. machines, that the patient metabolises only fat and carbohydrate. H. G. Bray.

186

SENDROY, J. (JR.) and CECCHINI, L. P. Determination of human body surface area from height and weight. *J. Appl. Physiol.*, 1954, 7, 1-12. [Div. Chem., Naval Med. Res. Inst., Nat. Naval Med. Centre, Bethesda, Md.]

Two grid diagrams, of which enlarged copies can be had from the authors, are reproduced, one giving body surface area in sq. m. from the sum and quotient of weight (kg.) and height (cm.), the other a simpler one derived from it with weight and height as co-ordinates. They are claimed to be at least as reliable as the calculations of Boyd (Abst. 1350, Vol. 6) and more so than the DuBois chart. They are based on 123 sets of data from the subjects of the classic researches of DuBois and DuBois and Benedict and from Eskimo and white subjects recently studied by Rodahl and Edwards (Absts. 1831, 4507, Vol. 23) and 129 additional sets from Boyd's compilation.—W. M. Deans.

187

HESS, S. M., LAUG, E. P. and FITZHUGH, O. G. Metabolism cage for small animals. *J. Lab. Clin. Med.*, 1954, 43, 824-826. [Div. Pharmacol., Food and Drug Admin., Washington, D.C.]

188

LEMARCHANDS, H. Appareil pour la mesure de la consommation d'oxygène des petits animaux de laboratoire. [Apparatus for measuring oxygen consumption of small laboratory animals.] *Experientia*, 1954, 10, 269-271. [Lab. Physiol. Gén., Fac. Sci., Univ. Lyons.]

189

HUTCHINSON, J. C. D. A simple climatic chamber for physiological work with poultry. *J. Agric. Sci.*, 1954, 44, 361-368. [Poultry Res. Centre (A.R.C.), W. Mains Rd., Edinburgh.]

The design of an inexpensive climatic chamber which is transportable and in which the temperature, humidity and rate of movement of the air can be independently controlled is described in detail. Temperature and humidity may be varied over a wide range of values above external air conditions. For lower values a refrigeration system, to which brief reference is made, is employed.

The average rate of air movement is normally 20 ft. per min., and the range of variation about this figure is small. The chamber, designed primarily for poultry, is just large enough to accommodate 6 cages within the working space, but larger chambers may be built on the same principles.—J. D. Pullar.

190

WECHSLER, R. L. and ROTH, J. L. A. Measurement of the rate of gastric emptying in man as determined by the clearance of a radioactive colloid (Ag^{131}): normal values, effect of urecholine chloride and morphine sulfate. *Amer. J. Med. Sci.*, 1954, 227, 712. *Proc. [Dept. Gastroenterol., Grad. Sch. Med., Univ. Pennsylvania, Philadelphia.]*

191

PLACER, ZD. Stanovení žaludečního hlenu. [Estimation of gastric mucin.] *Sborn. pathophys. tráv.*, 1954, 8, 26-29. [Res. Inst. Human Nutrit., Prague.]

Biochemical methods for estimating gastric mucin are reviewed. There are 66 references. M. Prokšová (Czechoslovakia).

192

LATNER, A. L., MERRILLS, R. J. and RAINE, L. C. D. P. Further observations on the isolation and chemical composition of Castle's intrinsic factor. *Biochem. J.*, 1954, 57, xix. [Sect. Chem. Pathol., Dept. Pathol., King's Coll., Newcastle upon Tyne.]

193

EBERT, E. F., ROSEBOOM, B. B. and DALE, H. E. "Deperitonealization" of the wall of the rumen. *Amer. J. Vet. Res.*, 1954, 15, 405. [Dept. Vet. Med., Sch. Vet. Med., Univ. Missouri, Columbia.]

The procedure was designed to allow repeated penetration of the rumen by needles or trocars without contamination of the peritoneum or the need for a permanent fistula.

The subject was a young Jersey cow. With paravertebral anaesthesia in the standing position an 8-in. vertical incision was made in the left paralumbar fossa. An area of parietal peritoneum 3 in. to each side of the incision and the corresponding area of visceral peritoneum on the rumen wall were scraped with a dull knife to produce mild hyperaemia. The rumen was then anchored to the abdominal wall at the 4 corners of this area by single large interrupted sutures and the incision was closed.

From 4 weeks after the operation repeated stab wounds were made into the rumen, without evidence of peritoneal infection.—D. Duncan.

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- 194
NICHOLS, R. E. An inflatable plug for small rumen fistulas. *Amer. J. Vet. Res.*, 1954, 15, 246. [Dept. Vet. Sci., Univ. Wisconsin, Madison.]

The plug has the advantages of being fairly simple, easily removed and capable of being inflated to seal the fistula opening. It has withstood rumen pressures of several lb. per sq. in. in sheep without leakage. It consists of a plastic stem with a flange to lie against the skin. Around the stem below the flange is fitted a piece of rubber from an ordinary toy balloon, sealed to it at its upper and lower ends. An air passage from the outside runs through the stem, emerging again within the balloon. To seal the plug in position, air is forced in through this passage to inflate the balloon.—W. A. Greig.

- 195
KUMSIEV, S. A. Uskorennoe vyvedenie soderzhimogo rubtza u krupnogo rogatogo skota. [Accelerated regurgitation of the contents of the stomach in cattle by use of a tube.] *Veterinariya*, 1954, 31, No. 4, 55-57. [Moscow Chem. Technicol. Inst. Meat Trade.]

- 196
KYLE, L. H. Estimation of body fat. *J. Clin. Endocrinol.*, 1954, 14, 969-973. [Dept. Med., Georgetown Univ. Hosp., Washington 7, D.C.] A short review, with 14 references.

- 197
BEST, W. R. An improved caliper for measurement of skinfold thickness. *J. Lab. Clin. Med.*, 1954, 43, 967-970. [U.S. Army Med. Nutrit. Lab., Fitzsimmons Army Hosp., Denver, Colo.]

- 198
WILLIAMS, J. B. and IRVINE, J. W. (JR.) Preparation of the inorganic matrix of bone. *Science*, 1954, 119, 771-772. [Radioactivity Centre, Massachusetts Inst. Technol., Cambridge.] Soxhlet extractors of any size are used for extraction of the bone with a constant-boiling mixture of water and ethylenediamine 80:20. b.p. 118° C. To prevent agitation the tip of the water-cooled condenser is placed so that the solvent runs down the side of the extractor. If the Soxhlet is a large one, insulation or external heating may be necessary to maintain the solvent at a temperature near its boiling-point.—D. Harvey.

- 199
MAINLAND, D. (with MAINLAND, R. B.) Evaluation of the skeletal age method of estimating children's development. 2. Variable errors in the assessment of roentgenograms.

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Pediatrics, 1954, 13, 165-173. [Dept. Anat., Dalhousie Univ., Halifax, N.S.] Spanish summary.

For part 1, see Abst. 1579, Vol. 24.

The aim of this investigation was to evaluate accurately the variable error of an observer in estimating the skeletal age of children from X-ray photographs of the hand, and to find whether an error allowance should be made for the following: (1) atlas used (Todd or Greulich and Pyle), (2) age of child, (3) sex, (4) differences between skeletal and chronological age, (5) differences between X-ray photographs of different children, (6) differences between photographs of the same child, (7) quality of photographs, (8) speed of assessment. The variable error was studied on 1124 readings of 326 films from 233 children aged from 16 months to 17 years; 79 of the photographs were reproductions from Macy's *Nutrition and Chemical Growth in Childhood* (Absts. 2944, Vol. 12; 3256, Vol. 22), 90 were of healthy children in an orphanage in Halifax and the rest were obtained during a nutrition survey in Halifax.

A variable error of 3 months was found in the Macy photographs with either the Todd or the Greulich and Pyle atlas; a variable error of 3 months was also found in the nutrition survey children, with only the Greulich and Pyle atlas, and of 4 months in the orphanage children, with both atlases. In order to obtain 95 per cent. probability with a variable error of 3 months the observer must affix an error of ± 8.3 months, and for a deviation of 4 months the observer must allow ± 11.1 months.

On completing 1200 readings the observer's practice lapsed for a year. Re-assessment of random photographs revealed a systematic difference from the previous readings of the same films with the same atlases of approximately 3 months. D. Benzie.

- 200
PARETT, G. J. A standard clinical examination of the teeth. *Brit. Dent. J.*, 1954, 96, 296-300. [Dept. Prevent. Dent., Inst. Dent. Surg., London.]

A standard probe and grading system for evaluation of caries where X-ray facilities are not available are described. When these were tested by repeated examination of 57 children the observational error for the grade commonly regarded as "requiring treatment" was 2 per cent.

W. M. Deans.

- 201
ARONS, W. L. and SOLOMON, A. K. 1. The separation of sodium from potassium in human blood serum by ion exchange chromatography. ARONS, W. L., VANDERLINDE, E. J. and SOLOMON, A. K. 2. The simultaneous measurement of

exchangeable body sodium and potassium utilizing ion exchange chromatography. *J. Clin. Invest.*, 1954, **33**, 995-1000; 1001-1007. [Biophys. Lab., Harvard Med. Sch., Boston, Mass.]

1. The resin used is Dowex 50, mesh size 200 to 400, minus 325 or 400, 12 per cent. cross-linked. The eluting agent is HCl.

2. ^{24}Na and ^{42}K are injected and after 24 hr. the radio-activity and total Na and K in a blood sample are estimated, the latter by flame photometer. Loss of radio-activity in urine during the equilibration period is also measured.—H. G. Bray.

202

JAMES, A. H., BROOKS, L., EDELMAN, I. S., OLNEY, J. M. and MOORE, F. D. **Body sodium and potassium. 1. Simultaneous measurement of exchangeable sodium and potassium in man by isotope dilution.** *Metabolism*, 1954, **3**, 313-323. [Surg. Res. Lab., Peter Bent Brigham Hosp., Boston, Mass.]

1. Sodium and potassium in serum are estimated by flame photometer and the total radio-activity due to both ^{24}Na and ^{42}K and that due to ^{42}K after chemical separation by a cobaltinitrite method is measured. In urine the elements may be estimated after chemical separation or by means of a counting technique using aluminium absorbers.

H. G. Bray.

203

SIMMONS, D. H., HARVEY, R. B. and HOSHIKO, T. **Effect of sodium intake on sodium loss due to mannitol diuresis. An empirical test for renal sodium-retaining activity.** *Amer. J. Physiol.*, 1954, **178**, 182-188. [Dept. Physiol., Sch. Med., Univ. Minnesota, Minneapolis.]

204

WAGNER, E. A., KOCH, C. A. and JONES, D. V. **An improved indwelling tube for feeding premature infants.** *J. Pediat.*, 1954, **45**, 200-201. [Premature Serv., Cincinnati Gen. Hosp., Ohio.]

A polyvinyl plastic tube was found to have advantages over the polyethylene tube previously used (Wagner *et al.*, *J. Pediat.*, 1952, **41**, 79).

F. C. Aitken.

205

COPPING, A. M. **Purified casein for nutritional research.** *Nature*, 1954, **173**, 1165-1167. [Queen Elizabeth Coll., Univ. London.]

A brief history is given of the preparation in Britain of casein with a standard of purity and a low vitamin content suitable for the present-day needs of nutrition workers. The product prepared by Messrs. Genatosan, Ltd. has been tested in the same way as other caseins (see Abstr. 1906, Vol. 21) and has been found satisfactory. Results are as

yet unpublished. The extent of the dependence of workers on the continued availability of supplies of purified casein is emphasised.—D. Harvey.

206

CABELL, C. A. and EARLE, I. P. **Protein quality assay. Comparison of the rat repletion method with other methods of assaying the nutritive value of proteins in cottonseed meals.** *J. Agric. Food Chem.*, 1954, **2**, 787-790. [Animal and Poultry Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

The nutritive value of the protein of 12 specially prepared cottonseed meals was studied by the Cannon rat repletion method. The best value was obtained with a butanone-extracted meal and the lowest value with a meal in which the gland cells had been ruptured before the meal was cooked. The nutritive value of these proteins was studied also by rat growth, chick growth and microbiological methods.

The results obtained from the Cannon rat repletion method had a significant positive correlation with the results of the microbiological method and a significant negative correlation with the amount of bound gossypol.—D. H. Shrimpton.

207

LANCASTER, R. J. **Measurement of feed intake of grazing cattle and sheep. 5. Estimation of the feed-to-faeces ratio from the nitrogen content of the faeces of pasture fed cattle.** *N.Z. J. Sci. Technol.* [A], 1954, **36**, 15-20. [Animal Res. Div., Dept. Agric., Ruakura Animal Res. Stat., Hamilton.]

For previous parts see Abstrs. 133, Vol. 21; 2670, Vol. 23; 2452, 4194, Vol. 24.

The results of 22 digestibility trials with cattle receiving different pasture feeds were used to obtain regression equations relating the nitrogen content of the faeces to pasture intake, expressed as total organic matter, digestible organic matter or starch equivalent.—D. M. Walker.

208

MC CREA, M. R. and TRIBE, D. E. **The baby pig as a laboratory animal.** *J. Physiol.*, 1954, **124**, 52P. [Sch. Vet. Sci., Univ. Bristol.]

209

DAVIDSON, J. **Studies on the fate of the major plant pigments in the alimentary tract of the sheep and their relation to the 'chromogen' marker method for determining nutrient digestibilities.** *Proc. Nutrition Soc.*, 1954, **13**, v-vi. [Rowett Res. Inst., Bucksburn, Aberdeen-shire.]

210

MERKEL, R. A., SORESENSEN, D. K., KOWALCZYK, T. and BRAY, R. W. A technique for securing tissues to study muscular fat deposition in swine. *Cornell Vet.*, 1954, 44, 3-6. [Dept. Animal Husb., Univ. Wisconsin, Madison.]

A biopsy technique is described by which fat and muscle samples for histological and chemical analyses can be obtained from animals on feeding trials.

An incision $1\frac{1}{2}$ to 2 in. long is made parallel and close to the vertebral column of an anaesthetised pig. After the depth of back fat is measured, a rectangular sample measuring about $1\frac{1}{2} \times \frac{3}{4} \times \frac{3}{8}$ in. is removed from the longissimus dorsi muscle; haemorrhage is controlled by gauze tampons, and if necessary by ligation of large vessels. This operation was performed on 60 pigs with normal surgical precautions and after-treatment, and in none did any secondary complication ensue.

W. A. Greig.

211

KRAYBILL, H. F., HINER, R. L. and FARNWORTH, V. M. The relation of organ weights to lean

body mass and empty body weight in cattle. *J. Animal Sci.*, 1954, 13, 548-555. [U.S. Dept. Agric., Bur. Animal Indust., Agric. Res. Admin., Beltsville, Md.]

The relation between lean body mass, empty bodyweight and the weights of the liver, kidney, spleen, heart and pancreas was determined by statistical analyses of data from 165 cattle of varying weights and ages. The weights of all organs were positively correlated with both empty bodyweight and lean body mass. It was concluded that the weights of all organs studied would prove of equal value in estimating empty bodyweight and lean body mass. The hypothesis that liver weight is unique as an index of the weight of the lean body mass was not confirmed.—J. N. Aitken.

212

LOCKART, L. W. Sampling of fleeces for yield, staple length, and crimps per inch measurement. *Austral. J. Agric. Res.*, 1954, 5, 555-567. [N.S.W. Dept. Agric., Wool Res. Lab., Agric. Exp. Stat., Trangie.]

See also Absts. 726, 1055, 1143, 1298.

COOKING, STERILISATION AND PRESERVATION OF FOOD

213

MOSSSEL, D. A. A. and NELEMANS, F. A. De toevoeging van chemische verbindingen zonder voedingswaarde aan levensmiddelen, gezien van het standpunt der volksgezondheid. [Addition of chemical compounds without food value to foods, from the standpoint of public health.] *Nederland. Tijdschr. Geneesk.*, 1954, 98, 2577-2588. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.] English summary.

A list is given of commonly used "additives without food value" under the headings: preservatives, anti-oxidants, anti-staling agents, pigments, flour improvers, thickeners, emulsifiers, sweeteners and miscellaneous. Views differ from the one extreme that nothing should be added to the other that anything is permissible that is not obviously harmful.

Techniques for the testing of these additives and their limitations are discussed. Some have been shown to have extremely undesirable long-term effects, e.g., hyperplasia of the testis from some glycols used in essences, thyroid dysfunction from some sweetening agents. With reference to the question of supervision, compulsory declaration of additions may not be of much help to the average consumer but might be useful to doctors. Metabolism tests with labelled test substances may provide more reliable information than the usual pharmacological tests (cf. Deuel, *Food Technol.*, 1953, 7, 381).—I. Leitch.

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214

GERRITSMAN, K. W. Polymere fosphaten toegevoegd aan levensmiddelen. [Polymeric phosphates added to foods.] *Voeding*, 1954, 15, 293-303. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.] English summary.

Polymeric phosphates have displaced organic acids, e.g. citric acid, in the processing of spreading cheeses; they are used in baking powders and in the meat processing industries to improve the colour of meat and prevent the clotting of blood for sausage.

The chemistry of these phosphates is reviewed. Their metabolism is not properly understood. Danger may arise from contamination with arsenic or fluorine.—I. Leitch.

215

KALOYERREAS, S. A. The effect of pasteurization on the stability of phosphates can be used as a test for heated milk. *Science*, 1954, 120, 111-112. [Dept. Agric. Chem., Louisiana State Univ., Baton Rouge.]

Pasteurisation for 30 min. at 62°C. reduced the pH of milk; continuation of the treatment for 30 min. more made no further change. Titration curves of rennet sera indicated that the heat treatment produced an increase in mono- and a decrease in di-calcium phosphate. The phosphate is considered to be more stable in heated than in raw milk. A similar change in pH with heating was reproduced with mixtures of the phosphates,

and it is suggested that the change is the result of a new equilibrium between the mono- and di-calcium salts established by a reaction between the di-calcium phosphate and carbonic acid.

These effects of heat on the pH and on the stability of the phosphates of the serum can be used to differentiate heated from raw milk.

D. Harvey.

216

BURTON, H. Colour changes in heated and unheated milk. 1. The browning of milk on heating. *J. Dairy Res.*, 1954, 21, 194-203. [Nat. Inst. Res. Dairying, Univ. Reading.]

217

PATTON, A. R., SALANDER, R. C. and PIANO, M. Lysine destruction in casein-glucose interaction measured by quantitative paper chromatography. *Food Res.*, 1954, 19, 444-450. [Chem. Sect., Colorado Agric. Exp. Stat., Fort Collins.]

Casein was subjected to different treatments, namely, autoclaving with or without water and/or glucose at 120° C., autoclaving with 6 N HCl for 6 hr. and enzymic digestion with 1 per cent. trypsin for 10-5 hr. Lysine was estimated by paper chromatography and comparison with a standard lysine curve.

After trypsin digestion the percentage of lysine left was as follows: casein untreated, 6.0; casein autoclaved without glucose, 5.2; casein-glucose mixture untreated, 3.2; and casein-glucose mixture autoclaved, 1.2.

Autoclaving alone had no effect on the lysine content of casein, nor did acid hydrolysis in the presence of 1 per cent. glucose cause significant destruction of lysine although other amino-acids were significantly affected at the 0.01 level. A greater amount of glucose did cause lysine destruction, which was most severe when casein was autoclaved with moist heat. Autoclaving for 4 hr. with different amounts of moisture caused only slight destruction of lysine.

When casein was treated with 2:4-dinitrofluorobenzene and the hydrolysate was chromatographed a yellow spot due to the ϵ -dinitrophenyl derivative of lysine appeared. When autoclaved with steam in the presence of glucose no dinitrophenyl derivative was formed; this was evidence that the free amino-groups in the lysine residues had been blocked, presumably by a carbonyl-amino reaction.

A. Hepburn.

218

SANDERS, G. P., SAGER, O. S. and HUFFER, J. A. Factors affecting the sensitivity and accuracy of the phosphatase test. *J. Dairy Sci.*, 1954, 37, 698-710. [Washington Utilization Res. Branch, U.S. Dept. Agric., Washington, D.C.]

219

RADEMA, L. De invloed van temperatuur en vochtgehalte op de duurzaamheid van verstuivingspoeder uit volle melk. [The effect of storage temperature and moisture content on the keeping quality of whole milk powders.] *Nederlands Melk Zuivelijdschr.*, 1954, 8, 125-135. [Nederlands Inst. Zuivelonderzoek (N.I.Z.O.), Ede, Ontvangen.] English summary.

220

SCHORMÜLLER, J., BIEN, K. J. and WINTER, H. Beiträge zur Biochemie der Käsebereitung. 4. Das Verhalten des Tyrosins im Verlauf der Reifung. [Biochemistry of cheese ripening. 4. Behaviour of tyrosine during ripening.] 5. Das Verhalten des Tryptophans im Verlauf der Reifung. [5. Behaviour of tryptophan during ripening.]

SCHORMÜLLER, J. 6. Methionin, Cystin und Schwefelwasserstoffschwefel im Verlaufe der Reifung von Sauermilchkäse. [6. Methionine, cystine and hydrogen sulphide sulphur during the ripening of sour milk cheese.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, 98, 411-24; 99, 98-109; 214-227. [Inst. Lebensmittelchem., Tech. Univ., Berlin, Charlottenburg.]

4. In continuation of previous work (Abst. 4263, Vol. 24), tyrosine was estimated in samples of sour skimmed milk cheese by the method of Bálint (Title 4210, Vol. 8) and that of Thomas (Abst. 2896, Vol. 14). The results are presented in tables and graphs.

In normally ripened cheese, tyrosine in the true protein and water-soluble protein fractions tended to increase during ripening; in accelerated ripening it decreased; free tyrosine was not found except in stored unsalted curd.—W. M. Deans.

5. Tryptophan was estimated by the method of Bates (Title 1356, Vol. 7) or that of Spies and Chalmers (Absts. 46, Vol. 18; 4359, Vol. 19; 3108, 4611, Vol. 20). Under normal conditions no free tryptophan appeared in the residual N fraction. Only with excessively long ripening, or breakdown of casein under conditions leading to complete spoiling of the cheese, was any considerable amount of this amino-acid liberated. Moreover, under normal ripening conditions there was no question of any diminution of biological value occurring through destruction of tryptophan. In rapid ripening there was an increase of tryptophan in the water-insoluble protein, coupled with a decrease in the water-soluble protein fraction. This confirms previous findings that rapid ripening is inferior from the nutritional standpoint to the normal ripening procedure.

6. The constituents were estimated by a micro-method previously developed (Schormüller and

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Ballschmieter, *Ztschr. anal. Chem.*, 1951, **132**, 1 and 6). Under normal ripening conditions there was no destruction of methionine or cystine. Only with excessively prolonged ripening did the methionine content fall off. Conversely, within the framework of the present investigations, there was no indication of biogenesis of the amino-acids in question. The percentages of both in the total N remained very constant, so that under the conditions tested there was no question of any reciprocal transformation of the 2 substances. As a rule H_2S -sulphur was about evenly divided between the true protein and residual N fractions, and this distribution showed no appreciable change during ripening.—M. B. Richards.

221

GUILLOT, G. La conservation des oeufs. [The preservation of eggs.] *Ann. Nutrit. Alimentation*, 1954, **8**, 503-529.

222

GINGER, I. D., WACHTER, J. P., DOTY, D. M., SCHWEIGERT, B. S., BEARD, F. J., PIERCE, J. C. and HANKINS, O. G. Effect of aging and cooking on the distribution of certain amino acids and nitrogen in beef muscle. *Food Res.*, 1954, **19**, 410-416. [Div. Biochem., Amer. Meat Inst. Found., Chicago, Ill.]

Nitrogen, arginine, leucine, tyrosine, histidine, glutamic acid and lysine were estimated before and after ageing for 2 weeks, in raw and cooked beef rib steak, in the drippings from the meat and in the N.P.N. fraction, in the last two both before and after acid hydrolysis.

Cooking caused a sharp decrease in the soluble protein N present, some free amino groups being liberated as a result of proteolysis. Ageing increased the amino-N content of the N.P.N. fraction of both raw and cooked meat. Raw meat had only a slight loss of total N in the drippings, irrespective of ageing; this was chiefly N.P.N. with 14 to 25 per cent. free amino-N.

Ageing had little effect on the arginine, leucine and tyrosine content of the samples except in the drippings and the N.P.N. fractions, where there was a slight increase. Less than 3 per cent. of the total of these amino-acids was found in the N.P.N. fractions. Hydrolysis of the drippings and the N.P.N. fractions showed leucine, tyrosine, glutamic acid and lysine to be present in bound forms. The N.P.N. fraction contained up to 32 per cent. of the total histidine after hydrolysis, compared with 3 per cent. before hydrolysis. Microbiological analyses with carnosine as a reference standard indicated histidine to be present also in bound forms other than the peptide carnosine.

A. Hepburn.

223

AUERBACH, E., WANG, H., BATES, V., DOTY, D. M. and KRAYBILL, H. R. A histological and histochemical study of beef dehydration. 3. Influence of pre-cooking. *Food Res.*, 1954, **19**, 420-432. [Amer. Meat Inst. Found., Univ. Chicago, Ill.]

Cylinders of *Biceps femoris* from a commercial grade carcass were pre-cooked to internal temperatures of 60°, 76.6° and 93.3° C. in a beef tallow bath and dried for 16 hr. at 45° C. under vacuum and at 70° C. in an air oven; duplicate cylinders were electrolysed after pre-cooking and before dehydration. Large blocks of tissue were also cooked and cylinders removed for further treatment. Methods for rehydration, moisture estimation, electrolysis, histological and histochemical treatment were as before (Absts. 176, 2827, Vol. 24).

From the degree of subsequent rehydration of the samples the best internal temperature of pre-cooking was found to be 76.6° C. for only the electrolysed block cylinder group. Electrolysed block cylinder samples dehydrated at 70° C. reached a higher level of rehydration than similarly treated samples dehydrated at 45° C., regardless of cooking temperature. The calculated correlation coefficient between moisture content and muscle fibre diameter for all the data obtained was 0.612. In the dehydration of unground beef tissue pre-cooked had no advantage over raw meat. G. F. Garton.

224

SWICKARD, M. T. and HARKIN, A. M. Percentage relationships of raw carcass weights and yield of cooked edible portion for young Beltsville Small White turkeys. *Poultry Sci.*, 1954, **33**, 775-779. [Bur. Human Nutrit., Agric. Res. Admin., U.S. Dept. Agric.]

Fifty-two Beltsville Small White turkeys were used in this study, twenty 14-week-old toms, twenty 16-week-old hens and twelve 26-week-old toms. The carcasses were stored at 35° F. before evisceration and were then frozen for 1½ to 3½ months at 0° F. The roasting times varied with size and degree of fatness of the bird. After cooling and skinning, the meat was stripped from the bones, that from the base of the neck to the end of the ribs being reckoned as light and that from the legs, thighs and back below the ribs as dark meat.

The dressed weight as a fraction of liveweight was 89.2 per cent. for 14- to 16-week-old birds irrespective of sex and 91.4 per cent. for 26-week-old toms. The ready-to-cook weights indicated that the hens (68.8 per cent. of the liveweight) were significantly heavier than the young toms; older toms gave a still higher weight at 71.8 per cent. of the liveweight. The proportionately higher ready-

to-cook weight of the older birds was due to a larger amount of fat; the difference between the young toms and hens was due to different viscera, neck and gilet weights.

Expressed as a percentage of liveweight, the cooked edible portion of 14-week-old toms was 36.3 per cent., of 16-week-old hens 37.7 per cent. and of 26-week-old toms 39.9 per cent., all differences being significant at the 5 per cent. level. Yield of light meat from 14-week-old toms was 26 per cent. of ready-to-cook weight, from 16-week-old hens 27.4 per cent. and from 26-week-old toms 28.1 per cent. Shrinkage during roasting was greatest in the older birds, 25.3 per cent., significantly higher than in the younger birds, 21.4 per cent.—M. J. Head.

225

THEVENOT, R. La conservation des volailles. [The preservation of poultry.] *Ann. Nutrit. Alimentation*, 1954, 8, 531-539 (with discussion 539-540).

226

GILBERG, Y. Undersøkelser over holdbarhet av lettsaltet sild uten eddik. [Keeping quality of lightly salted herring without vinegar.] *Fiskeridirektoratets Skr. Ser. Teknol. Undersøkt.*, 1953, 2, No. 12, pp. 23. English summary.

A study of different preservatives, with 15 per cent. salt.

227

MCDONALD, C. E. and MILNER, M. The browning reaction in wheat germ in relation to "sick" wheat. *Cereal Chem.*, 1954, 31, 279-295. [Dept. Milling Indust., Kansas State Coll., Manhattan.]

Studies of samples of wheat germ stored under different conditions provided further evidence in favour of the conclusion of Cole and Milner (*Cereal Chem.*, 1953, 30, 378) that the brown pigmentation of the germ found in "sick" wheat is due to a browning (Maillard) reaction. The colour change is favoured by high temperature and high moisture content; it sets in before mould growth, and is accompanied by a decrease in peptisable protein.

W. M. Deans.

228

OLAFSON, J. H., CHRISTENSEN, C. M. and GEDDES, W. F. Grain storage studies. 15. Influence of moisture content, commercial grade, and maturity on the respiration and chemical deterioration of corn. *Cereal Chem.*, 1954, 31, 333-340. [Dept. Agric. Biochem., Minnesota Agric. Exp. Stat.]

Studies of respiration with continuous aeration at 30° C. over a 10-day period in an apparatus previously described (Title 3023, Vol. 15) and of

mould count, viability, fat acidity and reducing and nonreducing sugars in samples of white or yellow dent maize differing in moisture content, U.S. grade or stage of maturity at harvesting showed that respiration is accelerated when the moisture content exceeds about 14.5 per cent. and that maize respire more rapidly than wheat (see Abst. 1554, Vol. 17), and confirmed earlier findings that unsound grain or grain harvested immature is more liable to heat or deteriorate on storage.

W. M. Deans.

229

BARTNIK, J. and TRZEBSKA, I. Wpływ stopnia rozdrobnienia i typów przemian na strawność mąk razowych. [The influence of the degree of disintegration and type of milling on the digestibility of whole-grain flours.] *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 187-194. Russian and English summaries.

The types of milling studies were stone, hammer, roller, hurricane and "vitahan" and the degree of disintegration was determined by the use of standard sieves. Digestibility trials were made with rats.

The degree of disintegration of the grains, wheat and rye, had no effect on the digestibility of organic matter or crude protein of the flours but in relation to the type of milling may have some effect, depending on the dimensions of the free bran particles. The digestibility of the organic matter of wheat flours was about 1 per cent. and of protein 13 per cent. higher than for rye flours. (From English summary.)—J. S. Thomson.

230

BRONISZ, H. Uwagi w związku z kwasowością mąki przemian "vitahan". [Observations on the acidity of "vitahan" milled flour.] *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 215-220. Russian and English summaries.

231

MORAN, T., PACE, J., and McDERMOTT, E. E. The lipids in flour. Oxidative changes induced by storage and improver treatment. *Nature*, 1954, 174, 449-452. [Res. Assoc. British Flour Millers, Cereals Res. Stat., St. Albans.]

The oxidation or peroxide value of whole flour suspensions was studied by adapting the thiobarbituric acid method of Wilbur *et al.* (*Arch. Biochem.*, 1949, 24, 305). Treatment of 80 per cent. extraction flour with agene (NCl₃) or chlorine dioxide (ClO₂) resulted in an immediate small rise in the peroxide value.

Light petroleum extracts of treated and untreated flour were prepared by percolating the solvent through a column of the flour. When the extracts were kept in stoppered flasks in the light at room temperature the thiobarbituric acid value

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increased and eventually insoluble, polymer-like material was deposited; the value increased most rapidly in the extracts from flours treated with agene or ClO_2 . Other solvents (carbon tetrachloride, chloroform, benzene and ether) were similarly used to extract the lipids. In all cases the extracted material auto-oxidised in the light more quickly than did the light petroleum extracts; in the dark all the extracts were comparatively stable.

The total reducing value of the unsaponifiable matter of the lipids of a range of treated and untreated flour was estimated by the method of Tošić and Moore (Abst. 346, Vol. 17). Treated flours yielded unsaponifiable matter with reducing values much lower than those obtained with untreated flour lipids; it is suggested that this test could be used to decide whether or not a given flour had been treated. Although flour stored in air for several months showed only a relatively small fall in reducing value, a steady rise occurred in the peroxide value of the extracted lipids.

G. A. Garton.

232

GREUP, D. H. De werking van vetten en emulgatoren in brooddeeg. Hun invloed op de houdbaarheid van brood. [Effect of fats and emulsifiers in bread dough. Effect on keeping quality of bread.] *Conserva*, 1953-54, 2, 352-357.

233

WENSVEEN, C. J. and WIEBOLS, W. H. G. Het bakken van gerezen roggebrood (Brabants roggebrood) met melkzuur. [The baking of raised rye bread (Brabant rye bread) with lactic acid.] *Bakkerswereld*, 1953/54, 14, No. 45, pp. 872-874.

234

MORAN, T., HUTCHINSON, J. B. and THOMLINSON, J. The flavour of porridge. *Nature*, 1954, 174, 458. [Res. Assoc. British Flour Millers, Cereals Res. Stat., St. Albans.]

It is alleged that porridge nowadays is often insipid and lacking in flavour and aroma, possibly because English consumers are too readily satisfied by the effect of adding sugar instead of salt. The flavour of porridge meal or flakes is developed during the original kilning process, and in this note on work which will be published more fully elsewhere it is stated that the optimum conditions correspond to gentle drying of the oats from their usual moisture content of about 17 down to about 8 per cent., followed by toasting for 20 min. in a current of air at 150° C. The substances responsible for the desirable "nutty" flavour are not known. Despite traditional belief, the furnace gases play no part in its development.

W. M. Deans.

235

REEVE, R. M. Histological survey of conditions influencing texture in potatoes. 1. Effects of heat treatments on structure. 2. Observations on starch in treated cells. 3. Structure and texture in dehydrated potatoes. *Food Res.*, 1954, 19, 323-332; 333-339; 340-349. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany, Calif.]

236

OLSEN, G. E. Fresh vs. pre-processed vegetables. Comparative cost and availability. *J. Amer. Dietetic Assoc.*, 1954, 30, 762-765. [Dining Halls, Univ. Washington, Seattle.]

The vegetables studied were fresh or frozen broccoli, carrots, peas, spinach, fresh or dried onions, and fresh or pre-peeled potatoes. Trimming waste and preparation time and cost were estimated, and quality and palatability were judged.

Fresh broccoli, peas, onions and spinach were less economical than the pre-processed vegetables because of the time required in preparation. Diced frozen carrots and pre-peeled potatoes were more expensive than the unprocessed vegetables. Pre-processed vegetables were more uniform in quality than the fresh. Frozen broccoli and peas were preferred to fresh, but fresh carrots, onions and spinach were preferred to the pre-processed vegetables.—F. C. Aitken.

237

DEUEL, H., SOLMS, J. and DENZLER, A. Klärung von Fruchtsäften mit polymeren Basen. [Clarification of fruit juices by means of polymeric bases.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 73-84. [Agrik.-Chem. Inst., Eidg. Tech. Hochsch., Zürich.] French and English summaries.

Methods of clarifying fruit juices are briefly reviewed and the precipitation of pectins is discussed. By addition of the polymeric base polyethyleneimine to apple, bramble, currant, cherry, orange, tomato or white grape juice, pectins were satisfactorily precipitated, and with them other substances causing turbidity; viscosity was greatly reduced, with little change in pH. Since the optimum amount differs with different juices, preliminary tests must be made. Further studies are in progress.—W. M. Deans.

238

GUADAÑI, D. G. Effect of sucrose and ascorbic acid on quality retention in fresh and frozen strawberry puree. *Food Res.*, 1954, 19, 396-401. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany, Calif.]

239

AXELSSON, J. and SUNDEBY, H. Våxlingen för ensilagens pH-värde, särskilt under tiden närmast efter fodrets inläggning. [Changes in the pH of silage, especially immediately after the fodder is ensiled.] *Kgl. Lantbruksakad. Tidskr.*, 1954, 93, 218-224. English summary.

The measurements were on silage made in glass jars of 1 to 2 litres capacity, with lucerne, clover and grass, ensiled with A.I.V. solution, acid salts, molasses or Kofa salt (calcium formate and sodium nitrite). The addition of acid as A.I.V. solution or a mixture of sulphate and phosphoric acid rapidly reduced pH: buffering caused a subsequent rise and fermentation a second fall which continued until bacterial activity ceased. Molasses and Kofa salt accelerated fermentation but the bases contributed by Kofa salt kept pH relatively high. Other things being equal the pH of lucerne silage was above that of clover, and that of grass was lowest.

I. Leitch.

240

HARWOOD, V. D. Analytical studies on the carbohydrates of grasses and clovers. 6. Changes in the cell-wall polysaccharides during the ensilage of perennial ryegrass with a high protein and low soluble-carbohydrate content. *J. Sci. Food Agric.*, 1954, 5, 276-277. [Dept. Chem., Univ. Edinburgh.]

For the methods used to estimate the polysaccharides see Abstr. 39, Vol. 25.

Experimental silages were prepared from perennial ryegrass where the ratio of crude protein to water-soluble carbohydrates was 4.5:1. In the preparation of the silages some were inoculated with a culture of lactobacilli. Changes in pH and in the content of individual carbohydrates were followed over a 2-month period. A bad silage resulted (pH 6.6 after 2 months) and was explained chemically by the rapid disappearance of soluble sugars and failure of the acid-producing bacteria to attack the cell-wall polysaccharides. No free arabinose or xylose was found and the cellulose content was unchanged. It was concluded that the lactobacilli attack the pentosans after the depletion of the free sugars, since significant losses of araban and xylan occurred.—D. M. Walker.

241

SHEPHERD, J. B., WISEMAN, H. G., ELY, R. E., MELIN, C. G., SWEETMAN, W. J., GORDON, C. H., SCHOENLEBER, L. G., WAGNER, R. E., CAMPBELL, L. E., ROANE, G. D. and HOSTERMAN, W. H. Experiments in harvesting and preserving alfalfa for dairy cattle feed. *U.S. Dept. Agric. Tech. Bull.* No. 1079, February 1954, pp. 147. [Washington, D.C.]

This comprehensive bulletin gives the results of experiments made at Beltsville, Md., over a period of 5 years to determine the relative merits of harvesting a hay crop of alfalfa as field-cured hay, barn-dried hay, wilted silage or artificially dehydrated hay with special reference to labour and equipment required for harvesting and storage by each method, the length of exposure of the crop to the weather after it is cut, losses of dry matter and nutrients during harvesting and storage, the yield, composition and quality of the fodders produced, their value for growth and milk production and their effect on the vitamin A content of the milk and butterfat produced.

Field losses by different methods of harvesting all indicated a relationship between the length of time forage was exposed to the weather and the percentage of losses of dry matter, carotene, protein and leaf. Loss of carotene was highest and the loss was most rapid immediately after the forage was cut, the rate diminishing as a logarithmic function of time. Losses of other constituents were linear functions of time. Storage losses were least for hay that was barn-dried with supplemental heat, slightly greater for field-cured hay and dehydrated hay, and still greater for hay that was barn-dried without heat and for wilted silage. In each method of harvesting loss of crude fibre was least. For the field-cured hay and for barn-dried hays storage losses of dry matter, N-free extract and carotene were greatest in hay stored with the highest moisture content.

Combined harvest and storage losses were lowest for dehydrated hay, only slightly higher for wilted silage and for barn-dried hay with supplemental heat and increasingly higher for barn-dried hay without supplemental heat, hay that was field-cured without damage by rain, and rain-damaged, field-cured hay.

Dehydrated hay and wilted silage were more palatable than the other forages.

The wilted silage, barn-dried hay and field-cured hay given at the rate of 1 to 1½ lb. daily to vitamin-D-depleted calves provided an adequate supply of vitamin D.

Experiments with cows showed that it was possible to produce forages sufficiently high in carotene, when liberally fed during the winter, to produce winter butter with a yellow colour and vitamin A potency approaching those of summer butter.—J. S. Thomson.

242

ACCARDI, F. Indagini sulla perdita in valore nutritivo nella formazione di fieno-silo con *Hedysarum coronarium* L. ed *Avena sterilis* L. [Losses of nutrients in ensiling hay of *Hedysarum coronarium*, L. and *Avena sterilis*, L.] *Zootec. Vet.*, 1954, 9, 178-181; 212-219.

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The first part of the paper is a theoretical discussion on hay-silage and on methods of comparing nutritive values.

Herbage was wilted and ensiled at about 50 per cent. moisture, with the addition of salt at 2 per cent. of the dry matter. After 6 months the silage was acceptable to cattle. The moisture content had fallen to 43.6 per cent. Comparison between the herbage at the time of ensiling and the silage itself, after corrections to allow for loss of ammonia and volatile substances in analyses, gave the following differences in percentages of dry matter: crude protein 10.41 and 10.35, crude fat 1.13 and 1.13, ash 7.66 and 8.43, cellulose 34 and 35, N-free extract 46.80 and 45.09. The nutritive values in starch units were calculated as 41.49 and 30.60, and in forage units as 59.33 and 43.76. It was estimated that the loss of digestible protein was 6 per cent., but part of the N was present as ammonia and probably still available to the ruminant. The total loss of nutritive value, about 35 per cent., is probably less than would have occurred if the herbage had been stored as hay.—D. Duncan.

243

LEROY, A. M. and ZELTER, S. Z. Recherches sur l'efficacité alimentaire des marcs de pomme fermiers. 2. Dégradation de la matière alimentaire d'un marc de pomme fermier frais, conservé par ensilage. Action inhibitrice de certains conservateurs chimiques. [Feeding value of cider apple residues. 2. Decrease in feeding value of apple residues conserved as silage. Inhibitory action of some chemical preservatives.] *Ann. Zootech.*, 1954, 3, No. 2, 95-107. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

For part 1, see Abst. 5330, Vol. 24.

The apple pulp, containing 26.2 per cent. dry matter and 6.22 per cent. soluble sugar, was distributed in silos of about 1 c.m. capacity holding about 1 ton of pulp. The silos were drained and were lined with bituminised paper. Preservatives added to each layer in aqueous solution, with quantities used per ton of pulp, were formic acid, 2 litres of 10 per cent. solution; salt, 10 kg.; or SO_2 , 420 g. in 7.5 per cent. solution. The silos were opened for sampling after 193 or 213 days.

The pH of the pulp changed little, and the loss of protein was negligible. In each silo there was a considerable increase in lipids, accounted for by the formation of volatile fatty acids from carbohydrate. In silos without added preservative 30.5 per cent. of the nutrients was lost, including 28.6 per cent. of the cellulose and 39.8 per cent. of the non-nitrogenous matter, with 89.8 to 95.7 per cent. of the soluble sugars. Alcohol was the chief product, with some acetic and lactic acids, but no butyric acid.

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Salt was of no value in preventing the loss of nutritive value. Sulphurous acid reduced the loss of cellulose but did not prevent the loss of sugars, and even more alcohol was produced than in the control silos. Formic acid was the most valuable preservative; with it the loss of sugar was only 39.9 per cent. of the control and that of organic matter 58.6 per cent. The alcohol content was reduced by 61 per cent. and the organic acids by 32.5 per cent.—D. Duncan.

244

SKRIBAN, A. I. Khimiko-biologicheskaya obrabotka grubyykh kormov. [Chemico-biological treatment of coarse fodder.] *Priroda*, 1954, No. 2, 93-95. [Inst. Chem., Acad. Sci., White Russian S.S.R.]

The chemico-biological treatment of coarse fodders developed by the Institute of Chemistry greatly increased the feeding value of these fodders, and only insignificant amounts of HCl were used. The chopped fodder is placed in a vat (tank or trough) and covered with a weak solution of HCl (0.1 to 0.2 per cent.). The receptacle is then tightly covered and steam is driven in. Saccharification is complete in 3 hr.; the hemicellulose part of the polysaccharides is easily hydrolysed, with the formation of sugar. Straw and other coarse fodders have their feeding value raised to approach that of succulent feeds.

In the second stage of the treatment the saccharified fodder with the liquid is used to grow feed yeast. After cooling the treated fodder is placed in a fermentation vat, which is inoculated with feed yeast, and at a temperature of 27° to 30° C. air is bubbled through continuously for 20 to 24 hr. The protein, fat and carbohydrate contents of the fodder then approach those of concentrated feeds.

Addition of salt to solutions of HCl increased the degree of saccharification of vegetable tissues by from 2.5 to 3.5 per cent. Addition of cobalt chloride increased also the output of reducing sugar.

The yeast used was *Manila murmanica*. At the start of fermentation the nutrient salts essential for the growth of the yeast were added, 150 g. superphosphate and 80 g. ammonium sulphate per 100 kg. saccharified fodder. The straw used was that of winter cereals, which had become unfit for cattle feeding in its natural state. During saccharification all the harmful organisms which would otherwise have caused severe stomach upsets in the cows were destroyed.

Increased yields of milk, up to 15 per cent., were noticed when cows were given the improved fodder.

The hydrolysed straw chop, without the liquid, was also found useful as silage, both alone and

when added to greenstuff (beans) difficult to ensile.—H. Scherbatoff.

245

KITTS, W. D. and WOOD, A. J. A note on a simple method for ensilage production using plastic

containers. *Canad. J. Agric. Sci.*, 1954, **34**, 319. [Dept. Animal Husb., Univ. British Columbia, Vancouver.]

See also Absts. 161, 309, 370, 371, 441, 522, 545, 548-50, 1106, 1537, 1538.

CULTURE OF MICRO-ORGANISMS FOR FOOD

246

STEINBERG, M. P. and ORDAL, Z. J. Microbiological fat production. Effect of fermentation variables on rate of fat formation by *Rhodotorula gracilis*. *J. Agric. Food Chem.*, 1954, **2**, 873-877. [Dept. Food Technol., Univ. Illinois, Urbana.]

Experiments were undertaken to find the effects on fat production by *Rhodotorula gracilis* of different experimental conditions when the fat-producing phase was separated from the multiplication or growth phase of the culture. Details of apparatus, preparation of full-grown yeast cultures and analysis of the fat produced are given. The fat content was expressed as the ratio of weight of fat to weight of non-fat yeast solids ("fat ratio"). The term "fat rate" was applied to the number of g. fat per 100 g. non-fat dry yeast formed per hr.

Between pH 3.0 and 8.5 the fat rate varied linearly and increased from 2.1 to 3.1. Reducing the temperature from 28° to 22° C. halved the fat rate. To find out if accessory growth factors influenced fat formation, studies were made on yeasts grown in media without yeast extract. Although the growth of the cells was poorer than on normal media which contain yeast extract the subsequent fat production was just as great. In a second experiment the medium without yeast extract was inoculated from a culture of the yeast already grown in yeast-extract-free medium. Again fat was formed. It is concluded that this

yeast's requirement of yeast extract for fat formation must be very small or zero. The cells grown in yeast-extract-free medium had a very high fat content before the fattening phase of the experiment was started. It is suggested that the lack of yeast extract limited the growth of the cells and excess carbohydrate was then used for fattening during what corresponded to the growing phase in normal medium. The cations sodium and iron were tested in a similar way; neither was necessary for fat formation.

Increasing the sugar concentration of the medium from 4 to 40 per cent. by weight showed that up to 20 per cent. no increase in fattening was obtained. Above 20 per cent. the fat content decreased. Glucose, fructose and a mixture of equal quantities of glucose and fructose were equally good as substrates for fat formation. Ethanol and sodium acetate in concentrations equimolar in carbon content with the sugars gave less fat formation than the sugars. The pH of the acetate medium rose from 7.55 to 9.12 after 38 hr.; that of all other media fell to about 5.5. Replacement of 10 per cent. of the sugar on a carbon basis with glycerol or sodium acetate was tried. Glycerol made little difference to fat formation. The pH of the acetate medium was initially adjusted to 4.78. Cell growth was inhibited. The results are discussed with those of other workers.

M. J. Dobson.

2. CHEMICAL COMPOSITION OF FOODSTUFFS

(Except Vitamins, for which see Section 3)

ENERGY VALUE, PROXIMATE PRINCIPLES AND INORGANIC CONSTITUENTS

GENERAL

247

DESCHREIDER, A. R. Les traces métalliques et la qualité des produits alimentaires. [Trace elements and quality in foods.] *Rev. Ferment. Indust. aliment.*, 1954, **9**, 59-63. [Lab. Central, Minist. Affaires Écon., Belgium.]

A lecture report, with references. The desir-

ability of international agreement on the limits for trace metals is stressed.—W. M. Deans.

248

MINISTRY OF FOOD, FOOD STANDARDS COMMITTEE. Report on lead. Revised recommendations for limits for lead content of foods. H.M.S.O., London, 1954, pp. 11. Price 6d.

See also Absts. 1334, 1554.

N. A. and R., January 1955

FOODSTUFFS OF ANIMAL ORIGIN

Milk and Milk Products

249

OLONOVSKI, M. and MONTEUIL, J. Étude chromatographique des polysaccharides du lait de femme. [Chromatographic study of the polysaccharides of human milk.] *C.R. Acad. Sci.*, 1954, 238, 2263-2264.

Human milk from which protein and lipid had been removed was evaporated to dryness and the residue was dissolved in boiling methanol to get rid of most of the lactose. The resulting mixture of polysaccharides was crystallised and separated by chromatography on paper with different solvents and by elution with alcohol on a charcoal-Celite column.

Fourteen polysaccharides were isolated and the hydrolysates purified by passage through an anion exchange column were separated chromatographically to give the relative proportions of each component. Eight polysaccharides contained both glucose and galactose; of these 6 also contained fucose and 3 also acetylglucosamine. Polysaccharides were not found in cow's milk but were found in appreciable quantities in human milk and increased in amount from the first to the seventh day after birth.—A. Hepburn.

250

MONTEUIL, J. Structure de deux triholosides du lait de femme. [Structure of two trisaccharides in human milk.] *C.R. Acad. Sci.*, 1954, 239, 510-511.

The application of paper chromatography to a solution of human milk containing a mixture of polysaccharides resulted in isolation of 2 trisaccharides both with a reducing group and strongly laevorotatory. The acid hydrolysates after purification by anion exchange were chromatographed and glucose, galactose and fucose identified in the ratio 1:1:1.

Partial hydrolysis with 0.5 NH_4SO_4 for 2 to 15 min. and chromatography of the hydrolysate revealed in both cases fucose and a substance with an R_F value corresponding to lactose. Hydrolysis of the latter yielded galactose and glucose. After oxidation of the trisaccharides with bromine and then hydrolysis only galactose and fucose were found, showing that glucose was the terminal reducing group. The β -configuration in the trisaccharides was demonstrated by the action of specific enzymes.

The following structure for the 2 trisaccharides was therefore proposed: either β -fucosido- β -galactosido-glucose or β -galactosido- β -fucosido-glucose.

A. Hepburn.

251

RUELIUS, H. W. and GIRARD, M. M. Occurrence of galactosamine in human milk. *Arch. Bio-*

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chem. Biophys., 1954, 50, 512-513. [Wyeth Inst. Appl. Biochem., Philadelphia, Pa.]

Skimmed human milk was deproteinised and dialysed and then hydrolysed with HCl. The hydrolysate was filtered and freed from HCl and the residue was dissolved in water and the pH adjusted to 5 with pyridine. Ninhydrin was added, the solution was heated and, after filtration, the solution was dried *in vacuo*. An aqueous solution of the product was chromatographed on paper and yielded spots corresponding to arabinose and lyxose; the occurrence of the latter suggested the presence of galactosamine.—G. F. Garton.

252

BASSIR, O. Protein fractionation of breast milk of Nigerian women. *Proc. Nutrition Soc.*, 1954, 13, xv-xvi. [Area Pathol. Lab., Westwood Hosp., Beverly, Yorks.]

253

WHITTLESTONE, W. G. and PERRIN, D. R. Variations in the fat content of human milk during suckling. *J. Dairy Res.*, 1954, 21, 204-206. [Ruakura Animal Res. Stat., Dept. Agric., N.Z.]

Human milk was found to have creamed after 7 hr. at 37° C. In serially drawn samples taken on the 65th and 140th days of lactation, the characteristic rise in fat content was found, but there was no systematic change in the size of the fat globules. These findings are taken as support for the theory that the fat globules cluster in the breast and are filtered out by the fine ducts during milking.—F. E. Hytten.

254

KON, S. K. and HENRY, K. M. Reviews of the progress of dairy science. Section D. Nutritive value of milk and milk products. *J. Dairy Res.*, 1954, 21, 245-298. [Nat. Inst. Res. Dairying, Univ. Reading.]

255

JARRIGE, R. Études sur les variations de la richesse en constituants azotés des laits de vache. [Variations in the nitrogenous constituents of cow's milk.] *Ann. Zootech.*, 1953, 2, No. 1, 33-53. [Stat. Recherches Elevage, Jouy-en-Josas.]

Samples of milk from cows were pooled separately and analysed 3 times weekly before and after the cows were put out to grass in the spring.

The mean butterfat content increased by 10 per cent. from an average of 34.4 g. per 1000 for the last 3 weeks in confinement to a maximum of 38.0 after 8 days. Total N constituents increased rapidly by 8 per cent. from 30.8 g. per 1000 to a maximum of 33.3 after 1 week of grazing. Casein

increased by 9 per cent. to a maximum after 1 week; other proteins had a maximum increase of 16 per cent. after the first 2 days. All the increases mentioned varied widely with different cows and lasted only about 2 weeks. N.P.N. decreased throughout the experiment.

Milk production was not significantly increased, and as a good quality feed was supplied for the last few months in confinement the increase in the protein content was considered to be due to the spring grass, possibly to its oestrogen content, which is very low or nil in summer and autumn.

A. Hepburn.

256

BERGE, S. Forholdet protein/fett og fettfritt tørrstoff/fett ved ensidig utvalg av kyr etter produksjon av mjølkefett. [The ratio protein: fat and non-fat solids: fat in the restricted selection of cows on their production of milk fat.] *Tidsskr. norske Landbruk*, 1954, 61, 211-219.

The data on composition of the milk from the college herd (see Abst. 1383, Vol. 25) are used with those of Janse (Abst. 3261, Vol. 20) for Holstein milk and of Davis (Abst. 1411, Vol. 23) to establish that as milk fat rises, solids-not-fat rise also but at a lower rate. Most of the increase in solids-not-fat, at least in Jersey milk, is in protein. It is suggested on the basis of Swedish observations on inheritance of capacity to produce fat and protein (Larsson *et al.*, 12th Internat. Dairy Congr., 1949, p. 287) that by selection for protein as well as fat more rapid improvement in the quality of milk would have been achieved.—I. Leitch.

257

THOMAS, W. R., HARPER, W. J. and GOULD, I. A. Free fatty acid content of fresh milk as related to portions of milk drawn. *J. Dairy Sci.*, 1954, 37, 717-723. [Dept. Dairy Technol., Inst. Nutrit. Food Technol., Ohio State Univ., Columbus.]

Milk samples were obtained at different stages of lactation from cows of the Ayrshire, Guernsey, Jersey, Holstein and Brown Swiss breeds and analysed for free fatty acids. The samples were drawn in 3 portions with about 85 per cent. of the total amount in the second portion.

The general trend was for the first drawn portion to show the highest free fatty acid content and the last-drawn (third) portion to show the lowest content. In individual cows late in lactation, however, there was a tendency for all 3 portions of milk to contain about the same amount of free acid. The first, second and third samples from individual cows showed a wide variation from day to day.—G. A. Garton.

258

EL-KATIB, M. M. T. Relation of stage of lactation to volatile and unsaturated fatty acids of Egyptian cow and buffalo butterfat. *Indian J. Dairy Sci.*, 1954, 7, 101-109. [Agric. Chem. Dept., Fac. Agric., Cairo Univ.]

Butterfat samples were prepared from milk obtained at weekly or fortnightly intervals during the whole lactation period of 3 cows and 5 buffaloes. The Reichert, Polenske and iodine values of the fats were estimated.

The Reichert value of buffalo butterfat, average 29.18, was higher than that of cow butterfat, average 25.14, throughout the lactation periods, though both values declined gradually as lactation progressed. The Polenske values of cow butterfat were higher than those of buffalo butterfat. The average iodine values of cow and buffalo butterfats were 33.01 and 32.10, respectively; both rose slightly towards the end of lactation.

G. A. Garton.

259

MHASKAR, V. V. and BANERJEE, B. N. Component acids and the probable glycerides of the milk fat obtained from cottonseed-fed buffaloes. *Indian J. Vet. Sci.*, 1954, 24, 93-104. [Dept. Biochem., Indian Inst. Sci., Bangalore.]

Milk fat was prepared from the milk of buffaloes which had been given a diet which included 1 lb. of a mixture of cottonseed 75 and concentrate mixture 25 per cent. for every 3 lb. milk produced. The fat was separated into 4 fractions by crystallisation from acetone at low temperatures and the fatty acid composition of each fraction was estimated by the ester-fractionation technique.

The probable composition of the glycerides was computed to be trisaturated 25.5, disaturated-monounsaturated 40.0, monounsaturated-diunsaturated 27.2 and triunsaturated 7.3 moles per cent. The component fatty acids of the whole fat included higher percentages of oleic, palmitic and stearic acids and lower percentages of lower saturated acids than were found by Achaya and Hilditch (Abst. 3269, Vol. 20) in milk fat from buffaloes on a normal diet.—G. A. Garton.

260

HOLWERDA, K. Variaties in het citroenzuurgehalte van melk, geleverd aan zuivelfabrieken in Friesland. [Variations in citric acid content of milk delivered to dairy factories in Friesland.] *Nederlands Melk Zuivelijdschr.*, 1954, 8, 115-124. English summary. [Bond Coöp. Zuivelfabriek, Friesland, Leeuwarden.]

Citric acid was at a minimum between November and January with a rapid decline in November. These changes were associated not with change from pasture to stall and stall to pasture but with

stage of lactation. Mean values in summer were of the order of 1.6 to 1.8 g. and in winter 1.3 to 1.4 g. anhydrous citric acid per litre.—I. Leitch.

261

KERN, A. Le lait de brebis en Israel. [Ewe's milk in Israel.] *Lait*, 1954, 34, 257-276.

In this review of many analytical studies over a number of years the average composition of ewe's milk in Israel is compared with that of cow's and goat's milk. The percentage composition of ewe's milk is given as water 81.6, fat 7.5, protein 5.6, lactose 4.4 and salt 0.9. The monthly variations in the composition of bulk samples and also the composition of ewe's colostrum are recorded. Tables and graphs are presented showing the monthly variations in the composition of ewe's milk fat, as indicated by iodine value, saponification value, Polenske and Reichert values, refractive index and melting-point.—G. F. Garton.

262

KASHCHANOV, L. V. O razviti i i pol'zovanii molochnoi produktivnosti konevodstva i proizvodstva kumysa. [The development and exploitation of milk production in horse management and the preparation of koumiss.] *Konevodstvo*, 1953, No. 12, 19-24.

A survey of articles which have appeared in this journal on the production and utilisation of koumiss. Mare's milk has a high vitamin content; the vitamin C content is higher than in vegetables and fruit and the vitamin A content is higher than in cow's milk. The fat globules are small and therefore easily assimilable. Kirghiz mares had an average yield of from 17.3 to 30.8 litres daily, average 22.6 litres. The milk yield of mares of heavy breeds during a lactation period was over 3000 litres, and that of mares of racehorse breeds 2000 to 3000 litres, with daily yields of 18 to 22 litres.

It has been shown that as much as 1000 to 2000 litres per season of the milk of high-yielding mares can be used for the manufacture of koumiss without harm to the foals, provided these are given sufficient concentrates and succulent fodder.

It is recommended that the quality of mare's milk from different breeds should be studied. A study should also be made of the effect on the chemical composition of the milk, yield and length of lactation period of different systems of management, feeding and milking.—H. Scherbatoff.

263

KURAMSHINA, M. G. K voprosu o molochnom konevodstve. [The problem of horse management for milk.] *Konevodstvo*, 1953, No. 11, 40-41. [Microbiol. Sect. Acad. Sci., Kazakh SSR.]

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It is considered that in order to place the production of mare's milk on a sound footing and spread among the population a valuable subsidiary curative and dietetic product, it is essential to have a Central Scientific Research Institute with a koumiss laboratory, divided into medical, milk technological, and zootechnical departments.

H. Scherbatoff.

264

KHERASKOV, S. G. Moloko verbyuditz i produkty ego pererabotki. [Camel's milk and products prepared from it.] *Konevodstvo*, 1953, No. 11, 35-37. [Chkalov Agric. Inst.]

According to data from the former All-Union camel breeding station the average annual milk yield of 15 dromedaries was 1500 to 2000 litres, that of one Bactrian camel 800 to 1200 litres, with a fat content of 4.5 to 7 per cent. The average annual production of milk fat by dromedaries was 140 to 180 kg., a record annual milk yield during a lactation period of 15 to 18 months being 2500 to 3000 litres. The sugar content of camel's milk is over 5 per cent.

Several products are prepared. *Shuart* and *agaran* are prepared by curdling the milk; the latter is considered a cure for anaemia. *Chal* and *shubat* are fermented drinks. *Chal* is highly nutritious. *Shubat* resembles koumiss and is considered a cure for tuberculosis, anaemia and other diseases.—H. Scherbatoff.

265

ROSS, V. and MOORE, D. H. An alcohol-soluble protein in the milk of mice (RIII). *Biochim. biophys. Acta*, 1954, 15, 50-53. [Dept. Biochem., Coll. Phys. Surg., Columbia Univ., New York.] French and German summaries.

Samples of milk were obtained 10 to 12 days after parturition from groups of RIII mice, i.e., carriers of mouse mammary tumour agent, some of which had palpable tumours. Centrifuging at 1000 g and at 14,000 g for 45 min. at each speed removed lipids, cells and calcium-casein complex. Addition of absolute ethanol to the supernatant fluid and further centrifuging yielded another supernatant from which the single protein was precipitated by anhydrous acetone. Its chemical reactions and electrophoretic behaviour are described. Leucine, valine, proline and glutamic acid were the strongest spots on a paper chromatogram of a hydrolysate. Cow's milk given the same treatments yields none of this protein.

D. Harvey.

266

KOSIKOWSKY, F. V. and DAHLBERG, A. C. A quantitative appraisal of the free amino acids in foreign type cheese. *J. Dairy Sci.*, 1954, 37, 167-172. [Dept. Dairy Indust., Cornell Univ., Ithaca, N.Y.]

Quantitative data, by chromatography, are given for free amino-acids and amines in 30 commercial foreign types of cheese. Those present in highest amounts were usually glutamic acid, leucines, valine and basic amino-acids, but none of the cheeses could be definitely identified by its amino-acid content.—J. S. Thomson.

See also Absts. 355, 356, 442, 457, 511, 544.

Eggs

267

SAUTER, E. A., HARNS, J. V., STADELMAN, W. J. and McLAREN, B. A. Seasonal variations in quality of eggs as measured by physical and functional properties. *Poultry Sci.*, 1954, **33**, 519-524. [Dept. Poultry Sci., State Coll. Washington, Pullman.]

The eggs used in this study were obtained from Single Comb White Leghorn and New Hampshire hens of similar age, each given 2 different rations, one producing a light yolk and the other a dark yolk. The eggs were collected at different seasons and examined at weekly intervals after storage at 70° F., and 65 to 70 per cent. relative humidity. The 5 physical constants measured were albumin index, albumin score, yolk index, yolk colour and albumin pH; the functional and flavour properties of the eggs were judged from flavour of eggs raw, cooked in shell and poached, texture and grain, penetrometer values and angel food value.

The first 3 physical constants showed winter eggs to be superior to summer eggs when stored from 1 to 5 weeks in spite of an overall general decline in quality during storage. The other physical constants were unaffected by season and storage. The quality of the products prepared from stored eggs was directly related to the physical quality of the egg. Better products were obtained from winter eggs than from summer eggs and from fresh eggs than from stored eggs.

M. J. Head.

268

JACQUOT, R. and ADRIAN, J. Composition, valeur nutritive, éclosabilité de l'oeuf en fonction du régime de la poule. [Composition, nutritive value, hatchability of the egg in relation to the feeding of the fowl.] *Ann. Nutrit. Alimentation*, 1954, **8**, 247-326 (with discussion 326-329). [Lab. Biochim. Nutrit., Bellevue.]

Meat (All Kinds)

269

VÁŠA, J. Výživná hodnota hovězího masa. [Nutritive value of beef.] *Výživa lidu*, 1954, **9**, 38-41. [Res. Inst. Mech. and Econ. Food Indust., Prague.]

A review of the energy value and the content of moisture, protein, fat, ash, Ca, P, Fe, vitamins A and B₁, riboflavin, nicotinic acid and vitamin C in the meat of different beef cuts from animals of different classes and grades.

M. Prokšová (Czechoslovakia).

270

HARTMAN, L., SHORLAND, F. B. and McDONALD, I. R. C. Occurrence of *trans*-acids in animal fats. *Nature*, 1954, **174**, 185-186. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

Infrared absorption analysis revealed the presence of *trans*-fatty acids in ruminant depot fats (ox, sheep, deer); none was detected in the body fats of rat, horse or rabbit and only a trace in the fat from pigs which had received skimmed milk.

Although no appreciable amount of *trans*-acids was found in pasture lipids, about 9 per cent. of *trans*-acids was found in the fatty acids isolated from the rumen contents of pasture-fed sheep. It is suggested that these *trans*-acids may arise by bacterial action in the rumen.—G. A. Garton.

271

SWERN, D., KNIGHT, H. B. and EDDY, C. R. *Trans*-octadecenoic acid content of beef fat. Isolation of elaidic acid from oleo oil. *J. Amer. Oil Chem. Soc.*, 1952, **29**, 44-46. [E. Res. Lab., Philadelphia, Pa.]

Three samples of freshly rendered beef fat from the pleural and kidney regions and samples of the "oleo" oil and "oleo" stearine obtained from one of them were examined for the presence of *trans*-acids, using CS₂ solutions of the fats, in a Beckman IR-3 infrared spectrophotometer. The *trans*-acid content, calculated as tri-elaidin, of the pleural and kidney fat was from 5 to 8 per cent., of the "oleo" oil 6 per cent. and of the "oleo" stearine about 10 per cent. The increased amount of *trans*-acids present in the "oleo" oil and "oleo" stearine is tentatively attributed to oxidatively-induced *cis-trans* isomerisation, though the widely held assumption that *trans*-acids occur only in traces in beef fat is no longer tenable in view of the findings on the freshly rendered fat. Both elaidic and vaccenic acids were isolated from the "oleo" oil fatty acids by a combination of treatments, including low-temperature crystallisation, lead salt segregation and fractional distillation of methyl esters of the fatty acids.

It is suggested that the naturally-occurring *trans*-acids may arise as a result of oxidative *cis-trans* isomerisation coupled with double bond shift (reactions known to take place in oxidising fat systems), or by a simple oxidative *cis-trans* isomerisation without double bond shift of oleic or other

isomeric *cis*-octadecenoic acids which may be present in beef fat.—G. A. Garton.

272

HANSEN, R. P., SHORLAND, F. B. and COOKE, N. J. Isolation of *n*-heptadecanoic acid from hydrogenated mutton fat. *Nature*, 1954, 174, 39. [Fats Res. Lab., D.S.I.R., Wellington.]

Fractional distillation *in vacuo* of the methyl esters of fatty acids from hydrogenated mutton fat yielded fractions of saponification equivalent about 284. When these fractions were converted to the corresponding acids and submitted to low-temperature crystallisation several grams of a purified acid were obtained, the analytical characteristics of which (equivalent 270.2, m.p. 61.2°–61.4° C., and X-ray long spacing 4.08 mμ.) were consistent with those of *n*-heptadecanoic (margaric) acid.—G. A. Garton.

273

GUNSTONE, F. D. and RUSSELL, W. C. **Animal fats. 3. The component acids of ostrich fat. 4. The component acids of crocodile fat.** *Biochem. J.*, 1954, 57, 459–461; 462–465. [Dept. Chem., Univ. Glasgow.]

3. Fat was obtained from an adult male ostrich (*Struthio camelus*) which had been kept in a zoo on a diet of pasture and whole maize. The mixed fatty acids were separated into groups of differing unsaturation by low-temperature crystallisation from methanol and then each group was analysed by the ester-fractionation technique.

The major component acids were palmitic 24.8, oleic 39.8 and octadecadienoic 17.1 per cent. by weight; myristic, stearic, arachidic, hexadecenoic, polyethenoid C₁₆, octadecatrienoic and higher unsaturated acids were also present. The findings are discussed in relation to published analysis of the fats of other birds.

4. Analyses were made in the same way of the fats of two crocodiles: one animal was an adult Estuarine crocodile (*Crocodylus porosus*) which had been kept in captivity for 20 years and fed on whole dead piglets and the other (*Crocodylus niloticus*) was a Tanganyikan specimen which had been living in the natural state.

Each fat contained similar amounts, 33 to 35 per cent., of saturated fatty acids, consisting mainly of palmitic acid, with smaller quantities of lauric, myristic, stearic and arachidic acids, but the fats differed in the proportions of unsaturated acids present. The fat of *C. niloticus* was noteworthy for its high content of hexadecenoic acid, 14.4 per cent. by weight.

The findings are discussed in relation to the composition of the depot fats of amphibians and reptiles.—G. A. Garton.

See also Abstr. 123.

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Fish

274

OLLEY, J. and LOVERN, J. A. The lipids of fish. 5. The lipids remaining in the flesh of the haddock after extraction by acetone and ethanol-ether. *Biochem. J.*, 1954, 57, 610–619. [D.S.I.R., Torry Res. Stat., Aberdeen.]

Haddock flesh which had been previously extracted with acetone and with a mixture of ethanol and ether (Absts. 4042, Vol. 23; 229, 1642, Vol. 24) was successively extracted with boiling ethanol-benzene (2:1), boiling chloroform-methanol (1:1) and pyridine at 100° C.

All 3 extracts consisted mainly of non-lipid material which was removed by partition between chloroform and water. The purified lipid extracts were separated into acetone-soluble and acetone-insoluble materials; further separation of the acetone-soluble lipids yielded acidic and neutral fractions. All the fractions obtained were complex mixtures, analysis of which was impossible with the small amounts available.

A table is given showing the composition of the total lipids of haddock flesh; lecithin is the major component (43 per cent.), and triglycerides (2.4 per cent.) are quantitatively among the least important constituents.—G. A. Garton.

275

PATHAK, S. P., PANDE, G. D. and MATHUR, S. S. The component acids of the fats of some Indian fresh-water fishes. *Biochem. J.*, 1954, 57, 449–453. [Dept. Indust. Chem., Banaras Hindu Univ., India.]

Body and visceral fats were obtained from 2 fishes, the rohu (*Labeo rohita*) and the nain (*Cirrhina mrigala*) caught in the River Ganges.

The mixed fatty acids were fractionated by the lead salt and ethanol and lithium salt and acetone methods and the resulting groups of acids of differing mean unsaturation were converted to methyl esters. The esters were then analysed by fractional distillation *in vacuo*.

All the facts contained palmitic acid as the major saturated acid, and the C₁₈ group of unsaturated acids accounted for about 30 per cent. of the total acids of each fat. The rohu fats were noteworthy as fish fats for their relatively high stearic acid content; body fat contained 11.5 per cent. and visceral fat 14.6 per cent. by weight. Unsaturated C₁₆ acids comprised only 8.1 and 8.6 per cent. of the rohu body and visceral fats, but were major components of the fats of the nain, 32.6 and 26.5 per cent., respectively.—G. A. Garton.

See also Absts. 107, 512, 1050.

FOODSTUFFS OF VEGETABLE ORIGIN

General

276

MANSFORD, K. and RAPER, R. Amino-acid content of plants. *Nature*, 1954, 174, 314-315. [Tech. Coll., Sunderland.]

The free and combined amino-acids present in the cell juices of a number of plants have been studied qualitatively and quantitatively by paper chromatography. In this preliminary account, results are presented as percentages of total N in 75 per cent. ethanol extracts and in hydrolysates of the residues insoluble in ethanol for *Malus sylvestris*, *Beta vulgaris*, *Funaria hygrometrica*, *Pinus sylvestris*, *Mucor mucedo* and *Equisetum arvense* as wellknown examples of different branches of the vegetable kingdom.

A. Hepburn.

277

BAPTIST, N. G. Determination of essential amino-acids in some Ceylon vegetables. *Brit. J. Nutrition*, 1954, 8, 205-217. [Biochem. Lab., Dept. Physiol., Univ. Ceylon, Colombo.]

Preparations of crude protein from 7 Ceylon vegetables, namely, murunga leaf (*Moringa pterygosperma*), agati leaf (*Sesbania grandiflora*), kankun leaf (*Ipomoea aquatica*), okra (*Hibiscus esculentus*), drumstick bean (*Moringa pterygosperma*), jack seed (*Artocarpus integriflora*) and brinjal (*Solanum melongena*) were obtained by desiccation and subsequent successive exhaustive extractions with ethanol, light petroleum and water. The essential amino-acid contents of the crude proteins were estimated by chemical and microbiological methods; the applicability of the different methods used for the estimation of amino-acids is discussed. The leaf-vegetable proteins were low in methionine, but no marked deficiency of any essential amino-acid was found. Of the "whole" vegetable proteins, jack seed was relatively low in arginine, histidine and methionine and the others in tryptophan, isoleucine and methionine.—G. F. Garton.

278

BESSONOV, S. M. Pektinovy veshchestva i znachenie ikh v pitanii (obzor literatury). [Pectins and their importance in nutrition (a review of the literature).] *Vop. Pitan.*, 1954, 13, pt. 2, 30-41. [Otdel Pishch. Tekhnol., Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

279

DESCHREIDER, A. R. and VAN COILLIE, L. Les traces metalliques dans les legumes frais. [Trace elements in fresh vegetables.] *Lab. Central, Ministère Affaires Econ., Belgium*, Publ. No. 135, pp. 12.

Fe, Zn, Cu, Pb and As were estimated in 3 to 9 samples of potatoes and potato peelings, about a dozen other vegetables which are canned in Belgium, and tomatoes, by methods previously reported by the author (International Agricultural Congress, Rome, 1952). Means and ranges are tabulated from the fresh and dry material with some values from the literature, and the fresh values are also shown graphically.

Values for the different metals tended to run parallel. Spinach contained most Fe, Zn and Cu, followed by chervil. Chervil, endive and chicory contained most Pb, and endive and tomatoes most As.

Since the amounts of trace metals, notably Zn, in fresh vegetables may exceed the limits prescribed in certain countries for canned vegetables, a plea is made for revision of these limits on an international basis.—W. M. Deans.

280

SORTEBERG, A. Fortsatte forsøk med molybden. [Continued experiments with molybdenum.] *Forskning og Forsøk Landbruget*, 1954, 5, 161-198. [Inst. Jordkultur., Norges Landbruks-høgsk.]

Peat soils from West Norway were found in pot experiments to be deficient in Mo. With lettuce, heavy watering or addition of lime reduced the requirement for added Mo. On a soil with little lime and pH 4.1 to 5.0, Mo deficiency was most severe in timothy, red clover, carrot, parsley, cauliflower and beetroot, and less severe in swedes and radish; oats, barley and alfalfa showed no sign of deficiency, though at pH 4.3 barley gave a better yield when Mo was supplied. On several soils lime was as efficient as Mo in preventing deficiency disease in the plants. Mo deficiency is widespread in Norwegian peat soils.—D. Duncan.

281

OSTAPENYA, P. V. and GODES, G. YA. O vliyani razlichnykh doz geksaklorana na organolepticheskie svoistva ovoshchei. [The influence of different doses of hexachlorane on the organoleptic characteristics of vegetables.] *Vop. Pitan.*, 1954, 13, pt. 2, 46-47. [Belorussk. Sanit. Inst., Minsk.]

See also Absts. 1331, 1333, 1338.

Cereals

282

PENCE, J. W., WEINSTEIN, N. E. and MECHAM, D. K. The albumin and globulin contents of wheat flour and their relationship to protein quality. *Cereal Chem.*, 1954, 31, 303-311. [W. Utilisation Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany, Calif.]

The mean albumin and globulin contents of 32 unbleached flours of widely varying type and baking quality were, respectively, 9.1 and 8.3 per cent. of the total flour protein. Both, as well as their ratio, varied significantly among the flours. The albumin and globulin contents also increased directly with total flour protein, but this relationship became inverse when they were expressed as percentages of total protein. The coefficient of regression of loaf volume on flour protein was used to estimate the baking quality of the protein of each flour, although for several of the flours there was difficulty in estimating statistically reliable coefficients. The different levels of protein required in the estimation were obtained by fortifying each flour with its own gluten and water-soluble substances and diluting it with its own starch. Neither the amount of albumin or globulin nor the ratio of albumin and globulin to gluten was correlated significantly with protein quality as measured by the regression lines. The albumin:globulin ratio, however, was correlated with protein quality beyond the 1 per cent. point of significance. Although the total protein content of the flour was also correlated very significantly with protein quality, the partial correlation of albumin:globulin ratio with protein quality, obtained by keeping flour protein constant, retained a high degree of significance.—G. F. Garton.

283

HADORN, H. and JUNGKUNZ, R. Über einheimischen Zwieback und seine Analyse. [Swiss biscuits and their analysis.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 93–104. [Lab. VSK, Basle.] French and English summaries.

See also Absts. 285, 439.

Roots

284

BAKER, C. J. L. and EDEN, A. Studies on the oxalate contents of the leaves of certain varieties of *Beta vulgaris*. *J. Agric. Sci.*, 1954, 44, 394–399. [Minist. Agric. Fish., Nat. Agric. Advisory Serv., Anstey Hall, Trumpington, Cambridge.]

Legumes

285

BAPTIST, N. G. Essential amino-acids of some common tropical legumes and cereals. *Brit. J. Nutrition*, 1954, 8, 218–222. [Biochem. Lab., Dept. Physiol., Univ. Ceylon, Colombo.]

Three legumes, lentil, green gram and black gram, and 2 cereals, finger millet and sorghum, were analysed microbiologically for lysine, methionine, tryptophan, threonine, isoleucine, leucine, valine and phenylalanine.

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The amino-acid pattern was similar in the legumes, which were low in methionine and tryptophan and high in lysine. Finger millet contained most methionine and tryptophan; lentil, which was poorest in amino-acids, contained least.

A. Hepburn.

286

MOORJANI, M. N. and BHATIA, D. S. The proteins of the groundnut. *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, 3, 112–117.

A review.

See also Abst. 431.

Fruits

287

RENTSCHLER, H. and TANNER, H. Über die Zusammensetzung der Fruchtsäuren von schweizerischen Obstsorten. 1. Die Fruchtsäuren der schweizerischen Mostbirnensäfte. [Composition of organic acids of Swiss fruit juices. 1. Organic acids of Swiss perry.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 42–158. [Eidg. Versuchsanst., Wädenswil.] French and English summaries.

Organic acids in the pressed fermented juice of 12 kinds of Swiss pears were detected by paper chromatography after removal of interfering inorganic acids by ion exchange resins; the methods, which are described in detail, were based on those of Stark *et al.* (Abst. 1341, Vol. 21). As well as malic acid, citric acid was generally present in considerable quantity; this possibly explains the frequent occurrence of "diseases" of perry, especially among peasant producers. Quinic acid, not previously reported as a constituent, was present in amounts of about 0.5 g. per litre; glycolic acid only in small amounts, less than 0.2 g. per litre. Galacturonic acid, ascorbic acid and protocatechuic acid were not found.—W. M. Deans.

288

LIGTHELM, S. P., HORN, D. H. S., SCHWARTZ, H. M. and HOLDT, M. M. v. A chemical study of the fruits of three South African *Ximenia* species, with special reference to the kernel oils. *J. Sci. Food Agric.*, 1954, 5, 281–288. [Nat. Chem. Res. Lab., S. African Council. Sci. Indust. Res., Pretoria.]

Other Types

289

ADRIAENS, E. L. and BIGWOOD, E. J. Contribution à l'étude de la composition en acides aminés de la matière protéique de la graine de coton. [Amino-acid composition of the protein of cottonseed.] *Bull. Soc. Chim. biol.*, 1954, 36, 579–583. [Lab. Biochem., Fac. Méd., Univ. Brussels.]

Examination of cottonseed residues on ion exchange columns showed a protein content of 48.4 per cent. by weight, in agreement with Kjeldahl estimations. The 8 essential amino-acids formed 32.1 per cent. of the protein, which compares favourably with other foodstuffs, but the methionine and cysteine contents were low (0.08 per cent. S). The mechanical and heat treatment used in preparation of the residues was considered possibly to have destroyed part of the sulphur amino-acids.—A. Hepburn.

290

GRINDLEY, D. N., BURDEN, E. H. W. J. and AKOUR, A. A. The seed oils of *Clitoria ternatea* and of *Entada phaseoloides*. *J. Sci. Food Agric.*, 1954, 5, 278-280. [Wellcome Chem. Labs., Minist. Health, Khartoum, Sudan.]

Clitoria ternatea (Papilionaceae) is being introduced into the Gezira area of the Sudan as a fodder crop, but the sample analysed was from Australia, where it is a constituent of mature grazing. *Entada phaseoloides* (Mimosaceae) is a lofty climber with very large woody pods.

The percentage composition of the seeds in the above order was: moisture 5.68, 6.22; oil 11.76, 7.00; protein 41.19, 19.54; ash 3.48, 3.08; crude fibre 0.66, 0.98, carbohydrate 37.23, 63.18.

The characteristics of the seed oils are given. Both contained appreciable amounts of higher saturated fatty acids.—J. S. Thomson.

291

GYSEL, L. W. The value of safflower as a wild-life food plant in Michigan. *Quart. Bull. Michigan Agric. Exp. Stat.*, 1954, 36, 374-377. [Dept. Fish. and Wildlife.]

292

DE GARCIA PAULA, D. La complexité chimique et les propriétés physiologiques du maté (*Ilex paraguayensis*). [Chemical complexity and physiological properties of maté (*Ilex paraguayensis*).] *Bull. Soc. Chim. biol.*, 1954, 36, 751-757.

293

LAYCOCK, D. H. The mineral constituents of some Nyasaland tea leaves and tea soils. *J. Sci. Food Agric.*, 1954, 5, 266-269. [Tea Res. Stat., Mlanje, Nyasaland.]

Pasture, Hay and Silage

294

CURASSON, M. G. Études sur les pâturages tropicaux et subtropicaux. [Studies of tropical and subtropical pastures.] *Rev. Élevage Méd. vet. Pays trop.*, 1954, 7, 103-120.

A review of the botanical species most commonly found in pastures in tropical Africa, with a list of fodder trees and shrubs. Some other areas covered in the review are Madagascar, North America, Mexico, South America, Asia Minor and Central Asia and India.—J. S. Thomson.

295

FENTON, E. W. The influence of man and animals on the vegetation of certain hill grazings in mid-east Scotland. *Edinburgh and East of Scotland Coll. Agric. Tech. Bull.* No. 7, September 1953, pp. 160.

296

HUDSON, W. J. and CRADOCK, F. Major and minor elements. Deficiencies in pastures and crops in New South Wales. *New South Wales Dept. Agric. Publ.*, 1954, pp. 15.

Deficiencies of major and minor elements are discussed and a map is given showing where such deficiency occurs in New South Wales. Phosphorus and nitrogen deficiencies are prevalent; of the trace element deficiencies, that of molybdenum is the most widespread.—J. S. Thomson.

297

BELL, J. M., McLAREN, P. D. and McKAY, G. Mineral and protein content of forage crops in central Saskatchewan. *Canad. J. Agric. Sci.*, 1954, 34, 252-260. [Dept. Animal Husb., Univ. Saskatchewan, Saskatoon.]

Data are given for protein, ash, Ca, P, Mg, K, Na and Mn in cultivated grasses, cultivated legumes, native upland grasses, native lowland grasses and hedges, and grasses and legumes grown on alkaline soils. The results are discussed in relation to the nutrient requirements of cattle. It is suggested that the grass hays require supplements of protein, Ca, P and salt.—J. S. Thomson.

298

MILLS, C. F. Copper complexes in grassland herbage. *Biochem. J.*, 1954, 57, 603-610. [Dept. Phys. Sci., Wye Coll. (Univ. London), Ashford, Kent.]

The object of the work, part of a thesis (Univ. London, 1951), was to investigate the possibility that the copper in herbage from regions where swayback occurs may be present as stable organic complexes which are not available to the animal. Samples of herbage from a Derbyshire farm where swayback regularly occurs and from an unaffected farm in Kent were compared. The results are tabulated of serial extraction with several organic solvents of increasing dielectric constant and finally with water, and of dialysis after extraction with water or a dilute solution of glycine or tartaric acid. Cu was estimated colorimetrically

as diethyldithiocarbamate by an adaptation of the method of Eden and Green (Abst. 2322, Vol. 10). Aqueous extracts of some samples were also chromatographed on paper with phenol-water as solvent in order to separate free cupric ions from copper complexes.

On the average, about two-thirds of the total Cu was insoluble in organic solvents or water. The differences between normal and affected herbage were not great; the latter contained rather less water-soluble Cu. The dialysis experiments revealed seasonal variations in the solubility of herbage Cu, more marked in the normal samples. Chromatography indicated the presence of at least 8 water-soluble copper complexes in normal herbage, as against 5 in affected herbage.

The question now is whether the lower content of water-soluble Cu in affected herbage is sufficient to produce Cu deficiency in the sheep. This demands further information on the availability of water-soluble copper complexes to the ruminant, and studies of this are in progress.—W. M. Deans.

299

MACINTYRE, W. H., HARDIN, L. J. and HARDISON, M. Fluorine acquired by forage cultures in outdoor and washed atmospheres at Columbia, Tenn. *J. Agric. Food Chem.*, 1954, 2, 832-835. [Univ. Tennessee, Agric. Exp. Stat., Knoxville.]

Six-week-old cultures of red clover and of ryegrass were divided into 2 main groups; one was retained at Knoxville where the plants were grown out of doors or in a greenhouse, the other was sent to Columbia, where the F content of the atmosphere was known to be higher than at Knoxville, and where the plants were grown out of doors or in a chamber in an atmosphere freed from F. Similar experiments were made with Sudan grass grown outside at Knoxville for 6 weeks or for 3 weeks at Knoxville followed by 3 weeks outside or in the chamber at Columbia.

During their growth out of doors at Columbia all plants, in comparison with those at Knoxville, gained F, but those in the treated atmosphere did not do so. Not all the increase at Columbia can be attributed to the plants' having breathed in an atmosphere richer in F; some of the increase may have been due to contamination by dust with a high F content.—D. Harvey.

300

WALKER, D. M. The relationship between the chemical composition of hays and their content of gross digestible energy. *Proc. Nutrition Soc.*, 1954, 13, vi-vii. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

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301

BINGER, H. P., SULLIVAN, J. T. and JENSEN, C. O. Forage crop constituents. The isolation and analysis of hemicelluloses from orchard grass. *J. Agric. Food Chem.*, 1954, 2, 696-700. [U.S. Reg. Pasture Res. Lab., State College, Pa.]

Holocellulose was prepared from orchard grass (*Dactylis glomerata*) by successive extraction with ethanol-benzene, ammonium oxalate and sodium chlorite. The holocellulose was then extracted with hot water, 0.5 per cent. potassium hydroxide and 1.5 per cent. potassium hydroxide and the hemicelluloses were obtained from these extracts as precipitates upon acidification (pH 3), addition of alcohol, and finally dialysis against running water and evaporation of the alcoholic solution. The hemicellulose precipitates were hydrolysed to yield reducing sugars which were separated by paper chromatography and estimated by electron reflection densitometry.

Xylose, glucose, arabinose, galactose and uronic acids were found in almost all hemicellulose fractions, xylose and glucose giving from 60 to 95 per cent. of the carbohydrates. About 73 per cent. of the hemicelluloses obtained resulted from the water extraction of the holocellulose, the total yield of polyuronide hemicellulose on an ash-, moisture-, and protein-free basis being 12.8 per cent. of the weight of the original grass.

D. M. Walker.

302

DENT, J. W. and ZALESKI, A. Leafiness and chemical composition of some lucerne strains. *J. Brit. Grassland Soc.*, 1954, 9, 131-140. [Nat. Inst. Agric. Botany, Cambridge.]

Nine strains of lucerne were studied in 2 successive seasons for leafiness, calculated as the ratio of leaf to stem by green weight, at the stage when about 20 per cent. of the flowers were open. Dry matter and chemical composition of leaf and stem were then estimated.

Calculated on green weights the later flowering varieties had a higher leaf:stem ratio than the earlier varieties. The early varieties contained a higher proportion of dry matter in the leaf and a lower proportion of dry matter in the stem than the later varieties. This largely counterbalances the apparently low leaf:stem ratio, and calculated as dry matter the actual leaf:stem ratio was fairly consistent for all varieties.

Chemical analyses for proximate nutrients showed few consistent varietal differences. Crude fibre showed a tendency to increase in the later-maturing varieties at the expense of N-free extractives.—D. M. Walker.

303

ELY, R. E. and MOORE, L. A. Yields of holocellulose prepared from various forages by acid

chlorite treatment. *J. Agric. Food Chem.*, 1954, 2, 826-829. [Dairy Husb. Res. Branch, U.S. Dept. Agric., Beltsville, Md.]

Seven hays, 2 silages and 1 straw were used in experiments comparing the yields of holocellulose prepared by acid chlorite treatment of an "extractive-free" material. Theoretical holocellulose was used as the standard for comparison:

Theoretical holocellulose

$$= 100 - (\text{ash} + \text{protein} + \text{lignin}).$$

Two treatments with acid chlorite gave recoveries ranging from 97 to 103 per cent. of the theoretical holocellulose. Further treatments resulted in apparent losses of carbohydrate.

Lignin by the method of Ellis *et al.* (Abst. 2495, Vol. 16) and N content were estimated on the crude holocellulose and compared with the lignin and N content of the starting material. The holocellulose fraction represented from 66 to 81 per cent. of the dry matter of the "extractive-free" forages studied.—D. M. Walker.

304

KEMBLE, A. R. and MACPHERSON, H. T. Liberation of amino acids in perennial rye grass during wilting. *Biochem. J.*, 1954, 58, 46-49. [Chem. Dept., King's Bldgs., Univ. Edinburgh.]

Samples of young perennial ryegrass were allowed to wilt and were analysed for soluble N, volatile bases, total amide, glutamine, α -carboxyl-N, peptide and monoamino-monocarboxylic acids after 1, 2, 3, 5 and 8 days. Two samples of mature grass were similarly allowed to wilt, one in the presence of water vapour.

The liberation of α -amino-acids lagged behind the increase in soluble N for the first 2 days and most individual acids in fresh grass were in smaller quantities than would have been expected from a uniform breakdown of protein. The free amino-acids were evidently formed by way of peptides, as was confirmed by a sharp rise in the peptide content after 1 day. The concentration of amide reached a maximum after 3 days, when N metabolism ceased and the moisture content had fallen to about 40 per cent.

Proline alone was present in wilting grass in a concentration greater than that expected. After 8 days proline was 50 per cent. in excess of that in the original protein. Wilting mature grass did not synthesise proline under moist conditions, but the amount present was comparable with the amount of amide synthesised. Desiccation possibly alters the normal building-up of amide to proline and the disappearance of amino-acids is the same when moist or dry, which suggests a relation between proline and amide synthesis.

A. Hepburn.

305

KEMBLE, A. R. and MACPHERSON, H. T. Monamino monocarboxylic acid content of preparations of herbage protein. *Biochem. J.*, 1954, 58, 44-46. [Dept. Chem., King's Bldgs., Univ. Edinburgh.]

Protein samples from clover, young lawn grass, mixed grass from permanent pasture, young and old perennial ryegrass, wilted lawn grass and protein from perennial ryegrass treated to simulate silage making were analysed for monoamino-monocarboxylic acids, except methionine.

No significant difference was found in the amino acid composition of the protein from the different fresh herbage or the wilted grass. The protein from ensiled ryegrass had slightly less serine and threonine.—A. Hepburn.

306

POPE, G. S. and WRIGHT, H. G. Oestrogenic isoflavones in red clover and subterranean clover. *Chem. and Indust.*, 1954, No. 33, 1019-1020. [Nat. Inst. Res. Dairying, Univ. Reading, Shinfield.]

The presence of genistein, already reported in subterranean clover (see Abst. 268, Vol. 22) has been confirmed in red clover and that of biochanin A, already found in red clover (Abst. 2165, Vol. 24), has been confirmed in subterranean clover. The colours of the complexes formed by these with methanolic ferric chloride were found to depend on pH, being green in acid and red in alkaline solution.

D. Harvey.

307

WATKIN, B. R. The animal factor and levels of nitrogen. *J. Brit. Grassland Soc.*, 1954, 9, 35-46. [Wye Coll., near Ashford, Kent.]

A study was made of the effects on pasture production of 3 different rates of application of nitrogenous fertiliser (Nitro-chalk) and of grazing by wethers suitably harnessed so as to allow fertilisation also by dung and/or urine. In addition the botanical composition of the sward was examined.

The Nitro-chalk produced a considerable change in the flora by, at the highest rate, causing almost complete disappearance of clover. The increase in production of dry matter per acre was greatest when urine was applied with N, but the additional effect of dung was small. There was evidence, however, that dung stimulated growth of clover when no N or the lowest rate was used. Without N the effect of urine alone was small.

For the effects on the composition of the pasture only data for the no-nitrogen and the highest rate were considered.

The additional effect of excreta on N yield was greatest when urine was returned. With dung alone and no N there was also an effect due pre-

sumably to the stimulation by it of clover growth. At the high level of N dung had no additional effect. In all circumstances yields of K and Mg were increased by the use of N fertiliser.

The earthworm population was influenced more by the application of dung than of urine or N fertiliser.—J. L. Corbett.

308

HARSHBARGER, K. E., NEVENS, W. B., TOUCHBERRY, R., W., LANG, A. L. and DUNGAN, G. H. The yield and protein content of silage corn as influenced by fertilization. *J. Dairy Sci.*, 1954, 37, 976-981. [Dept. Agronom., Univ. Illinois, Urbana.]

Experiments over a 5-year period showed that, in the production of maize for silage, when soils were deficient in plant nutrients the application of commercial fertilisers increased the yield of fresh and dry matter, representing an increase in both ear and leaf stalk material, had little effect on the protein content of the grain, but considerably increased the protein content of the leaf stalk.

J. S. Thomson.

309

SUTOH, H. [Biochemical studies on silage. 8. On the comparison of digestibility and yield between green forage and silage. 9. On making silage of some wild plants and waste farm products.]

SUTOH, H. and KOMAKI, T. [10. On the effect of supersonic wave to silage-making.]

SUTOH, H. [11. On the evaluation of quality (1).] *Bull. Educat. Res. Inst., Univ. Kagoshima*, 1953, 5, 146-151; 152-158; 159-165; 166-172. [Lab. Nutrit., Fac. Educat., Univ. Kagoshima, Japan.] English summaries.

8. The feeding value of sweet potato vines as green forage or as silage with or without the addition of formic acid was estimated. On an air-dried basis the vines contained protein 8.65, fat 3.04, N-free extract 44.5, fibre 17.5, and ash 14.3 per cent.

The silage made with acid was superior to the control silage, loss of crude protein being 7 and 20 per cent., respectively, and loss of organic matter 7 and 22 per cent.

Trials with guineapigs gave digestibility coefficients generally lower for the silage than for the forage, and lower for the control silage than for the formic acid silage. Total digestible nutrient content of the formic acid and control silage was 92 and 65 per cent., respectively, of that of the forage.

9. Satisfactory silage was made from white clover, green oats, pea vines, onion leaves and Tokoimo-nuka (sweet potato with rice bran) but not from *Solidago serotina*.

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10. The use of supersonic waves was not particularly effective in the preparation of silage.

11. A negative correlation ($r = -0.724$) was found between pH and lactic acid content of silage. Above pH 4.2 there was considerable production of butyric acid.—J. S. Thomson.

310

VOISIN, A. Aspects biochimiques de l'ensilage. [Biochemical aspects of silage.] *La Conservation des Fourrages*, pp. 119-204. [Assoc. Française Zootech., 16 Rue Claude-Bernard, Paris, Ve.]

See also Abst. 358.

MISCELLANEOUS

311

RICHARD, C. and VIALARD-GOUDOU, A. Le fluor dans les eaux du Sud-Vietnam et des Plateaux Montagnards du Sud. [Fluorine in the water of southern Viet-Nam and the mountainous plateaux of the south.] *Bull. Soc. Chim. biol.*, 1954, 36, 901-903. [Lab. Contrôle des Eaux, Inst. Pasteur, Saigon.]

The F contents, estimated by a standard method, of 30 waters in Viet-Nam are tabulated. Apart from brackish wells they were generally low; the mean for 11 surface waters was 0.137 and for 8 deep wells 0.074 mg. F per litre.—W. M. Deans.

312

MITCHELL, T. J., DONALD, E. M. and KELSO, J. R. M. An examination of Scottish heather honey. *Analyst*, 1954, 79, 435-442. [Tech. Chem. Dept., Royal Tech. Coll., Glasgow.]

Forty-two samples, 30 of which were predominantly of ling honey, were collected from widely separated districts and, by methods which are detailed, were examined for colloid, nitrogen and ash and for pH and free acidity. With standard equipment as described the thixotropic ratio was obtained from the times required for a steel ball to fall through 14 cm. of honey after it had stood for 24 hr. and after it had been stirred vigorously.

Arrangement of the samples in ascending order of pH showed that with it ash and colloid contents tended also to increase and there was some evidence, less definite, that N content and thixotropic ratio increased with increasing colloid content. Bell heather and clover honey with ratios generally below 3 did not exhibit thixotropy; for ling honey the ratio sometimes exceeded 100.—D. Harvey.

313

WHITE, J. W. (Jr.) and MAHER, J. Sugar analyses of honey by a selective adsorption method. *J. Assoc. Off. Agric. Chem.*, 1954, 37, 478-486. [E. Utilization Res. Branch, Agric. Res. Serv., Philadelphia 18, Pa.]

3. VITAMINS

GENERAL

- 314
QUAIFE, M. L. **Fat-soluble vitamins.** *Annu. Rev. Biochem.*, 1954, **23**, 215-244. [Res. Labs., Distillation Products Industries, Div. Eastman Kodak Co., Rochester, N.Y.]
- 315
CHELDELIN, V. H. and KING, T. E. **Water-soluble vitamins. 2. (Pantothenic acid, thiamine, lipoic acid, riboflavin, vitamin B₆, niacin, ascorbic acid, and miscellaneous factors.)** *Annu. Rev. Biochem.*, 1954, **23**, 275-318. [Dept. Chem., Oregon State Coll., Corvallis.]
- 316
JONES, T. S. G. **Antibiotics and vitamins.** *Brit. Med. Bull.*, 1954, **10**, 224-228. [Wellcome Res. Labs., Beckenham, Kent.]
- 317
SOLARINO, G. **Vitamine e poteri immunitari. [Vitamins and immunising power.]** *Acta vitaminol.*, 1954, **8**, 177-184. [Ist. Patol. Gen., Univ. Bari.] French, English, German and Spanish summaries.
The results are summarised of 10 years of research in the author's Institute on the relationship between vitamins and immunising mechanisms.
E. M. Hume.
- 318
AXELROD, A. E. and PRUZANSKY, J. **Role of the vitamins in antibody production.** *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 8*, 1954, 26-37. [Inst. Pathol., W. Reserve Univ., Cleveland, Ohio.]
The effect was investigated of deficiency of vitamin A or D or members of the B vitamin complex on the formation of antibodies in the rat. Lack of any vitamin except vitamin D and vitamin B₁₂ impaired antibody formation in response to Rh-negative human erythrocytes. Vitamin deficiencies had no apparent effect on total lytic serum complement. There was no relation between the number of circulating lymphocytes and the ability of vitamin-deficient rats to produce antibodies. No change in the electrophoretic pattern of serum protein in immunised and nonimmunised rats could be related to vitamin deficiencies.
A. M. Copping.
- 319
WARKANY, J. **Disturbance of embryonic development by maternal vitamin deficiencies.** *J. Cell. Comp. Physiol.*, 1954, **43**, Suppl. 1, 207-225 (with discussion 225-236). [Child. Hosp. Res. Found., Cincinnati, Ohio.]
A review.
- 320
PFALTZ, H. **Auswirkung von Vitaminmangel bei der Ratte auf Fertilität, Trächtigkeitsverlauf und Aufzucht der Jungen. [Effect of vitamin deficiency in the rat on fertility, course of pregnancy and rearing of young.]** *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 313-315. *Proc. [Basle.]*
- 321
KODICEK, E. **Storage of vitamins in liver.** *Proc. Nutrition Soc.*, 1954, **13**, 125-135. [Dum Nutrit. Lab., Univ. Cambridge.]
- 322
ABELIN, I. **Über die Rolle der Ernährung bei der experimentellen Hyperthyreose. [Role of diet in experimental hyperthyroidism.]** *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 302-303. *Proc. [Berne.]*
- 323
STURKIE, P. D., SINGSEN, E. P., MATTERSON, L. D., KOZEFF, A. and JUNGHER, E. L. **The effects of dietary deficiencies of vitamin E and the B complex vitamins on the electrocardiogram of chickens.** *Amer. J. Vet. Res.*, 1954, **15**, 457-462. [Dept. Poultry Husb., Rutgers Univ., New Brunswick, N.J.]
Groups of pullets were given a basal ration, which provided the nicotinic acid, riboflavin, and vitamins A, D₃ and B₁₂ required, alone or with a supplement of α -tocopheryl acetate, or an oil containing vitamins A and D, or α -tocopheryl acetate and the vitamin oil, or B vitamins, ascorbic acid and vitamin K, or B vitamins, ascorbic acid, vitamin K and α -tocopheryl acetate. Electrocardiograms were taken after 275 days. The percentage mortality for 275 days for the 6 groups was 45.8, 36.0, 20.0, 36.0, 20.0 and 2.0, respectively, and the percentage of abnormal electrocardiograms 22.2, 37.8, 26.3, 20.0, 25.0 and 4.8. The abnormal electrocardiograms are described.—R. J. Ward.
- 324
REISS, R., PISARZEWSKI, A., GRAFFI, A. and HEBEKER, W. **Über chemische Frühveränderungen.** *N.A. and R.*, January 1955

erungen der Rattenleber nach Verfütterung cancerogener Azofarbstoffe. 7. Veränderung des Vitamin B₁-, B₂- und C-Gehaltes. [Early chemical changes in the rat liver after administration of carcinogenic azo dyes. 7. Changes in the content of vitamin B₁, B₂ and C.] *Arch. Geschweulstforsch.*, 1954, 7, 120-126. [Inst. Med. Biol., Berlin-Buch.]

After a preliminary period of 4 weeks on a normal diet rats were given 20 mg. of 3-methyl-4-dimethylaminobenzene daily for 4 days with a diet of low vitamin content. They were then killed and the vitamin content of the liver was estimated. The administration of the carcinogen caused an increase of vitamin B₁ and vitamin C, and a decrease of riboflavin, calculated on fresh weight and on nitrogen content. There was no apparent sex difference. Substitution of the low-vitamin diet for the normal diet in the 4 weeks of

preparation did not alter the effect of the carcinogen on the vitamin content of the liver.

A. M. Copping.

325

SAVCHIK, A. P. Spetsificheskoe proyavleniye gipovitaminozov i zashchitnye svoystva nepigmentirobannoi kozhi u sel'skokhozyastvennykh zhivotnykh za polyar'ya. [Specific vitamin deficiency and the protective qualities of unpigmented skin of farm animals in the Arctic Circle.] *Veterinariya*, 1954, 31, No. 2, 53-55. [Vet. Bacteriol. Lab., Vorkuta.]

The low vitamin content of fodder in areas within the Arctic Circle is reported as the cause in farm animals of various types of vitamin deficiency [not specifically described]. Observations on cattle, horses and pigs suggested that those of light colour were affected to a less extent than those with pigmented skins.—H. Scherbatoff.

VITAMIN A

326

AMES, S. R., RISLEY, H. A. and HARRIS, P. L. Simplified procedure for extraction and determination of vitamin A in liver. *Anal. Chem.*, 1954, 26, 1378-1381. [Res. Labs., Distillation Products Industries, Div. Eastman Kodak Co., Rochester, N.Y.]

A portion of liver weighing from 3 to 5 g. was ground in a mortar with from 3 to 5 times its weight of anhydrous sodium sulphate until completely dry. The dry powdered liver was shaken with 100 ml. ether for 2 min. and after the solids had separated a portion was taken, the ether was removed and the residue was taken up in 1 ml. chloroform. Two drops of acetic acid were added and then 10 ml. of a saturated solution of SbCl₃ in chloroform, and the resulting blue colour was measured at wavelength 620 mμ. in a colorimeter. A standard curve of reference was used prepared from standard vitamin A. For livers that contained less than from 5 to 10 μg. vitamin A per g. the procedure was not suitable on account of the turbidity produced in the cell by large amounts of ether-soluble material. The average recovery of 30, 150 or 300 μg. added vitamin A was 98.6 per cent. The method compared favourably with four other published methods.—R. J. Ward.

327

GREEN, J. and SINGLETON, D. O. A rapid chromatographic method for the determination of vitamin A in whale-liver oils. *Analyst*, 1954, 79, 431-434. [Walton Oaks Exp. Stat., Vitamins, Ltd., Tadworth, Surrey.]

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A column of neutralised floridin earth was used to remove substances which cause irrelevant absorption during the spectrophotometric estimation of vitamin A in whale liver oils. Oils free from anhydrovitamin A were dissolved in *n*-hexane and passed through a column which had been neutralised with ammonia vapour and washed with *n*-hexane. The vitamin A esters were eluted with further quantities of *n*-hexane. If anhydrovitamin A was present, the oil was first saponified and then passed through a column which had been neutralised with ethanolic ammonium hydroxide and washed with *n*-hexane. The vitamin A alcohol was eluted with a mixture of 80 per cent. benzene and 20 per cent. *n*-hexane. The absorption curves obtained were in good agreement with those published for vitamin A between 300 and 350 mμ.—R. J. Ward.

328

WAGNER, K. H., LINDEN, G. and STUMPF, A. Photometrische Untersuchungen des zeitlichen Extinktionsabfalles des Vitamin A-Metallhalogenid-Farbkomplexes. [Photometric studies of the decrease with time of the extinction of the vitamin A metal-halogen colour complex.] *Hoppe-Seyler's Ztschr.*, 1954, 296, 193-204. [Inst. Ernährungswiss., Med. Akad., Justus-Liebig-Hochsch., Giessen.]

The rate of fading of the blue colour produced by vitamin A with SbCl₃ was studied by measuring the absorption at 610 mμ. in a photo-electric spectrophotometer. The colour produced by the standard vitamin A acetate fell to half its value in

430 sec. For practical purposes the fall which occurred between the addition of the reagent and the routine measurement 20 sec. later was small enough to be neglected. The addition of substances interfering with the development of colour, such as dichloroethylene, lowered the curve of fading at all its points. It was not possible, therefore, to extrapolate back to a point which would have been given in the absence of the interfering substances. The observations confirmed that the SbCl_3 method is reliable for estimating vitamin A in preparations that have been purified by chromatography, but that the results are unreliable when the source of vitamin contains interfering substances.—T. Moore.

329

ISHIZAKA, O. Studies on phosphate of unsaponifiable substances of cod liver oil (especially vitamin A). 1. Purification and esterification of unsap. subs. of C.L.O. 2. Studies in the conditions of esterification. 3. Vitamin A assays, phosphate preparations and their stabilities. 4. Excretion of vitamin A in urine. *J. Pharm. Soc. Japan*, 1953, **73**, 568-573; 573-580; 580-585; 586-588. [Showa Pharm. Coll., Tokyo.]

330

NAKAGAWA, T. and MUNÉYUKI, R. Applications of solubilization to pharmacy. 4. Solubilization of vitamin A palmitate. *J. Pharm. Soc. Japan*, 1954, **74**, 858-861. [Res. Lab., Shionogi Co., Ltd., Hyogo-ken.]

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BALAKHOVSKII, S. D., SHARTZ, S. E., and DROZDOVA, N. N. K voprosu o fiziologicheskoi deistvii analoga bokovoi tzepe vitamina A 2,6-dimetiloktatriena (allootzimen). [Physiological action of the side-chain analogue of vitamin A, 2: 6-dimethyloctatriene (alloocimene).] *Dokl. Akad. Nauk S.S.S.R.*, 1953, **92**, 377-379. [Mosk. Glaz. Klin. Bol'n.]

It is stated to have been shown that carotene and other substances analogous to vitamin A can alleviate painful irritation without disturbing pain sensitivity or conduction along nerve fibres. Experiments with *alloocimene* on isolated segments of guinea-pig intestine showed that, in common with other substances of the group, it possessed a high degree of antihistamine activity. On administration to normal subjects and to patients with painful disorders of the eye corneal sensitivity was increased, but there was a definite analgesic action, with diminution in the manifestations of eye irritation such as muscle spasm, photophobia and lachrymation with obstruction of the lachrymal duct.—D. W. Taylor.

332

BICKOFF, E. M., LIVINGSTON, A. L. and BAILEY, G. F. Evaluation of two methods for the determination of carotene. *J. Assoc. Off. Agric. Chem.*, 1954, **37**, 509-518. [W. Utilisation Res. Branch, Agric. Res. Serv., Albany 6, Calif.]

Possible sources of error in the A.O.A.C. method for estimating carotene were reviewed and some of them evaluated. The possibility exists of isomerisation through heat, and of oxidation, during the extraction. Extraction of carotene is never complete, and about 4 per cent. more can be extracted by subsidiary procedures. There are possibilities of variation at the stage of chromatography; for instance, with standard volumes of eluent the carotene is not all eluted, and with large volumes non-carotene pigments are eluted.

The modified A.O.A.C. method now in use at the Western Region Research Laboratory was compared with the standard A.O.A.C. method. The carotene values obtained with the former were 5 per cent. higher than with the latter, which was due to a combination of causes, the most important being better control in elution of the carotene from the magnesia.—V. H. Booth.

333

BOOTH, V. H. Carotene: effect of antioxidant on its determination. *Analyst*, 1954, **79**, 507-509. [Dunn Nutrit. Lab., Univ. Cambridge.]

Dried grass and lucerne meals were treated with NN' -diphenyl- p -phenylenediamine, an anti-oxidant sometimes used to prevent loss of carotene on storage at concentrations ranging from 100 to 2000 p.p.m. The carotene content of the material was estimated before and after treatment with the anti-oxidant by extraction with light petroleum, b.p. 80° to 100°C , and chromatographic separation on alumina. The mean ratio of the carotene content of the treated to that of the untreated meal was 1.003. When defatted bonemeal was used for the chromatogram, the mean ratio was 1.03. The present method eliminated the interference of NN' -diphenyl- p -phenylenediamine in the estimation of carotene which was reported by Beauchene *et al.* (Abst. 4123, Vol. 23).—R. J. Ward.

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GRANGAUD, R., MASSONET, R. and SANSAC, A. Activité antixérophthalmique du pigment caroténoïde de Pénéides (*Aristeomorpha foliacea*, Risso et *Aristeus antennatus*, Risso). Technique de préparation des extraits actifs. [Antixerophthalmic activity of the carotenoid pigment of prawns (*Aristeomorpha foliacea*, Risso and *Aristeus antennatus*, Risso). Technique for preparing active extracts.] *C.R. Soc. Biol.*, 1954, **148**, 533-536.

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Results obtained previously with *A. foliaceae* were confirmed (Absts. 2951, Vol. 18; 3318, Vol. 19; 282, Vol. 20).

Chromatography on alumina enabled astaxanthin to be obtained from the hepatopancreas and other tissues of the prawn *Aristeus antennatus*. Complete separation of astaxanthin was possible even when small amounts of carotene and vitamin A had been added. Xerophthalmia in the rat was cured by astaxanthin, the effect of which cannot, therefore, be explained by the presence of carotene or vitamin A as an impurity.

R. J. Ward.

335

PETERSON, W. J., BELL, T. A., ETCHELLES, J. L. and SMART, W. W. G. (Jr.) A procedure for demonstrating the presence of carotenoid pigments in yeasts. *J. Bacteriol.*, 1954, 67, 708-713. [Dept. Chem., N. Carolina Agric. Exp. Stat., Raleigh.]

336

ZALOKAR, M. Studies on biosynthesis of carotenoids in *Neurospora crassa*. *Arch. Biochem. Biophys.*, 1954, 50, 71-80. [Nat. Inst. Arthritis Metabol. Dis., Nat. Inst. Health, Bethesda, Md.]

Two wild types of the fungus *Neurospora crassa* were crossed and after the spores had been isolated the strain with the best production of conidia and of carotenoid colour was selected for investigation. Most of the colour is concentrated in the conidia and conidia-bearing hyphae, so it was necessary for assessment of pigment production to control the proportion of conidia to mycelium. Production of conidia was suppressed when necessary by the use of submerged cultures, for which polyoxyethylene sorbitan monooleate was added to the medium to keep the hyphae wet. The pigments were extracted with methanol and acetone, and were separated by chromatography.

When grown in the dark, the mycelium remained almost colourless. Pigment production began on exposure to oxygen and light, the rate increasing rapidly during the first hour and then falling off; after 24 hr. there was no further production of pigment except when conidia were formed or when fresh medium was added, allowing new growth. The independent appearance of the different carotenoids produced after exposure to light and oxygen did not indicate a sequence in biosynthesis, but phytoene, which was present before exposure to air and light, and disappeared with the appearance of acidic pigment, might be a precursor. In mycelia exposed to air there was more phytoene and less acidic pigment; in mycelia exposed to oxygen more acidic pigment and correspondingly less phytoene were found. In mycelia free of

conidia only the young hyphae on the surface produced carotenoids; those in the lower layers remained colourless. The conidia and the hyphae bearing them produced much larger quantities of the pigments than the mycelium itself and in different proportions. No increase in pigment production occurred when substances were tested in the culture medium as possible precursors of the carotenoids.—I. M. Sharman.

337

NAKAYAMA, T., MACKINNEY, G. and PHAFF, H. J. Carotenoids in asporogenous yeasts. *Antonie van Leeuwenhoek J. Microbiol. Serol.*, 1954, 20, 217-228. [Dept. Food Technol., Univ. California, Berkeley.]

The carotenoid content of 7 species or varieties of *Rhodotorula* and 6 of *Cryptococcus* was investigated. It varied very widely and often according to temperature of culture; β -carotene was usually present, and torularhodin and torulin as well occurred in *Rhodotorula*.—E. M. Hume.

338

CURL, A. L. and BAILEY, G. F. Orange carotenoids. Polyoxigen carotenoids of Valencia orange juice. *J. Agric. Food Chem.*, 1954, 2, 685-690. [W. Utilisation Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 6, Calif.]

The unsaponifiable fraction of a light petroleum extract of Valencia orange juice was separated by countercurrent distribution in a Craig apparatus into 6 fractions. Of the total carotenoids the several fractions had the following approximate percentages: hydrocarbons 6, monols 13, diols 22, mono-ether diols 26, di-ether diols 23, mono-ether polyols 10. The present paper is concerned with the analysis of the last 3 fractions totalling 60 per cent. of the carotenoids. Each fraction was chromatographed on magnesium oxide and developed with ethanol or benzene in light petroleum. Seventeen pigments were thus separated. The spectral absorption curve for each was recorded from 290 to 550 m μ . Each pigment was treated with HCl in ether to determine the number of cyclic ether groups in the molecule.

By study of the absorption curves including *cis* peaks, chromatographic behaviour including the results of mixed chromatograms, and chemical reactions, some of the pigments were identified. Five were probably antheraxanthin, mutatoxanthin, violaxanthin, auroxanthin and zeaxanthin-epoxide-furanoxide. Two others were tentatively identified as trollixanthin and trollichrome. Three have probably not been hitherto described and they have been named. The 7 others were stereoisomers of these 10. All 17 were apparently epoxides or furanoxides of xanthophylls. The

possibility is discussed that some may have been formed during the manipulations.—V. H. Booth.

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BALAKHOVSKII, S. D., RYVKINA, D. E. and FEDOROVA, V. N. O fiziologicheskomo deistvii veshchestv, poluchaemykh v rezul'tate okisleniya karotina (antigistaminovaya i antizetilkholinovaya aktivnost' retinena.) [The physiological action of substances obtained by oxidation of carotene. Antihistamine and anti-acetylcholine activity of retinene.] *Dokl. Akad. Nauk S.S.S.R.*, 1953, 93, 869-870.

A method of preparing retinene from carotene by oxidation with manganese dioxide is described in detail. Experiments on isolated segments of guinea pig intestine showed that retinene had a high degree of activity against histamine and acetylcholine.—D. W. Taylor.

340

GOODWIN, T. W. The chemical pathology of carotenoids. *Biochem. Soc. Symposia* No. 12, 1954, 71-84. [Dept. Biochem., Univ. Liverpool.]

341

LAMMING, G. E., MILLEN, J. W. and WOOLAM, D. H. M. Hydrocephalus in rabbits associated with maternal vitamin A deficiency. *Proc. Nutrition Soc.*, 1954, 13, xii-xiii. [Univ. Nottingham Sch. Agric., Sutton Bonington.]

342

GEBAUER, H. Die Milz der Albinoratte bei Vitamin A-Mangel. [The spleen of the albino rat in vitamin A deficiency.] *Naturwissenschaften*, 1954, 41, 288-289. [Anst. Vitaminforsch., Potsdam-Rehbrücke.]

In 40 per cent. of rats deprived of vitamin A the spleen was found to be reduced to about one-third of the normal weight for animals of a given size. Microscopic studies indicated reduction of the spleen pulp and increase of the fibrous parts of the organ. It is suggested that the spleen may play an important part in resistance to infections, and that the widely different lesions seen in vitamin A deficiency may have a common origin, being secondary to damage in the spleen.

T. Moore.

343

PIERANGELI, E. and RADICE, J. C. Absorción de la vitamina A en roedores y batracios. Microscopia fluorescente. [Absorption of vitamin A in rodents and batrachians. Fluorescent microscopy.] *Rev. Asoc. argent. Dietologia*, 1953, 11, 77-82.

Vitamin A in oil is unstable to ultraviolet light and its fluorescence disappears in a very short time. The fluorescence can be seen in a drop on a slide or in sections of tissues, such as the liver and adrenal gland, which are loaded with vitamin A. The fluorescence was used to follow the absorption of vitamin A in rodents and batrachians by means of the fluorescence microscope. Rats deprived of vitamin A showed no fluorescence in the liver or adrenal glands, and when deprived rats were given large doses of vitamin A at varying intervals before being killed, the progress of absorption could be followed until, after from 3 to 5 hr., the Kupffer cells were loaded with the vitamin, and after from 5 to 7 hr. the trabeculae. Normal rats loaded with vitamin A showed a similar phenomenon. In rats absorption is mainly from the jejunum and ileum. In batrachians it is from the gastric region and small intestine, and the liver shows Kupffer cells loaded with vitamin A.

M. B. Richards.

344

DZIEWIATKOWSKI, D. D. Vitamin A and endochondral ossification in the rat as indicated by the use of sulfur-35 and phosphorus-32. *J. Exp. Med.*, 1954, 100, 11-24. [Hosp. Rockefeller Inst. Med. Res.]

Experiments were made with young albino rats which were given single intraperitoneal injections of sodium sulphate made with ³⁵S or of disodium phosphate made with ³²P. The metabolism of the sulphur was studied by measuring the radioactivity of the bones and of isolated chondroitin sulphate during the next 24 to 120 hr., and by taking radio-autographs of the bones. One group of non-deprived rats was studied at weaning; the remainder were given a diet deficient in vitamin A, usually for 6 weeks. Some of them were given an intraperitoneal injection of 2 mg. vitamin A dissolved in ethyl laurate immediately before the sulphate, others were injected only with ethyl laurate. In rats which had not been depleted of vitamin A injection of the vitamin had no effect on the metabolism of sulphate. In deficient animals injection of vitamin A decreased the concentration of inorganic sulphate S in the blood serum from 2.5 mg. per cent. to 1.8 mg., which is close to the normal value of 2.0 mg. for rats of the same age. The uptake of sulphate and phosphate by the femur and tibia was reduced in rats depleted of vitamin A, and was increased by injection of the vitamin.

Radio-autography showed that sulphate was increased in the epiphyseal cartilage; phosphate was increased in the diaphysis immediately adjacent to the epiphyseal cartilage plate. The amount of specific radio-activity of sulphate from chondroitin sulphate isolated from the skeletons of rats

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deficient in vitamin A fell progressively as the deficiency advanced. After injection of vitamin A the radio-activity rose to equal or exceed the normal. Injection of vitamin A increased the radio-activity also of the sulphate of sulphomucopolysaccharides isolated from the skin.

T. Moore.

345

FELL, H. B., MELLANBY, E. and PELC, S. R.
Influence of excess vitamin A on the sulphate metabolism of chick ectoderm grown in vitro.
Brit. Med. J., 1954, ii, 611. [Strangeways Res. Lab., Cambridge.]

Radio-autographs were made from sections of chick ectoderm which had been grown *in vitro* in a medium of plasma and embryo extract in the ratio 3:1, containing radio-active sulphur as sodium sulphate. The squamous, keratinising epithelium which was formed gave only a faint radio-autograph. The addition of a high concentration of vitamin A alcohol to the medium caused a dense radio-autograph in the region where epithelium of the mucus-secreting type (see Abstr. 4147, Vol. 23) had grown instead of squamous epithelium. Proof was, therefore, obtained of the effect of excess vitamin A in increasing the metabolism of sulphur in the epithelium to a value comparable with that occurring in normal mucus membrane.—T. Moore.

346

COHLAN, S. Q. **Congenital anomalies in the rat produced by excessive intake of vitamin A during pregnancy.** *Pediatrics*, 1954, 13, 556-567. [Dept. Paediat., Beth Israel Hosp., New York.] Spanish summary.

Female rats were kept on a diet of proprietary pellets and were mated for one night when in the pre-oestrous state. Some of them were given massive doses of an aqueous dispersion of vitamin A for varying periods during pregnancy. Others received the dispersing agent without the vitamin. Usually the animals were killed shortly before parturition was expected. From 100 controls untreated with vitamin A 84 litters were obtained with 831 normal offspring. From 210 females given 35,000 I.U. vitamin A from the 2nd, 3rd or 4th to the 16th day of gestation only 25 litters were obtained with 148 offspring of which 77 were malformed. The abnormalities observed included protrusion of part or all of the forebrain, malformation of the eyes, cleft palate, shortening of the mandible and maxilla, spina bifida with meningocele, and hydrocephalus. From the 7th to 10th day of gestation was the time of critical susceptibility to the teratogenic effect of vitamin A in excess. Daily doses of 15,000 I.U. vitamin A did not cause foetal malformations.—T. Moore.

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LEROY, A. M. and LÉRY, G. **Comparaison de la distribution du facteur vitaminique A sous forme d'axérophthol et sous forme de carotène pour la satisfaction des besoins des volailles. [Distribution of vitamin A as axerophthol or carotene to meet the requirements of fowls.]** *Ann. Zootech.*, 1953, 2, No. 2, 149-157. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

In following years two successive batches of hens were used to study the allowance of carotene or vitamin A necessary for survival, laying, and satisfactory hatching of eggs. In the first batch heavy mortality was not prevented by 5000 I.U. of carotene or vitamin A, but a greater number of eggs was laid with vitamin A than with carotene. For the second batch of hens vitamin A was raised to 10,000 I.U. and carotene to 20,000 I.U., and no death occurred. Egg laying was now the same with both supplements. The vitamin A content per egg from hens given carotene and vitamin A, respectively, was 520 and 715 I.U. in the first batch and 608 and 743 I.U. in the second batch. Hatching trials on the second batch gave only 8 and 24 per cent. of eggs hatched from hens given carotene and vitamin A, respectively. When vitamin E as wheat germ was given in addition to the other supplements, the percentage of eggs hatched was raised to 32 and 39, which showed that deficiency of vitamin E could obscure the favourable action of carotene or vitamin A. It is recommended that laying hens weighing about 2 kg. should be allowed at least 360 µg. vitamin A or 1800 µg. carotene per head daily. Vitamin A is best supplied as fish liver oil and vitamin E as wheat germ oil.—T. Moore.

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CHARLET-LÉRY, G., FRANÇOIS, A. C. and LEROY, A. M. **Effet de l'ingestion de protéines iodées sur la ponte et sur la teneur en vitamine A des œufs de poule. [Effect of iodinated protein on egg production and on the vitamin A content of hen's eggs.]** *Ann. Zootech.*, 1953, 2, No. 2, 159-161. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

Twenty chickens, aged 6 months, were maintained in an unheated laying battery under observation for a preliminary period of 3 weeks. They were then separated into two equal groups according to bodyweight and rate of growth since hatching. Both groups were given the same diet and one received a supplement of iodinated protein in the form of a commercial product "thyroboline" obtained by the iodination of proteins extracted from thyroid. The supplement containing 1.4 per unit. thyroxine was added at the rate of 15.5 g. per 100 kg. diet. Both groups

were given supplements of vitamins A and D₃. Laying capacity was then recorded, or if they had not begun to lay their exterior characteristics, width of pelvis and depth of abdomen, were measured. No significant difference between the groups in growth rate or in laying capacity was found. Neither was there any appreciable difference in average food consumption. The eggs of those that received iodinated protein were found to contain less carotene and less vitamin A than those from the control birds. The average carotene of the yolks of the eggs obtained from the supplemented group was 66 $\mu\text{g.}$ per 100 g., compared with 104 $\mu\text{g.}$ per 100 g. for the control groups; the vitamin A values were 326 and 416 $\mu\text{g.}$ per 100 g.—I. M. Sharman.

349

CHARLET-LÉRY, G., FRANÇOIS, A. C. and LEROY, A. M. Influence du facteur vitaminique A (axérophthol ou carotène d'huile de palme associé au tocophérol) sur la ponte et les phénomènes de reproduction chez la poule. [Effect of vitamin A (axerophthol or carotene in palm oil associated with tocopherol) on egg laying and phenomena of reproduction in the hen.] *Ann. Zootech.*, 1953, 2, No. 2, 163-176. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

Hens were given 4030 $\mu\text{g.}$ carotene from red palm oil, or from 1270 to 1350 $\mu\text{g.}$ vitamin A palmitate, per kg. dry mash. Each supplement was supplied with or without from 5580 to 5950 $\mu\text{g. dl-}\alpha\text{-tocopherol}$ per kg. mash, making 4 groups in all. Just before feeding, the vitamins were mixed with oats which were a component of the mash. The birds picked out the oats and ate them quickly, which minimised the loss of vitamin by oxidation. The number of eggs laid from December to July was the same whether vitamin A or carotene was given, but the percentage hatching was better with vitamin A. The tocopherol supplements had no effect. By raising the intake of vitamin A or carotene the concentration in the egg yolk could be increased.—T. Moore.

350

PIERCE, A. W. The effect of intake of carotene on reproduction in sheep. *Austral. J. Agric. Res.*, 1954, 5, 470-483. [Div. Biochem., C.S.I.R.O., Univ. Adelaide, S. Australia.]

Merino ewes aged from 4 to 7 years, presumably with normal reserves of vitamin A, were given a basal diet which supplied about 10 $\mu\text{g.}$ carotene per kg. bodyweight daily. After 16 months the value for vitamin A in the plasma had fallen from an average initial value of 27 $\mu\text{g.}$ per 100 ml. to one of only 13, and most of the sheep were found to be suffering from night blindness. Supplements

of lucerne were then given to supply 50, 100, 150 or 200 $\mu\text{g.}$ carotene per kg. bodyweight daily. Reproduction was considered to be satisfactory with all the supplements. After 34 weeks the content of vitamin A in the blood plasma had risen to about 22, 28, 32 and 37 $\mu\text{g.}$ per 100 ml., respectively, for the 4 supplements.

In a second experiment after 19 months of restriction the average vitamin A value fell from an initial value of 34 $\mu\text{g.}$ per 100 ml. to 21. The sheep were then continued as before, or given lucerne to supply 50, 75 or 100 $\mu\text{g.}$ carotene per kg. bodyweight daily for the first mating, 25, 50, 75 or 100 $\mu\text{g.}$ for the second mating, and none or 25 or 50 $\mu\text{g.}$ for the third mating. Reproduction was normal in all the groups for the first and second matings apart from failures not considered to be due to vitamin A deficiency. From the third mating no viable lamb was born to the group receiving the basal ration only or the supplement of 25 $\mu\text{g.}$ carotene. It was considered that 50 $\mu\text{g.}$ carotene per kg. bodyweight daily was necessary for repeated reproduction in sheep.—R. J. Ward.

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CHURCH, D. C., MACVICAR, R., BIERI, J. G., BAKER, F. H. and POPE, L. S. Utilization of intravenously-administered carotene by sheep and cattle. *J. Animal Sci.*, 1954, 13, 677-683. [Oklahoma Agric. Exp. Stat., Stillwater.]

Yearling wethers were given a ration low in carotene and a mineral mixture for 8 weeks at the end of which time the blood plasma values for vitamin A ranged from 10 to 28 $\mu\text{g.}$ per 100 ml. Each wether then received an intravenous injection of 9.2 mg. of an aqueous carotene preparation. Blood samples were taken at intervals between 10 min. and 10 days after the injection. The initial average plasma value for carotene in $\mu\text{g.}$ per 100 ml. was 1.4. From a mean value of 612 $\mu\text{g.}$ 10 min. after injection, the value fell rapidly during the first 6 hr. to 52, then decreased steadily until, after 5 days, almost all the carotene had disappeared from the bloodstream. The initial mean plasma value for vitamin A was 21 $\mu\text{g.}$ per 100 ml. Within 1 hr. the value had risen to 34 and it continued to rise until, 9 hr. after injection, the mean value was 48. A steady fall then occurred until, after 10 days, the value was 25. The mean carotene content of the liver 12 days after injection was 3.1 $\mu\text{g.}$ per g. dry matter, compared with 1.8 for similar untreated wethers.

In a similar experiment calves were given a ration without carotene and were injected with from 13.7 to 17 mg. of an aqueous carotene preparation. The initial mean carotene value for the blood plasma was 11.9 $\mu\text{g.}$ per 100 ml. and it rose to 307 $\mu\text{g.}$ 10 min. after the injection. The peak value was followed by a rapid fall to 89 after 2 hr.

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and that value was maintained for 24 hr. After 10 days the value was still 32. For vitamin A there was no significant difference between the mean values for samples taken at different times after the injection. Values for vitamin A and carotene in the liver were, respectively, 2.5 and 0.7 $\mu\text{g.}$ per g. dry matter before injection and 3.1 and 2.5 after it.—R. J. Ward.

352

BONADONNA, T. and KAAH, I. Primi risultati della somministrazione di vit. A e di olio di germi di grano ai tori. [First results of the administration of vitamin A and wheat germ oil to bulls.] *Zootec. Vet.*, 1954, 9, 148-158; 172-177; 206-211. [Ist. Sper. Ital. "L. Spallanzani" Fecond. Art., Milan.] English summary.

In the Centro Tori of the Institute, the ration for bulls remained much the same from 1948 onwards; once a month a concentrate containing 500,000 I.U. vitamin A and 125,000 I.U. vitamin D was injected subcutaneously, and vitamin C, 5 to 8 g. daily for from 3 to 5 days, was injected intravenously from time to time. From 13 June 1953 every bull received daily 50 ml. fresh wheat germ oil containing 25 mg. crystalline vitamin A (Roche), with 100 g. wheat germ flour from which the oil had been extracted. No untreated group was maintained but comparison was made between performance between 13 May and 12 October in 1952 and in 1953, and between 13 May and 12 June 1953 and in the pre-experimental period.

The quantity and character of the semen collected were recorded for 12 bulls of different breeds. Detailed protocols are given for each animal, and summary tables 1, 2 and 3 are mentioned in the text but are stated to be supplied only with reprints. It is concluded that treatment with vitamin E was followed by production of a larger amount of semen of better quality and usually of greater vitality. The less efficient bulls seemed to benefit more than the more efficient; from the semen of one bull abnormal spermatozoa, which had previously been present, disappeared entirely. The amount of fructose in the semen increased on treatment.—E. M. Hume.

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ROUSSEAU, J. E. (Jr.), EATON, H. D., HELMBOLDT, C. F., JUNGHERR, E. L., ROBRISH, S. A., BEALL, G. and MOORE, L. A. Relative value of carotene from alfalfa and vitamin A from a dry carrier fed at minimum levels to Holstein calves. *J. Dairy Sci.*, 1954, 37, 889-899. [Dept. Animal Indust., Storrs Agric. Exp. Stat., Conn.]

Forty male calves were reared on vitamin-A-deficient rations. At about 220 lb. bodyweight

and about 12 weeks old they were given carotene at one of 5 levels, 12, 18, 24, 30 or 36 $\mu\text{g.}$, or vitamin A at one of 5 levels; 2, 4, 6, 8 or 10 $\mu\text{g.}$, per lb. bodyweight daily. Dried alfalfa meal was used as the source of carotene, and the source of vitamin A was a commercial preparation in a dry carrier. Blood samples were taken, and the heart rate, rectal temperature and cerebrospinal fluid pressure were recorded at intervals. After 16 weeks the calves were slaughtered and tissues were analysed.

The minimum amounts of carotene and vitamin A required to maintain a plasma value of 10 $\mu\text{g.}$ vitamin A per 100 ml. were, respectively, 31 and 3.8 $\mu\text{g.}$ per lb. bodyweight daily. To achieve a liver concentration of 0.6 $\mu\text{g.}$ per g. the corresponding amounts were 30 and 3. To maintain a minimum cerebrospinal fluid pressure of 120 mm. water, measured shortly before slaughter, the amounts were 33 and 6.4. To prevent papillary oedema, the amounts were more than 36 and 8. Prevention of squamous metaplasia in the main duct of the parotid gland required 24 and 6, and prevention of similar lesions in the interlobular ducts of the same gland required 30 and 4. The equivalence in the amounts of carotene and vitamin A needed agreed with the observations of other workers.—V. H. Booth.

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ROUSSEAU, J. E. (Jr.), HELMBOLDT, C. F., DEMBICZAK, C. M., JUNGHERR, E. L., EATON, H. D. and BEALL, G. Effect of two levels of intake of a vitamin A depletion ration on some blood constituents and deficiency criteria in the dairy calf. *J. Dairy Sci.*, 1954, 37, 857-862. [Dept. Animal Indust., Storrs Agric. Exp. Stat., Conn.]

Groups of 10 calves, 36 days old, were given a ration deficient in vitamin A, with intakes designed to give 7-day rates of increase of 5 lb. and 10 lb. The ration was continued until the value for vitamin A in the plasma had fallen to less than 4 $\mu\text{g.}$ per 100 ml. for 2 consecutive 7-day periods. The calves were then slaughtered. The average number of 7-day periods was the same for both groups. Plasma carotenoids and vitamin A decreased with rates of change, in $\mu\text{g.}$ per 100 ml., per 7-day period of -2.104 and -2.944, and -1.443 and -1.455 for the low- and high-intake groups, respectively. Hb decreased only in the calves of the low-intake group. Whole blood and plasma ascorbic acid were unaffected. The rate of the calves on the high intake was on the average 20 beats per min. faster than of those on the low intake. The incidence of squamous metaplasia in the interlobular ducts of the parotid gland was significantly greater in the high-intake group.—R. J. Ward.

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WHITE, R. F., EATON, H. D. and PATTON, S. Relationship between fat globule surface area and carotenoid and vitamin A content of milk in successive portions of a milking. *J. Dairy Sci.*, 1954, **37**, 147-155. [Dept. Animal Indust., Storrs Agric. Exp. Stat., Conn.]

Four first-lactation Holstein cows on a pasture of bluegrass and ladino clover were given a grain mixture with 13.4 per cent. crude protein at the rate of 1 lb. to 4 lb. milk produced, and U.S. No. 1 alfalfa hay was given to appetite. They were examined during successive fortnightly periods; samples of milk were collected every third evening for a single quarter and from each quarter of every cow once during the experiment. Specimens of whole and skimmed milk were taken from each sample, and globule size and vitamin A and carotene content were recorded.

Average values for 60 samples showed for carotenoids a higher value, 18.06 $\mu\text{g.}$ per g. fat, in skimmed milk than in whole milk, 9.26 $\mu\text{g.}$ Corresponding values for vitamin A were 9.71 and 7.37 $\mu\text{g.}$ per g. fat. The fat globule surface-to-volume ratio also was higher in the skimmed milk ($2.2935 \mu^{-1}$) than in the whole milk ($1.6494 \mu^{-1}$). The results support the hypothesis that carotenoids and vitamin A are concentrated at the surface of the fat globule. Further examination of the results for whole milk showed that the amounts of both carotenoids and vitamin A per g. fat had significant positive trends with globule surface-to-volume ratios. From the magnitude of the trends, carotenoids and vitamin A were thought not to form continuous surface layers but to exist possibly in dilute solution, or as a loose chemical complex on the globule surface. Calculated values for the concentration of carotenoids and vitamin A at the globule surface would appear to be as high as 2.6×10^{-4} and 1.9×10^{-4} $\mu\text{g.}$ per sq. cm., respectively; corresponding values for the interior of the globule would be only 0.000476 and 0.000381 per cent. by weight.

In confirmation of earlier work the vitamin A per g. fat showed no trend in relation to the stage of milking, though carotenoids showed a highly significant tendency to decline until about the midpoint and then to increase. Globule size, whether expressed as surface-to-volume ratio or as mean diameter, showed no trend with stage of milking, though fat percentage increased significantly, the final percentage being more than twice the initial.

I. M. Sharman.

356

NARAYANAN, K. M., SHROFF, N. B., ANANTAKRISHNAN, C. P. and SEN, K. C. Vitamin A in dairy products. 2. Vitamin A in curd and ghee from fortified milk. *Indian J. Dairy Sci.*, 1954, **7**, 76-82. [Indian Dairy Res. Inst., Bangalore.]

Specimens of cow and buffalo's milk were examined for vitamin A after different treatments. In the first series of experiments 5 specimens each of whole milk, whole milk fortified with oil-soluble vitamin A, and skimmed milk fortified with water-miscible vitamin A, were investigated, half of each specimen being soured for 24 hr. at room temperature. Analysis of the unsoured milk and dahi (soured milk) showed that both forms of vitamin A used for fortification were stable during the process of souring. In further experiments it was found that boiling or keeping fortified milk at 50° F. for 24 hr. did not increase the solubility of water-miscible vitamin A in the milk fat. Thus, with cow's milk, an average vitamin A content of 33.8 I.U. per g. fat was found in the 5 specimens examined without treatment, 33.5 I.U. in the specimens held at 50° F., and 34.1 I.U. in those that had been boiled. During the preparation of ghee from cow's milk fortified with water-miscible vitamin A, 6.6, 6.8 and 60.8 per cent. of the water-miscible form became soluble in cream, creamery and desi ghee, respectively. The last value was obtained when the curd was soured for 1 day; after souring for 3 days the value fell to 60.2. Corresponding values for buffalo milk were 7.3, 7.6, 56.3 and 55.9, respectively. Vitamin A was almost unaffected when ghee was prepared from cream fortified with water-miscible vitamin A, by direct cooking at 115° F.—I. M. Sharman.

357

NIEMAN, C. De vitamine A-activiteit van verse varkensreuzel. [Vitamin A activity of fresh lard.] *Voeding*, 1954, **15**, 232-240. [Nederland Inst. Volksvoeding, Amsterdam.] English summary.

Fresh lard was tested biologically for its vitamin A potency in comparison with vitamin A acetate. Lard as 30 per cent. of a diet containing casein or gluten with added tryptophan, methionine and lysine, and no other source of vitamin A, supported good growth in rats. It was calculated that the vitamin A potency of the lard was at least 0.7 I.U. per g. An unsaponifiable fraction from lard was shown to have vitamin A activity but its potency was not determined. The results are discussed with reference to those of Herb *et al.* (Abst. 1709, Vol. 24) and of Lowe and Morton (Abst. 1710, Vol. 24).

A. M. Copping.

358

JONES, L. G., ZSCHELLE, F. P. and GRIFFITH, R. B. Carotene and protein contents of alfalfa as influenced by variety and certain environmental factors. *Hilgardia*, 1953, **22**, 179-202. [Dept. Agronom., California Agric. Exp. Stat., Davis.]

Methods of sampling alfalfa (lucerne) were studied and the advantages and disadvantages of

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some are discussed. The method recommended is to take 25 culms from a plot, dry them, analyse sub-samples and base all analyses on dry weight. Loss of dry matter in hot water blanching led to misleading carotene values, so blanching in steam or in air at 130° C. was preferred. Drying *in vacuo* at 65° C. gave least loss of carotene. By comparison there was a loss of 5 per cent. when samples were dried in air at 65°, 100° or 130° C. Differences in protein content between different treatments were not considered significant.

Carotene concentrations increased with the development of the plants up to the pre-bud stage, then fell, but total carotene per culm increased until seed pods were formed. Protein content

decreased with increasing maturity. The importance is emphasised of sampling at the same stage of maturity in comparative studies. When samples were taken from the same plot in the morning and in the afternoon, sometimes the former had the higher carotene content, and sometimes the latter. Day-to-day variation was observed also. No explanation was found.

Several varieties were compared, some of them during 6 cuttings. No variety was consistently higher than the others in carotene or protein content. Any difference found could be attributed to difference in leafiness.—V. H. Booth.

See also Absts. 241, 545.

VITAMIN D

359

COWARD, K. H. and IRWIN, J. O. The second international standard for vitamin D: crystalline vitamin D₃. *Bull. World Health Organiz.*, 1954, 10, 875-894. [Dept. Nutrit., Sch. Pharmacol., Univ. London.] French summary.

Work is reported which was done for the Vitamin D Sub-committee of the Accessory Food Factors Committee (Medical Research Council) to test the suitability of vitamin D₃ for adoption as international standard of reference for vitamin D.

The substances tested were a preparation from pooled samples of vitamin D₃, the current international standard (irradiated ergosterol in olive oil), the purest sample of calciferol obtainable, and the British Standards Institution standard of vitamin D₃. All were tested on rats and the vitamin D₃ preparations on chicks also. In addition the U.S.P. Reference cod liver oil was available for test. Thirty laboratories throughout the world took part. The results were remarkably uniform; they are not set out in detail but the statistical analysis is given, and the final estimates for the potency ratios of the preparations to one another are tabulated.

(For the Report of the meeting of the WHO Expert Committee on Biological Standardization, Subcommittee on Fat-soluble Vitamins, at which vitamin D₃ was recommended for adoption as the international standard of vitamin D see *WHO Tech. Report Ser.* No. 3, Feb. 1950.)

E. M. Hume.

360

BLISS, C. I., WHITMAN, C., McDONALD, F. G. and BILLS, C. E. Sources of variation in the determination of vitamin D by the line test. *J. Assoc. Off. Agric. Chem.*, 1954, 37, 499-508. [Mead, Johnson and Co., Res. Lab., Evansville, Md.]

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The magnitude of certain sources of error was studied in a test with pied rats of the Wisconsin laboratory strain, reared on a diet of 75 parts Mead's Pabulum and 25 parts whole milk powder. Litters were reduced at birth to 8 of which 6 were used. About the age of 21 days they received McCollum's rachitogenic diet No. 3143, which produced florid rickets in 20 days. Some rats were caged in groups and some individually but it was found to make no difference. Vitamin D was given as the U.S.P. Reference Standard Cod-Liver Oil No. 2, diluted with maize oil to give 6 doses increasing by multiples of $\sqrt{2}$ from 1.06 to 6 mg. The doses were given daily for 6 days. The experiment was in 2 series, in each of which it was arranged in 2 Latin squares with 6 doses and 6 rats per dose. In one series the rats of the same litter began to receive their treatment when they had reached a certain age, and in the other when they had reached a certain weight, each group being balanced according to litter for the other variable. At the end of the experiment the radius and tibia from both sides were taken for the line test. Two observers made the readings and scored each bone in grades from 0 to 4 by quarter units on the Bills scale (*Biol. Symposia*, 1947, 12, 409).

Analysis of the results showed that the mean of the results obtained by the 2 observers was the same, but the less experienced observer tended to overscore poor healing and underscore good healing. Subsequently only the more experienced observer's readings were used; the standard deviation of his results showed that differences expressed in terms of even smaller units than those used would have had significance.

The use of bones from the right and left sides had no significant influence. The tibia proved more sensitive than the radius, with which 70 per cent. more rats would have been needed to give the same

degree of significance. In subsequent analysis of the results, only the data for the tibia were used.

The attempt to start treatment when all the rats in the same litter had reached the same weight led to an average range of difference of 19 days in the time spent on the rachitogenic diet before treatment, which was clearly unsatisfactory, and the results obtained in this series were not subjected to further analysis.

Bodyweight, amount of food consumed, and a small loss in weight, at the end of the preliminary period before treatment, had no effect on the degree of healing.

If rats were allotted to doses irrespective of litter, 50 per cent. more of them would be needed to give the same accuracy as when littermates were evenly distributed.

When the mean response to each of the 5 largest doses was plotted against the logarithm of the dose value, a straight line of satisfactory slope was obtained.—E. M. Hume.

361

KANZAWA, T. and KOTAKU, S. **Stability of vitamin D.** *J. Pharm. Soc. Japan*, 1953, **73**, 1357-1360. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

Crystals or alcoholic solutions of vitamin D lost 5 per cent. of their activity when exposed to air at room temperature. Several products of decomposition were isolated [apparently not identified].

K. H. Coward.

362

YODER, L. and THOMAS, B. H. **An antirachitic sulfonic acid derivative of cholesterol.** *Arch. Biochem. Biophys.*, 1954, **50**, 113-123. [Chem. Sect., Iowa Agric. Exp. Stat., Ames.]

Chlorosulphonic acid was added to cholesterol in glacial acetic acid. The mixture was heated for several hours at a temperature of from 120° to 125° C.; HCl and SO₂ were evolved. The solution was concentrated by distillation, suspended in hot water, and treated with excess Ca acetate. The Ca sulphonates thus formed were further purified, and the brucine salt of a steroid sulphonate was prepared from a benzene solution of the ether-soluble component of them. The brucine salt was characterised. The free steroid monosulphonate and its Na salt were prepared from the brucine salt. The free acid was subjected to bromination, hydrogenation, permanganate oxidation, and perbenzoic acid titration. The absorption spectrum was studied; the maximum was at 230 mμ.

Tested biologically on chicks and rats, the antirachitic potency of the free acid is reported as 25,000 A.O.A.C. units per g.

The evidence was considered to support the

conclusion that the substance was not of the same type as vitamin D₃ or the vitamin in cod liver oil.

E. M. Hume.

363

HAVINGA, E. and BOTS, J. P. L. **Studies on vitamin D. 1. The synthesis of vitamin D₃** 361⁴. *Rec. Trav. chim. Pays-Bas*, 1954, **73**, 393-400. [Lab. Org. Chem., Univ. Leyden.]

364

SCHUBERT, K. **Kristallisiertes Dihydrovitamin D₂II. [Crystalline dihydrovitamin D₂II.]** *Naturwissenschaften*, 1954, **41**, 231. [Inst. Mikrobiol., Jena.]

A preliminary report is made on the preparation of crystalline dihydrovitamin D₂II by partial catalytic hydrogenation with Raney nickel of vitamin D₂. As the 3:5-dinitrobenzoate, it crystallised in pale yellow needles with m.p. 165° to 166° C. (corr.), and $[\alpha]_D^{25} = 138^\circ$ in acetone. The uptake of H corresponded with the presence of 3 double bonds. The spectrum showed the maximum in the ultraviolet characteristic of dihydrotachysterol.—E. M. Hume.

365

CRUICKSHANK, E. M., KODICEK, E. and ARMITAGE, P. **The vitamin D content of tissues of rats given ergocalciferol.** *Biochem. J.*, 1954, **58**, 172-175. [Dunn Nutrit. Lab., Univ. Cambridge.]

Further investigation was made into the fate of a single dose of 1 mg. (40,000 I.U.) vitamin D₂ given orally to rats, of which only 6 per cent. could previously be found (Abst. 4159, Vol. 23). With the same technique as before, 15 rachitic rats were given the dose of 1 mg., and were killed 24 or 48 hr. later. The vitamin D content of the fresh organs and tissues was estimated in tests with 200 other rats. As was found before, the liver with a mean total of 1440 I.U. on the first day contained most of the absorbed vitamin, but there was an appreciable amount also in muscle and skin. The kidneys contained a relatively high concentration. The lungs, spleen, brain and adrenal glands contained little. The mean total amounts in the organs and tissues without the liver and intestines in the present experiment, and in the body as a whole without the liver and intestines in the previous experiment, were, respectively, in I.U. 620 and 690 on the first day, and 890 and 630 on the second day. In the present experiment, the amounts on the first day were greatest in the liver, intestinal tissue and kidneys, and on the second day in the muscles and skin. Other organs were not tested on both days.

It is suggested that the relatively high concen-

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tration in the kidneys may be connected with the function of tubular re-absorption.

The results are treated statistically.

E. M. Hume.

366

TULPUL, P. G. and PATWARDHAN, V. N. **Mode of action of vitamin D. The effect of vitamin D deficiency in the rat on anaerobic glycolysis and pyruvate oxidation by epiphyseal cartilage.** *Biochem. J.*, 1954, **58**, 61-65. [Nutrit. Res. Labs., Indian Counc. Med. Res., Coonoor, S. India.]

Other studies (in the press) led to the conclusion that failure of calcification in vitamin D deficiency is probably due to disturbance in the metabolism of glycogen in cartilage.

To test the conclusion, 180 rats weighing about 45 g. were maintained on a rachitogenic diet low in P; some of them received 25 I.U. vitamin D daily. Rats were killed after 5, 10, 15 and 20 days, and the epiphyseal cartilage of the tibia was removed. With thin slices of it the anaerobic breakdown of glycogen and hexose phosphate, and the aerobic oxidation of pyruvate, were measured with the Warburg manometer. Adenosine triphosphate, diphosphopyridine nucleotide and Mg ions, added to the reaction medium, heightened the activity. For rats in the early stages of rickets, the glycolytic activity of the cartilage was considerably higher than for those given vitamin D. Later the difference disappeared, and it was not as a whole statistically significant. The aerobic oxidation of pyruvate, on the other hand, diminished steadily in rachitic cartilage, and after 20 days seemed to have ceased entirely; in the rats given vitamin D the process was unimpaired.

Tests with liver and kidney homogenates showed no loss of capacity to oxidise pyruvate by rachitic rats.

It is suggested that failure to oxidise pyruvate interferes with the supply of citrate to the bone, and that the significance of citrate in rickets is thus explained.—E. M. Hume.

367

BELLIN, S. A., HERTING, D. C., CRAMER, J. W., PLEGGI, V. J. and STEENBOOK, H. **The effect of vitamin D on urinary citrate in relation to calcium, phosphorus and urinary pH.** *Arch. Biochem. Biophys.*, 1954, **50**, 18-24. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Rats weighing from 60 to 100 g. were fed on a diet of glucose, cooked egg white, roughage and cottonseed oil, with a salt mixture without Ca or P, and vitamins without vitamin D. Ca was added as CaCO_3 , P as a mixture of KH_2PO_4 and K_2HOP_4 , and vitamin D₂ as 75 I.U. every 3 days.

NaHCO_3 and NaCl were sometimes added. Food consumption was equalised between groups with and without vitamin D. Citrate was estimated in the urine for 3-day periods, and the pH of the urine at the end of the 3-day period. The effect of varying amounts of minerals in the diet was thus studied.

Citrate was always excreted even with the smallest intakes of Ca and P; the amount was always greatest with NaHCO_3 , 6.6 or 10.0 per cent. in the diet. The amount was always increased by addition of vitamin D. Addition of P to a rachitogenic diet did not reproduce the effect of vitamin D in increasing urinary citrate. No correlation was found between excretion of citrate and of Ca or P.

The relation of changes in urinary pH was less clear. Vitamin D increased the urinary pH with diets high in Ca and low in P, but did not do so with diets not of rachitogenic type; it did, however, increase urinary citrate on such diets even when urinary pH was reduced. It is considered possible, notwithstanding, that systemic pH may be raised by vitamin D at the sites of citrate formation in the body.

No conclusion could be drawn as to whether increase in citrate excretion resulted from increased formation or decreased destruction; the authors are inclined to favour the former.—E. M. Hume.

368

DZIEWIATKOWSKI, D. D. **Vitamin D and endochondral ossification in the rat as indicated by the use of sulfur-35 and phosphorus-32.** *J. Exp. Med.*, 1954, **100**, 25-32. [Hosp. Rockefeller Inst. Med. Res.]

Weanling rats were maintained on a rachitogenic diet low in P and were given intraperitoneal injections of ^{35}S and ^{32}P , with or without vitamin D₂. The animals were killed at different intervals afterwards, and the injections of the isotopes and vitamin were spaced in different ways. The serum, urine and portions of the skeleton were analysed as described elsewhere (Abst. 344, Vol. 25). Sulphomucopolysaccharides were estimated in the skeleton and pelt.

The deposition of ^{32}P in the femur and tibia increased from 36 to 48 hr. after administration of vitamin D₂ to vitamin-D-deficient rats. The skeleton immediately incorporated ^{35}S . The rate of synthesis of chondroitin sulphate was the same in both normal and rachitic rats but was increased on administration of vitamin D₂ to deficient rats; in vitamin D deficiency the utilisation of chondroitin sulphate was impaired. The results were held to support the view that "vitamin D directly influences the step in which chondroitin sulfate is used in endochondral ossification".

E. M. Hume.

369

BRONSH, K. Zur Wirkung von Thyroxin auf rachitische Ratten. [The effect of thyroxine on rachitic rats.] *Ztschr. ges. exp. Med.*, 1954, 124, 118-130. [Inst. Physiol. Ernährung Tiere, Univ. Munich.]

Rats weighing about 35 g. were maintained on McCollum's rachitogenic diet. When they showed signs of rickets radiographically, 15 were given 100 I.U. vitamin D₃ for 10 days, 16 received 70 µg. dl-thyroxine by subcutaneous injection daily for 14 days, and 8 received no extra treatment. Basal metabolism was estimated, and 6, 24 and 48 hr. before the animals were killed radio-active Ca and P were given. Blood and tissues were taken for analysis.

The mean B.M.R. of the rachitic rats was 2.3 ± 0.6 Cal. per 10 g. bodyweight in the 24 hr., and the value for those given vitamin D was 3.5 ± 0.5 . In the rachitic rats given thyroxine for 14 days, the B.M.R. rose gradually up to the 6th day, when it reached the value for the rats given vitamin D; it then fell again by the 12th day to the initial value.

The bone ash of the rats given thyroxine was only slightly higher than that of the rachitic rats. In the liver and muscle, the mean value for creatine phosphate was much higher for the rats given thyroxine than for either of the other groups. In the rats given thyroxine, the mean value for phosphatase activity in the tibia was like that of untreated rats, but in the kidneys and duodenum it was nearer to that of rats given vitamin D.

Numerous other results are presented of which the significance is discussed. It is concluded that for the mineralisation of the tissues, especially osteoid tissue, vitamin D and thyroxine must be present in the organism in a balanced equilibrium.

E. M. Hume.

370

THEOPOLD, W. and SCHULTE-NICKELL, I. Tierexperimentelle Untersuchungen über die antirachitische Wirksamkeit handelsüblicher ultraviolet-bestrahlter Milch. [Animal tests of the antirachitic potency of commercial milk irradiated with ultraviolet light.] *Monatsschr. Kinderheilk.*, 1954, 102, 262-267. [Kinderklinik, Univ. Marburg a.d. Lahn.]

The vitamin D potency of the irradiated milk (Moha milk) supplied to the city of Frankfurt had become a matter of controversy, so, on official request, biological tests were made on milk freshly bought between November 1952 and July 1953.

Groups of young rats were given for 14 days the rachitogenic diet of Steenbock and Black with addition by stomach tube of small daily amounts of the test milk. At the end of the time, the right

hind leg was examined radiographically, and the distal end of the femur histologically. If 80 per cent. of the animals were protected, the test was held to be positive. It was accepted that the protective dose of vitamin D was 1 I.U. daily. Rats gaining less than 2 or more than 22 g. during the experiment were rejected. The test on winter milk offered difficulties, since the potency was much less than expected. Small groups of rats receiving no addition were included but, only in one experiment, a small group given 1 I.U. vitamin D₃ daily. It was concluded that 1 litre irradiated winter milk contained less than 50 I.U. vitamin D.

In the tests in summer, cream (1 ml. = 16.6 ml. milk) and separated milk (0.1 per cent. fat) were tested separately on groups of 10 rats given daily 0.25, 0.5, 1.0 or 1.5 ml. cream, or from 10 to 12 ml. skimmed milk, or 1 I.U. vitamin D₃ or no addition. All the rats given vitamin D₃ or the largest dose of cream were protected, and 8 of those given 1 ml. All the remainder had rickets. The potency of the irradiated summer milk was concluded to be about 80 I.U. per litre, associated entirely with the fat fraction.—E. M. Hume.

371

HOFMEIER, K. Arricchimento del latte con vitamina D (vitaminizzazione del latte) mediante un composto idrosolubile di vitamina D e lattalbumina. [Enrichment of milk with vitamin D (vitaminisation of milk) by means of a water-soluble complex of vitamin D and lactalbumin.] *Lattante*, 1954, 25, 106-111. [Stoccarda.] English summary.

A general article in which the use of the vitamin D preparation Vitamina D-Lattoalbumina to fortify milk for prophylaxis against rickets is recommended.—E. M. Hume.

372

RANGANATHAN, S. The vitamin D content of Indian butter. *Indian J. Med. Res.*, 1954, 42, 165-166. [Nutrit. Res. Labs., Indian Council Med. Res., Coonoor, S. India.]

Exceptionally high values for vitamin D in Indian butter and ghee were previously reported (Abst. 1643, Vol. 20). In a further test the unsaponifiable fraction of 3 samples of butter from the Dairy Research Institute, Bangalore was tested by the line test. Groups of 6 rats received 3 doses of the butter and 3 of the international standard. The mean values obtained were 1.20, 1.18 and 1.50 I.U. vitamin D per g. butterfat, which are less than those previously reported and within the normal range.—E. M. Hume.

See also Absts. 241, 494.

VITAMIN E

373

TAPPEL, A. L. **Studies of the mechanism of vitamin E action. 2. Inhibition of unsaturated fatty acid oxidation catalyzed by haematin compounds.** *Arch. Biochem. Biophys.*, 1954, **50**, 473-485. [Dept. Food Technol., Univ. California, Davis.] Colloidal solutions of linoleate, oleic acid, linseed oil and cod liver oil were made in phosphate butter, usually with the aid of Tween 40. Carotene and vitamin A were similarly emulsified after solution in oleic acid. The oxygen uptake of the solutions was studied in Warburg's apparatus in the presence or absence of haematin compounds, such as haemin, cytochrome *c* and Hb, and with or without the addition of anti-oxidants, such as α -tocopherol, *nordihydroguaiaretic* acid, propyl gallate, butylated hydroxyanisole, methylene blue, thionine and sodium diphenylamine sulphate. Loss of carotene and vitamin A was estimated by spectrophotometry. All the anti-oxidants mentioned, at suitable concentrations, inhibited the oxidation of the fats and fatty acids in the presence of haematin compounds. Against auto-oxidation in the absence of haematin methylene blue gave no protection. α -Tocopherol inhibited the destruction of vitamin A and carotene proportionately with its effect on total oxidation.—T. Moore.

374

MOORE, T., SHARMAN, I. M. and WARD, R. J. **The partial vitamin E activity of certain redox dyes.** *Biochem. J.*, 1954, **58**, vii. [Dunn Nutrit. Lab., Univ. Cambridge.]

375

MARKEES, S. **Substitution von Vitaminen durch Fremdstoffen.** [Replacement of vitamins by alien substances.] *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 316-317. *Proc.* [Basle.]

376

CORDY, D. R. **Experimental production of steatitis (yellow fat disease) in kittens fed a commercial canned cat food and prevention of the condition by vitamin E.** *Cornell Vet.*, 1954, **44**, 310-318. [Sch. Vet. Med., Univ. California, Davis.]

Nine kittens, from 6 to 8 weeks old, were fed on a commercial canned cat food, which consisted largely of fish. The animals grew well at first, but after 6 weeks 2 lost their vitality and appetite and died. The remaining kittens were killed after

8 weeks. Severe steatitis, indicated by an orange-brown colour in all the fat depots, was found in both the animals that died. Histological examination of the affected tissues revealed the deposition of acid-fast pigment, and the presence of many mononuclear cells, mostly macrophages. In one of the other kittens the omental and mesenteric fat was brown, but elsewhere the fat depots were normal. The remaining 5 animals had normal fat. In further experiments 10 more kittens were given the same diet with the addition of 1 ml. fish liver oil daily. Four were given no vitamin E, and 2 each received 10 mg., 20 mg. and 40 mg. of DL- α -tocopherol daily. One of the kittens not given tocopherol died after 4 weeks, and the remaining animals were killed after 16 weeks. The fat was normally coloured in all, except for a faint yellow colour in the animal which died. Microscopic lesions were severe in the same animal, moderate in 2 of the others not given vitamin E, and slight in the fourth. Slight lesions were found in one of the animals given 10 mg. tocopherol daily, but in all the remaining animals, given from 10 to 40 mg. daily, the fat was normal.—T. Moore.

377

SAFFORD, J. W., SWINGLE, K. F. and MARSH, H. **Experimental tocopherol deficiency in young calves.** *Amer. J. Vet. Res.*, 1954, **15**, 373-384. [Agric. Exp. Stat., Montana State Coll., Bozeman.]

Newborn male calves were given a synthetic milk diet without tocopherol after they had had 3 feedings of the dam's colostrum. A capsule containing 74 mg. *d*- α -tocopheryl acetate was given to 2 other calves every 12 hr. after feeding. Vitamins A and D and ascorbic acid were given daily. Electrocardiograms were taken at weekly intervals, and blood was taken weekly for erythrocyte, leucocyte, Hb and α -tocopherol estimations. Urine was tested for creatine, creatinine, albumin and occult blood. Gain in weight was not affected until signs of the deficiency were advanced. Traces of tocopherol appeared unexpectedly in the blood plasma of all 4 of the deprived calves at the occurrence of the most severe signs of deficiency. Body temperature, erythrocyte and leucocyte counts and Hb were not affected by the deficiency of tocopherol. Creatine was present in the urine of the deprived and non-deprived animals. The electrocardiogram tracings of the deprived calves had an average P—R interval of 0.139 sec. and an average Q—T interval of 0.319 sec. The

corresponding average values for the non-deprived calves were 0.109 and 0.286. Only one of the deprived calves had changes in the kidneys.

R. J. Ward.

378

TRIBE, D. E. Observations on the feeding behaviour of rats and chicks deficient in vitamin E. *J. Hyg.*, 1954, 52, 315-320. [Sch. Vet. Sci., Univ. Bristol.]

For 56 days, rats were offered daily in two pots a diet deficient in vitamin E. At the end of the time one of the pots was filled with a diet containing an adequate amount of vitamin E. Vitamin E deficiency was confirmed by the dialuric acid haemolysis test. The rats showed no preference for the adequate diet; the weekly selections from the two pots showed precisely the same pattern in the second period as in the first.

In a second experiment with chicks the development of encephalomalacia was used as criterion of vitamin E deficiency, and a similar result was obtained.—R. J. Ward.

379

MASON, K. E. and DRU, M. Y. Newer knowledge of the metabolism of tocopherols in human tissues. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 7*, 1953, 1-19. [Sch. Med. Dent., Univ. Rochester, N.Y.]

Total lipids, total tocopherols, γ - and δ -tocopherols, and α -tocopherol by difference, were estimated in over 1100 specimens of human tissues, usually obtained at autopsy. α -Tocopherol invariably predominated, and the amounts of the other forms were often negligible.

In whole foetuses aged from 2 to 6 months total tocopherols amounted on the average to 0.32 mg. per 100 g. fresh tissue. The placenta had on the average 0.71 mg., the skeletal muscles 0.59 mg. and the liver 0.57 mg. In infants, 18 premature and 6 full-term, the average values per 100 g. tissues and per g. fat were 2.14 and 0.07 mg. for adipose tissues, 0.97 and 0.28 for liver, 0.76 and 0.35 for heart, 0.61 and 0.30 for lung, 0.60 and 0.24 for kidney and 0.60 and 0.32 for intestine. In older children and adults who had died from accident or disease, much higher levels were found than in infants. At 4 to 10 years the average levels per 100 g. muscle, heart, liver and adipose tissue were 1.07, 1.33, 1.52 and 5.21 mg., respectively, at 12 to 18 years 0.97, 1.03, 1.48 and 9.11, at 23 to 52 years 1.24, 1.15, 2.08 and 8.31, and at 61 to 93 years 0.93, 1.07, 0.89 and 6.09 mg. In endocrine glands and other visceral organs collected from adults tocopherols amounted on the average to 13.17 mg. per 100 g. tissue and 0.73

mg. per g. fat in adrenals, 4.04 and 1.24 in pituitary, 4.01 and 1.01 in testis, 1.10 and 0.62 in ovary, 1.81 and 0.31 in pancreas, 0.85 and 0.72 in uterus, 0.81 and 0.34 in spleen, 0.68 and 0.28 in kidney and 0.37 and 0.19 in lung.

No evidence of deficiency of tocopherol was found in patients with muscular dystrophy. The daily intake of α -tocopherol in a healthy human adult is estimated as about 25 mg., which may be compared with a total of 20 mg. found in a still-born child.—T. Moore.

380

GRAY, D. E. and DE LUCA, H. A. Effect of vitamin E on carbohydrate metabolism of rat diaphragm. *Canad. J. Biochem. Physiol.*, 1954, 32, 491-497. [Dept. Biochem., Univ. W. Ontario, London.]

Rats were given a diet deficient in vitamin E, with no supplement, or 0.5 mg. or 100 mg. vitamin E daily. The supplements had no effect on carbohydrate metabolism of the diaphragm incubated with glucose, with or without insulin, except that there was a small difference in the amount of pyruvic acid accumulated during incubation without insulin, the respective values for the 3 groups in the order above being 1.13, 1.42 and 1.30 μ M pyruvic acid per g. wet tissue.

R. J. Ward.

381

DE ROSA, R. L'azione dell'alfa-tocopherolo nella intossicazione sperimentale da piombo. Comportamento della coproporfirinuria e della crisi ematica. [The effect of alpha-tocopherol on experimental lead poisoning. Behaviour of urinary coproporphyrin and of the blood picture.] *Acta vitaminol.*, 1954, 8, 167-172. [Ist. Med. Lavoro, Univ. Naples.] French, English, German and Spanish summaries.

Of 2 groups of 4 rabbits fed on a normal diet of herbage, and given every other day 200 mg. lead acetate, one group was given 200 mg. α -tocopherol by intramuscular injection every fourth day. Coproporphyrin was estimated in the urine, and blood counts were made, at intervals up to 37 days on such animals as survived so long. All the rabbits given tocopherol were alive on the 37th day; none of those not given it were. The mean amount of coproporphyrin in the urine in 24 hr. did not rise above 70 μ g. in the rabbits given tocopherol, but in those not given it, it reached 350 μ g. The development of anaemia did not show such a marked difference, but was more rapid in the rabbits not given tocopherol.—E. M. Hume.

See also Abst. 564.

VITAMIN K

382

UEHARA, K., MURAMATSU, I. and MAKITA, M. Vitamin K₃ as a coenzyme. *Proc. Japan Acad.*, 1953, 29, 511-512. [Dept. Pharmacol., Coll. Med., Univ. Osaka.]

Vitamin K₃, 2-methyl-1:4-naphthoquinone, stimulated the oxidation of phosphogluconate by yeast autolysate, as measured by oxygen uptake in a Warburg apparatus. Unsubstituted naphthoquinone was inactive.—E. M. Hume.

383

TALMAS, V. Naphtylamines, quinones, phénols et temps de saignement moyen. [Naphthylamines, quinones, phenols and mean bleeding time.] *Arch. internat. Pharmacodyn.*, 1953-54, 96, 365-385. [Inst. Clin. Méd., Univ. Liège.]

In rabbits both α - and β -Na naphthylamine-4-sulphonate reduced the bleeding time significantly after a latent period of under 15 min., and over 30 min., respectively; when the former compound was oxidised the latent period disappeared. The naphthoquinones and the naphthohydroquinones, including Synkavit, had an immediate effect in doses ranging from 50 mg. to 10 μ g. per kg. body-weight. Most phenols and quinones tested had also an immediate haemostatic effect. The significance of the findings is discussed.—L. Wills.

384

RUTQUIST, L. and BÖRNFORS, S. Jämförande undersökningar av olika K-vitaminers inverkan på av dicoumarolpreparat framkallad hypoprothrombinämi hos hund. [Comparative studies of the effect of different vitamin K preparations on prothrombin in the blood of dogs treated with dicoumarol.] *Nord. Vet. Med.*, 1954, 6, 511-519. [Kungl. Vet. Högsk., Stockholm.] English and German summaries.

The preparations tested were: Inj. K-vimin, Astra; Ido-K, Ferosan; and vitamin K₁ (Mephytone), Merck. Of the first 2, 1 ml. contained 10 mg. active substance; the third, the natural vitamin, was used in an oil emulsion of which 1 ml. contained 50 mg. active substance.

The tests were made on 10 dogs given by mouth from 2 to 3 cg. Dicusat (3-(α -acetylbenzyl)-4-oxydicoumarol) per kg. bodyweight. When the prothrombin value had fallen the test substances were given. Vitamin K₁ was immediately effective by mouth or intravenous injection but not by intramuscular injection. Both synthetic preparations given by intravenous injection were without effect. [An earlier paper (*ibid.*, 423; 433) describes the effect of dicoumarol in dogs and records that the Swedish synthetic vitamin K preparation,

Inj. K-vimin, Astra, had no effect on prothrombin time or the haemorrhage produced.]—I. Leitch.

385

BORNSTEIN, S. and SAMBERG, Y. Field cases of vitamin K deficiency in Israel. *Poultry Sci.*, 1954, 33, 831-836. [Govt. Poultry Field Lab., Tel Aviv, Israel.]

It is suggested that outbreaks of vitamin K deficiency, which occurred on diets considered standard for the country, may have resulted from the use of drugs to combat coccidiosis which interfered with the normal intestinal synthesis of vitamin K.—E. M. Cruickshank.

386

MULÉ, F. and GARUFI, L. Azione della vitamina K sul consumo di ossigeno del miocardio di coniglio in presenza di tossina diphtherica. [Effect of vitamin K on the oxygen consumption of the rabbit's myocardium in presence of diphtheria toxin.] *Bol. Ist. sieroterap. milan.*, 1954, 33, 174-178. [Ist. Prima Clin. Pediat., Univ. Rome.] English summary.

Of 30 rabbits weighing about 2 kg., 10 had no treatment, and 20 were given 1/10 m.l.d. of diphtheria toxin every other day. Readings on the electrocardiogram were taken daily until evidence of myocardial injury was plain, when all the rabbits were killed. The oxygen consumption by emulsions of the heart muscle was measured in a Warburg apparatus with and without addition of a solution of 100 μ g. vitamin K per ml. saline, and with and without addition of diphtheria toxin. The oxygen consumption of normal heart muscle was increased by presence in the medium of diphtheria toxin, and progressively more so with increasing concentration; the effect was less in rabbits previously treated with diphtheria toxin. The presence of vitamin K in the medium had no effect on normal heart muscle but tended to counteract the effect of diphtheria toxin.—E. M. Hume.

387

DOLIN, M. I. The flavin requirement for DPNH-menadione reductase in *Streptococcus faecalis*. *Biochim. biophys. Acta*, 1954, 15, 153-154. [Biol. Div., Oak Ridge Nat. Lab., Tenn.]

388

SIMONNET, H. Bacteriostatic action of the K vitamins. *Amer. J. Med. Sci.*, 1954, 227, 700-709. [Ecole Nat. Vét., Alfort, France.]

A lecture review with 78 references.

VITAMIN B COMPLEX: GENERAL

389

JONES, A. The plate assays of vitamins of the B group. *Analyst*, 1954, **79**, 586. [Beecham Research Laboratories, Ltd., Brockham Park, Betchworth, Surrey.]

Modifications are suggested in the design, medium and standards used in estimations by the plate method of vitamin B₁, vitamin B₆, nicotinic acid, Ca pantothenate, biotin and inositol. A medium previously used for estimating riboflavin in tube tests was adapted to plate tests. (*Cf.* Absts. 3357, Vol. 19; 4997 and 5020, Vol. 20; 4930, Vol. 21; 2882, Vol. 23.)—A. M. Copping.

390

MEISEL, M. N. and POMOSHNIKOV, N. A. Primenenie radioizotopov dlya uskorenogo mikrobiologicheskogo opredeleniya vitaminov. [Use of radio-isotopes for the rapid microbiological estimation of vitamins.] *Dokl. Akad. Nauk S.S.S.R.*, 1953, **91**, 953-955. [Inst. Mikrobiol., Akad. Nauk SSSR.]

Experiments showed that, in certain conditions, the rate at which radio-active P was assimilated by proliferating yeast cells reflected during the first hours the rate of growth and cell proliferation, and actually preceded the growth process by a few hours. Energetic growth did not start until from 4 to 6 hr. after seeding, and the assimilation of P from the media used attained its maximum within that time. On this principle was based a tentative method for estimating pantothenic acid with *Saccharomyces ludwigii* and vitamin B₆ with *Saccharomyces carlsbergensis* 4228. The time required for an analysis was reduced from 40 to 48 hr. to from 4 to 6 hr. The calibration process adopted for pantothenic acid was as follows. The indicator culture was grown for 2 days at 28° C. on a sugar and mineral Rider medium containing normal amounts of the necessary vitamins apart from pantothenic acid, which was added only in trace amounts of 0.004 µg. per ml., in order to obtain a culture particularly sensitive to it. The culture thus obtained was filtered, and washed with sterilised conductivity water, pressed and then added to the test flasks. For each 100 ml. medium, 100 mg. pressed yeast with from 1 to 2.5 µC. Na₂H³²PO₄, and different amounts of pantothenic acid, were added. After 6 hr. at from 27° to 28° C. the yeast was separated by centrifuging, washed 4 times with water and suspended in 10 ml. water; 0.1 ml. of the suspension was then tested with a Geiger counter. The results showed that a calibration curve could be drawn for estimating pantothenic acid from the radio-activity of the yeast suspension.—W. Hughes.

391

SMITH, E. L. Water-soluble vitamins. 1. (Folic acid, B₁₂, CF, choline, PAB, biotin.) *Annu. Rev. Biochem.*, 1954, **23**, 245-274. [Glaxo Laboratories, Ltd., Greenford, Middlesex.]

392

HUNT, C. H., BENTLEY, O. G., HERSHBERGER, T. V. and CLINE, J. H. The effect of carbohydrates and sulfur on B-vitamins synthesis, cellulose digestion, and urea utilization by rumen micro-organisms *in vitro*. *J. Animal Sci.*, 1954, **13**, 570-580. [Dept. Animal Sci., Ohio Agric. Exp. Stat., Wooster.]

Rumen fluid from 2 steers with a rumen fistula, one fed on good alfalfa hay and one on poor timothy hay, was used for experiments in an artificial rumen. Cellulose digestion, utilisation of urea and formation of riboflavin, pantothenic acid, nicotinic acid and vitamin B₁₂ were studied.

Addition of starch to the flasks reduced the amount of cellulose digested, but increased synthesis of riboflavin and utilisation of urea. With or without starch, less riboflavin was present after 48 hr. than after 24 hr., but more was present after 96 hr. Cellulose digestion and urea utilisation were complete after 48 hr. in most experiments. More cellulose was digested and more urea was used when the inoculum came from the steer fed on alfalfa hay than when it came from that on poor hay. Sulphur added as sodium sulphate or methionine in the presence of starch increased the amounts of riboflavin, nicotinic acid and vitamin B₁₂ formed. Glutathione was not effective. Aureomycin inhibited the formation of riboflavin, nicotinic acid and pantothenic acid, but not that of vitamin B₁₂. Cystine and elemental S were less effective in stimulating vitamin synthesis than methionine and sulphate. All the S compounds, but not elemental S, reduced the amount of pantothenic acid synthesised; it is concluded that pantothenic acid is formed by organisms other than those that make the other vitamins.

Ethionine reduced the activity of all the micro-organisms.—D. Duncan.

393

BEARE, J. L., BEATON, J. R. and McHENRY, E. W. Anterior pituitary growth hormone administration in B vitamin deficiencies in the rat. *Endocrinology*, 1954, **55**, 40-44. [Dept. Pub. Health Nutrit., Univ. Toronto.]

Anterior pituitary growth hormone was administered to rats on diets lacking certain members of the vitamin B complex. Rats deprived of

riboflavin or pantothenic acid failed to respond to it, as was shown by their failure to increase in weight, but in controls receiving riboflavin and Ca pantothenate it promoted weight gain and N retention. Animals deprived of vitamin B₁ responded to growth hormone. In all the groups fasting blood urea was depressed by administration of it. The results showed the necessity for considering the constituents of the diet, as well as the amount of food consumed, when investigating the effects of growth hormone.—M. B. Richards.

394

LEVY, H. A., DiPALMA, J. R. and ALFER, C. The effects of nutritional deficiency on response to thiopental. *J. Pharmacol. Exp. Therap.*, 1953, 109, 377-386. [Div. Pharmacol., Hahnemann Med. Coll., Philadelphia, Pa.]

The response to thiopental was measured by a simple device which is described. For comparative studies a standard dose producing a standard result was established after a large number of trials on many normal animals. In mice deprived of the vitamin B complex or of riboflavin, pyridoxine or pantothenic acid, the response was moderately increased; a complete diet for 2 weeks restored the response to normal in all the animals except those deprived of pantothenic acid, which required a longer period before normal function was restored. Acute protein starvation had a similar effect. Vitamin B₁ deficiency had no significant effect on the response. Mice rendered deficient in nicotinic acid by deficient diet or by a nicotinic acid inhibitor showed a greatly enhanced response, though nicotinic acid itself had no analeptic action and did not depress the response to thiopental. It is suggested that in nicotinic-acid-deficient mice the metabolism of thiopental is abnormal because of interference with the action of dehydrogenases linked to pyridine nucleotide.—L. Wills.

395

EVANS, W. C., EVANS, E. T. R. and HUGHES, L. E. Studies on bracken poisoning in cattle. 2. 1950 Bracken poisoning experiments (Lluest farm). *Brit. Vet. J.*, 1954, 110, 365-380. [Dept. Agric. Chem., Univ. Coll. North Wales, Bangor.]

Five yearling Shorthorns were fed on a diet of hay and high-protein cake with chaffed bracken equivalent in weight to the hay consumed. All of them, including two which received molasses also, died of typical bracken poisoning. A transient rise in temperature was noticed some weeks before the terminal pyrexia. Three others, fed on the same diet except that the bracken had been steamed for from 30 to 45 min., survived; they consumed greater quantities of feed than those given untreated bracken.

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All the animals having unsteamed bracken developed pronounced leucopenia, thrombocytopenia and haemorrhages. The polymorphonuclear leucocytes were the first to be grossly diminished and terminally, the non-granular cells also were affected. There were also defects in clot retraction and increased capillary fragility. Terminally, there was a sharp rise in blood pyruvate. The animals having steamed bracken remained normal for the 84 days of the experiment. The tissues of bracken-poisoned animals had a content of vitamin B₁ lower than normal, but were not grossly depleted, and the classical signs of deficiency were absent.

Four heifers were used to test the efficacy, as therapeutic agents for bracken poisoning, of nicotinamide given orally or parenterally, folic acid, a liver extract containing vitamin B₁₂, ascorbic acid, vitamin B₁, and many other components of the vitamin B complex. All were found valueless. The same animals were used to follow the lesions in the bone marrow which preceded the blood changes; granulocytic and thrombocytic aplasia occurred, and terminally there was some interference with the erythrocyte precursors.

Blood cultures were made at critical periods in the course of the disease. Several organisms were isolated, but there was no correlation between positive cultures and occurrence of fever. The faeces at no time contained salmonella or significant numbers of worm eggs, and filtrates of bowel contents at death were not harmful to mice.

W. A. Greig.

396

PHILLIPSON, A. T. and REID, R. S. Studies of the toxicity of bracken (*Pteris aquilina*). *J. Comp. Pathol.*, 1954, 64, 243-259. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Samples of rumen contents from 2 heifers, one given a ration of which 60 per cent. was sun-dried bracken and the other given hay, were strained through gauze and centrifuged to give a sludge which was tested fresh on weanling rats given a diet deficient in vitamin B₁. In later experiments the sludge was boiled for 15 min. at pH between 1 and 2 to destroy thiaminase. The neutralised supernatant fluid was concentrated and added to the sludge.

Rats given 12 per cent. of the diet on a dry matter basis as sludge from the heifer fed on bracken did not gain weight. Injections of vitamin B₁ gave an immediate response. With sludge from the normally fed heifer as 8, 12 or 16 per cent. of the diet, optimum or slightly suboptimum weight gain was obtained.

Rats given 40 per cent. of the diet as bracken and receiving vitamin B₁ injections grew normally, but with 60 per cent. they made only small weight gains.

The heifer fed on dried bracken showed no sign

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of bracken poisoning after 66 days and the mixed ration was replaced by fresh bracken only. In previous work with 15 heifers fed on bracken, all but one showed signs of poisoning and only one recovered; there were no definite signs of vitamin B₁ deficiency and blood pyruvate did not rise significantly until from 24 to 48 hr. before death.

A. Hepburn.

397

MOURIQUAND, G., BOURRET, J., EDEL, V. and CHIGHIZOLA, R. Action de l'arsenic sur l'indice chronologique vestibulaire en terrain équilibré et en terrain d'avitaminose B. [Effect of arsenic on the index of vestibular chronaxie with a balanced diet and a diet deficient in B vitamins.] *C.R. Soc. Biol.*, 1954, 148, 692-694.

Vestibular chronaxie in the pigeon was raised by giving arsenic when the birds were receiving a normal diet. The same effect of arsenic was produced with a diet lacking the vitamin B complex, in spite of the loss of weight; the effect increased progressively until signs of vitamin deficiency were obvious.—A. M. Copping.

398

MITTLER, S. Influence of vitamins upon incidence of tumors in tu⁵⁰¹ stock of *D. melanogaster*. *Science*, 1954, 120, 314. [Armour Res. Found., Illinois Inst. Technol., Chicago.]

It had been found previously that poor nutrition reduced the incidence of tumours in a susceptible stock of *Drosophila melanogaster*. The effect was studied of adding specific vitamins to a restricted medium in which the only source of nutrient was the yeast *Hansenula anomala*. Significant increases in tumour incidence occurred in flies reared with an excess of vitamin B₁₂, riboflavin, *p*-aminobenzoic acid, pyridoxine or pantothenic acid. A diet of maize meal and molasses also increased the number of tumours. No explanation is yet suggested for the effect of a more ample diet in promoting tumour formation.—A. M. Copping.

399

VACHEL, J. P. and FÉVRIER, R. Les antibiotiques dans l'alimentation animale. [Antibiotics in animal nutrition.] *Ann. Zootech.*, 1952, 1, No. 4, 53-91; 1953, 2, No. 1, 55-103. [Stat. Recherches Élevage C.N.R.Z., Jouy-en-Josas.] A review.

400

SLINGER, S. J. and PEPPER, W. F. The effect of antibiotics on the turkey poult's need for supplementary biotin and pantothenic acid. *Poultry Sci.*, 1954, 33, 633-637. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

Turkey poults, reared for 4 weeks in a normal way on a practical diet adequate in vitamin B₁₂,

grew poorly and had a high incidence of broken feathers, diarrhoea and dermatitis. Mortality also was high. When the diet was supplemented with aureomycin and vitamin B₁₂, growth and efficiency of utilisation of feed increased, the disorders disappeared, and mortality fell. In another experiment, poults were given a good basal diet containing 0.094 mg. biotin per lb., or this diet supplemented with different amounts of biotin with or without antibiotics. Growth increased with increase in the biotin supplement, maximum weight being attained with 0.30 mg. biotin per lb. feed. When terramycin or penicillin was given in addition, maximum weight was attained with as little as 0.04 mg. of added biotin. Efficiency of feed utilisation was not improved by biotin in presence or absence of antibiotics. Penicillin reduced the poult's requirement of Ca pantothenate also. About 5.24 mg. pantothenic acid per lb. feed was adequate for good growth and to prevent dermatitis, but more was necessary for optimum feather development.—E. M. Cruickshank.

401

ADRIAN, J. Teneurs de l'œuf de poule en riboflavine, niacine et acide pantothenique. Variabilité et corrélations. [Content of riboflavin, nicotinic acid and pantothenic acid in the hen's egg. Variability and correlations.] *Ann. Zootech.*, 1952, 1, No. 3, 17-29. [Lab. Biochim. Nutrit., C.N.R.S., Bellevue, Seine-et-Oise.]

Riboflavin, nicotinic acid and pantothenic acid were estimated microbiologically in eggs bought in the open market or obtained from hens on controlled diets. The eggs were plunged into boiling water and cooked for 10 min. so that white and yolk could be completely separated. The average amounts in μ g. per whole market egg (average weight 48.9 g.) were nicotinic acid 29.45, riboflavin 224.2, and pantothenic acid 968.5. Similar values were found in eggs from hens of a known stock. Nicotinic acid and riboflavin were present in greater total amount in the white, and pantothenic acid in greater amount in the yolk. In balance experiments with 7 Rhode Island hens, the eggs contained 11.4 per cent. of the riboflavin supplied by the diet, 0.065 of the nicotinic acid and 25.2 of the pantothenic acid. There was a correlation between the riboflavin and pantothenic acid contents of the egg, but the nicotinic acid content was not related to that of the other B vitamins. From the point of view of the vitamin B complex, eggs were good sources of riboflavin and pantothenic acid, but made only a very small contribution of nicotinic acid to the diet of man.

A. M. Copping.

See also Absts. 765, 1486.

N.A. and R., January 1955

VITAMIN B₁ (ANEURIN, THIAMINE)

402

WATANABE, A., FUJIWARA, H. and YOSHIDA, T. [Sources of variation in determination of vitamin B₁. 1. Fluorimetric method. 2. Formalin-azo method. 3. Comparison of the error in vitamin B₁ assays.] *J. Pharm. Soc. Japan*, 1953, **73**, 1272-1277; 1278-1281; 1281-1283. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.] In Japanese: English summary.

403

SILIPRANDI, N. and SILIPRANDI, D. Separazione e determinazione degli esteri fosforici della tiamina mediante elettroforesi su carta. [Separation and estimation of the phosphoric esters of vitamin B₁ by paper electrophoresis.] *Riv. Ist. sieroterap. ital.*, 1954, **29**, 361-365. [Ist. Chim. Biol., Univ. Rome.] English summary.

See Abst. 4394, Vol. 24.

404

ZIMA, O. and GÖTTMANN, G. Oxydationsprodukte der Phosphorsäureester des Aneurins. [Oxidation products of vitamin B₁ phosphoric acid esters.] *Naturwissenschaften*, 1954, **41**, 214. [Forschungslab., E. Merck A.G., Darmstadt.]

A preliminary report is made on the preparation of the disulphides of vitamin B₁ phosphoric esters with chlorine or H₂O₂ as oxidising agent instead of iodine. The resulting disulphide of the orthophosphoric ester of vitamin B₁ was active in the redox test by the Warburg method, but the orthophosphoric ester itself had little activity. The disulphide of the pyrophosphoric ester was somewhat less active by the Warburg method than the pyrophosphoric ester, cocarboxylase, itself. The disulphides of both esters could be reduced by cysteine and split by diastase to give products which behaved like vitamin B₁ disulphide and did not give the thiochrome reaction. Treatment with cysteine yielded the amount of vitamin B₁ expected.

A. M. Copping.

405

YOSHIDA, S. and ISHIZUKA, W. Studies on the allied compounds of vitamin B₁. 12. Structure of N-substituted dithiourethanes (4). 13. Structure of N-substituted dithiourethanes (5). 14. On dithiocarbamates of keto-carboxylic acid esters. *J. Pharm. Soc. Japan*, 1953, **73**, 331-335; 335-339; 1954, **74**, 602-605. [Takamine Res. Lab., Sankyo Co., Ltd., Tokyo.]

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HIRANO, H. Studies on vitamin B₁ and related compounds. 52. N-substituted tetrahydrofurothiazole-2-thione and related compounds (1). 53. N-substituted tetrahydrofurothiazole-2-thione and related compounds (2). *J. Pharm. Soc. Japan*, 1954, **74**, 56-59; 59-62. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

407

KAWASAKI, H. Studies on vitamin B₁ and related compounds. 60. Thiol-type thiamine derivatives (3). *J. Pharm. Soc. Japan*, 1954, **74**, 588-590. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

408

MATSUKAWA, T., IWATSU, T. and KAWASAKI, H. Studies on vitamin B₁ and related compounds. 43. Synthesis of allithiamine homologs. (2). *J. Pharm. Soc. Japan*, 1953, **73**, 497-501. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

409

KAWASAKI, H. and NOGUCHI, S. [Studies on vitamin B₁ and related compounds. 51. Synthesis of allithiamine homologs. (4).] *J. Pharm. Soc. Japan*, 1953, **73**, 1307-1309. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.] In Japanese: English summary.

410

YURUGI, S. Studies on vitamin B₁ and related compounds. 55. Reaction between thiamine and ingredients of Allium genus plants. 1. Detection and isolation of allithiamine-like compounds. (1). 2. Detection and isolation of allithiamine-like compounds. (2). 3. Reaction of L-cysteine and allithiamine. 4. Detection of allithiamine and its homologs. 5. On the sulfur-containing ingredients of Allium Genus plants. *J. Pharm. Soc. Japan*, 1954, **74**, 502-506; 506-510; 511-514; 514-519; 519-524. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

411

FUJIWARA, M., WATANABE, H. and MATSUI, K. "Allithiamine," a newly found derivative of vitamin B₁. 1. Discovery of allithiamine. FUJIWARA, M., NANJO, H., ARAI, T. and SUZUKI-ZIRO. 2. The effect of allithiamine on living

organism. *J. Biochem., Tokyo*, 1954, **41**, 29-39; 273-285. [Dept. Hyg., Fac. Med., Univ. Kyoto.]

1. The substance in garlic which gives rise to allithiamine is distinguished from antivitamin B_1 as having only a masking effect; it does not destroy the biological activity of vitamin B_1 but destroys its response in the thiochrome reaction. The structure has been determined and the substance synthesised. The present paper summarises the history of allithiamine (see Absts. 312, 313, Vol. 23).

The extract from 0.1 g. *Allium sativum* prevented the response of 800 μ g. vitamin B_1 in the thiochrome reaction; the optimum pH was about 8, and the optimum temperature from 60° to 70° C. Presence of oxygen was not necessary. An extract of unground, boiled garlic exerted no masking action; addition of protein from ground, raw garlic restored the activity, but the protein had no activity alone.

Allithiamine was isolated by extracting raw garlic bulbs with 99 per cent. ethanol, and adding vitamin B_1 in water to the extract. Ultimate extraction of allithiamine was with ether. The substance was analysed and characterised, and a formula was allotted to it. It could be estimated by the thiochrome reaction after reduction with cysteine or other suitable agent. It was reduced by human blood.

It is reported that other species of *Allium*, some members of the Cruciferae, and animal saliva and gall contain substances which mask the thiochrome reaction.

2. Synthetic allithiamine (thiamine allyl disulphide) and an analogue were less toxic for mice in very large doses than vitamin B_1 itself.

Four groups of 5 young rats were given a diet deficient in vitamin B_1 with daily addition of 40 μ g. vitamin B_1 or of 42 μ g. thiamine allyl disulphide or its analogue or no supplement. The last group were all dead within 4 weeks. In 5 weeks the mean weight of the other groups was, respectively, 118, 127 and 132 g. Two further experiments confirmed the result. The 3 substances were equally effective in curing bradycardia in rats deprived of vitamin B_1 , and convulsions in pigeons similarly deprived.

When groups of 2 human subjects were given orally for a week at a time 0, 2, 5, 10 or 20 mg. daily of one of the 3 substances, the urinary excretion of vitamin B_1 rose with increasing dose more slowly with vitamin B_1 than with the other 2 substances, neither of which was ever excreted unchanged. Faecal excretion of vitamin B_1 , on the other hand, was greatest after administration of it.

After intravenous injection into human subjects and rabbits, the blood concentration of vitamin B_1 rose more rapidly, and remained high longer, par-

ticularly in the cells, with allithiamine than with vitamin B_1 .

After oral ingestion, the concentration of vitamin B_1 in most organs and tissues of rats was higher with allithiamine than with vitamin B_1 . In the livers of rats the percentage of phosphorylated vitamin B_1 was greater after administration of allithiamine than of vitamin B_1 . It is considered that the differences in effect of allithiamine result from its more rapid spread in tissues.

E. M. Hume.

412

HILL, R. M. and HOLTKAMP, D. E. Storage of dietary manganese and thiamine in the rat. *J. Nutrition*, 1954, **53**, 73-82. [Dept. Biochem., Univ. Colorado Med. Centre, Denver.]

Ten groups of adult rats received for 24 weeks a basal diet supplying from 0.03 to 40.0 mg. Mn daily. In some groups the intake of vitamin B_1 was kept constant at 0.03 mg. daily and in others it was one-fifth of the Mn intake. Two other groups received for 4 weeks stock diet supplying 1.1 mg. Mn and 0.05 or 8.0 mg. vitamin B_1 . Estimations were made of Mn by Ray's method (Abst. 2330, Vol. 10) and of vitamin B_1 by the manometric method of Atkin *et al.* (Abst. 2897, Vol. 9) in the liver and small intestine, and sometimes in the caecum and colon. Dietary Mn had no effect on co-carboxylase content and results are given as total vitamin B_1 .

The storage of vitamin B_1 in the liver increased with increasing intake of Mn and vitamin B_1 up to a daily intake of 10 mg. and 2.0 mg., respectively. Maximum content of vitamin B_1 was between 11 and 16 μ g. per g. fresh liver tissue. A greater storage occurred in adults aged 13 weeks than in those aged 36 weeks. When the intake of vitamin B_1 was kept constant, increase of Mn intake up to 1.0 mg. daily increased the storage of vitamin B_1 in the liver.

Storage of Mn in the liver was increased, but not proportionately, with increase of Mn intake up to 40.0 mg. With a constant Mn intake of 1 mg., Mn increased slightly in the liver with increase of vitamin B_1 from 0.03 to 0.02 mg. daily. There was no apparent maximum value for the Mn content of the liver.

The content of Mn in the intestinal tissue depended on the dietary intake, and with small intakes the values per g. were about half those in the liver; with 10 mg. daily storage was greater than in the liver. The content per g. in the caecum and colon was at least as great as in the liver. There was some evidence that Mn was more readily absorbed at low than at high concentrations.—V. R. Jackson.

413

MCCARTHY, P. T., CERECEDO, L. R. and BROWN, E. V. The fate of thiamine- S^{35} in the rat. *J.*

N.A. and R., January 1955

Biol. Chem., 1954, **209**, 611-618. [Dept. Chem., Fordham Univ., New York.]

Vitamin B₁ labelled with ³⁵S was injected into rats having diets with or without the vitamin. Urine was collected for 10 days after administration of the radio-active vitamin and the distribution of the radio-activity was measured in the inorganic sulphate, etheral sulphate and neutral sulphur fractions. Normal rats excreted 64-38 per cent. of an injection of 50 µg. vitamin B₁ with 62 per cent. of the radio-activity in the neutral sulphur fraction. Deprived rats excreted 52 per cent. of the amount injected, 46-5 per cent. being in the neutral sulphur compounds. A very little radio-activity was found in the faeces, and small amounts were present in all organs and tissues which contained vitamin B₁. The greatest amounts were found in muscle.

When oxythiamine was injected into depleted rats 24 hr. after an injection of radio-active vitamin B₁, the utilisation and oxidation of the vitamin were disturbed and a higher proportion of the radio-activity was recovered from the neutral sulphur compounds of the urine.

A. M. Copping.

414

HOTOVY, R. Über die synergistische Wirkung von Thiamin-Hydrochlorid (Betabion) und Ergometrin am Kaninchenuterus. [Synergistic effect of vitamin B₁ hydrochloride (Betabion) and ergometrin on the rabbit uterus.] *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 274-281. [Forschungslab., E. Merck A.G., Darmstadt.] French and English summaries.

Injection of 20 or 30 mg. vitamin B₁ per kg. bodyweight into mature female rabbits anaesthetised with urethane increased the oxytocic effect of injections of 50 to 200 µg. ergometrin per kg. bodyweight on blood pressure and on contraction of the uterus and vagina.—A. M. Copping.

415

STURKIE, P. D. Effects of acute thiamine deficiency on the electrocardiogram of the chick. *Poultry Sci.*, 1954, **33**, 508-510. [Lab. Avian Physiol., Rutgers Univ., New Brunswick, N.J.]

Three groups of White Leghorn chicks, 2 and 12 days old, were given a synthetic diet without vitamin B₁. About 50 per cent. died within 15 days, and most of them were dead after 28 days. Heart abnormalities developed within from 7 to 10 days. Sinus arrhythmia appeared in the early stages of deficiency, and was followed by sinus arrest and bradycardia. The heart rate, normally from 250 to 300 beats per min., was reduced to from 90 to 100 in moribund chicks. Other abnormalities recorded were depression of the S-T

segment, and occurrence of ectopic beats and A-V dissociation with nodal rhythm.

E. M. Cruickshank.

416

FEKETE, G. and PRÓKAI, A. Effect of vitamin B₁ on changes due to chronic adrenal treatment. *Acta physiol. hung.*, 1954, **6**, 41-46. [Inst. Pathophysiol., Med. Univ., Szeged.] Russian summary.

The effects of continued adrenaline treatment, which reduces the growth rate and food intake of rats, were not influenced by giving vitamin B₁. Marked differences were found between cortisone and adrenaline in their effects on the weights of the organs. Cortisone reduced the weight of the heart, adrenal glands, spleen and thymus, but adrenaline reduced the weight only of the thymus; the weight of the spleen remained unchanged, and that of the heart and adrenal glands increased. The organ weights of the animals receiving adrenaline and vitamin B₁ were similar to those of the animals receiving adrenaline only, except that the thymus atrophy induced by adrenaline was inhibited by vitamin B₁. The results suggest that the mechanisms underlying "stress" and the effects of adrenocorticotrophic hormone and adrenaline are different. It is believed that vitamin B₁ causes structural changes in the adrenocorticotrophic hormone molecule *in vivo*.

M. B. Richards.

417

STEYN-PAARVÉ, E. P. The influence of feeding oxythiamine on the thiamine pyrophosphate content of some tissues of the pigeon. *Biochim. biophys. Acta*, 1954, **14**, 440-441. [Lab. Physiol. Chem., Univ. Utrecht.]

Two groups of 6 pigeons received 2 g. casein and 18 g. sucrose daily, with a salt mixture, and vitamins including 100 µg. vitamin B₁ daily; one group received in addition 1 mg. oxythiamine daily. After 15 days the birds were killed and manometric estimation was made of vitamin B₁ pyrophosphate in the liver, heart and breast muscle, and brain; none of them showed any pronounced sign of vitamin B₁ deficiency.

In birds receiving oxythiamine there was a significant decrease in the vitamin B₁ pyrophosphate content of the heart and breast muscle corresponding to a vitamin B₁ deprivation of 4 days' duration, and a non-significant decrease in the liver and brain. Another, similar test confirmed the results.—V. R. Jackson.

418

CERCOBDO, L. R., EICH, S. and BRESNICK, E. Effects of oxythiamine and neopyrithiamine on phosphorylation of thiamine by thiamine phosphorylase from rat intestine. *Biochem. biophys. Acta*, 1954, **15**, 144-145. [Dept. Biochem., Fordham Univ., New York.]

The formation of cocarboxylase from vitamin B₁ in a system containing Mg, adenosine triphosphate and phosphorylase from rat intestine was inhibited by neopyrithiamine but not by oxythiamine. From other unpublished results it appeared that inhibition of phosphorylation depended on the presence of an amino-group in position 4 of the pyrimidine nucleus of the analogue.

A. M. Copping.

419

ONRUST, H., VAN DER LINDEN, A. C. and JANSEN, B. C. P. Triphospho-pyrithiamine and p-chloromercuribenzoate in a study of the prosthetic groups of the pyruvic acid oxidase of animal tissue. *Enzymologia*, 1954, 16, 289-297. [Netherlands Inst. Nutrit., Amsterdam.]

In a previous study (Abst. 4195, Vol. 23) it was found that diphosphothiamine and triphospho-oxythiamine completely inhibited pyruvic acid dehydrogenase in animal tissue. A similar effect was obtained with triphosphopyrithiamine but the inhibition was incomplete. As was found before, re-activation was possible in the presence of yeast. Inhibition of the pyruvic dehydrogenase was found also with p-chloromercuribenzoate; it was re-

versed with glutathione or thiomalic acid but not with thiamine or diphosphothiamine, which suggested that the SH groups required were not available from diphosphothiamine. The nature of the inhibition is discussed with reference to the redox potentials of the systems involved.

A. M. Copping.

420

KITAOKA, M., MIURA, T. and HORI, K. Glutamyl-cholin and vitamin B₁ treatment on poliomyelitis monkeys (preliminary report). *Jap. J. Med. Sci.*, 1953, 6, 475-480. [Nat. Inst. Health, Tokyo.]

The experiments were designed for the typing of different strains of poliomyelitis virus and not for testing the efficacy of treatments, so that strictly comparable untreated controls were not available. The treatment was with from 0.5 to 2 ml. of a mixture of 3 mg. glutamyl choline per ml. and 5 mg. vitamin B₁ per ml. injected intrathecally from the first day of the appearance of paralysis until paralysis ceased to progress. Of 16 treated monkeys (*Macaca cyclopes*), 13 survived and of 9 not treated, none.—E. M. Hume.

See also Abst. 1353.

RIBOFLAVIN

421

GADEN, E. L. (Jr.), PETSLAVAS, D. N. and WINOKER, J. Microbiological production of riboflavin and citric acid from citrus molasses. *J. Agric. Food Chem.*, 1954, 2, 632-638. [Dept. Chem. Eng., Columbia Univ., New York 27.]

Attempts were made to produce citric acid by cultivation of *Aspergillus niger* on raw and refined citrus molasses, which is the syrup obtained by evaporating the "press water" by-product of citrus fruit processing. The result was unsatisfactory, and the failure was attributed to the high cation content of the molasses; small amounts were found when Cu and Fe were removed by ion exchange. Fermentation time was reduced and yields were higher if a vegetative inoculum was used, but only 35 per cent. of the theoretical amount was produced in 4 days and the purification required made the procedure commercially unprofitable.

Ashbya gossypii did not produce riboflavin from raw molasses in the conditions of the test, but in preliminary tests *Eremothecium ashbyii* synthesised substantial amounts when the sugar concentration ranged from 2.1 to 4.25 per cent., and 0.3 per cent. of yeast extract had been added. The yield was highest with the highest sugar concentration. Further tests with vegetative inoculum showed that the optimum pH value was 7; the yield did not decrease as rapidly at higher as at lower pH

values. The optimum initial sugar concentration was 6 per cent.; fermentation for 9 days gave considerably higher yields than for 6, up to 720 µg. per ml. Added peptone had no effect and bone glue was detrimental. The course of riboflavin production throughout fermentation is described.

V. R. Jackson.

422

KLUNGSÖYR, L. The biosynthesis of riboflavin in *Eremothecium ashbyii*. *Acta chem. scand.*, 1954, 8, 723-727. [Biochem. Lab., Univ. Clin., Bergen.]

When incubated in a solution of inorganic salts, washed mycelium of *Eremothecium ashbyii* produced significant amounts of riboflavin, which was evidently a metabolic product in the already formed cells.

A liquid medium was inoculated with the organism and shaken for 24 hr.; 10 µC. 1-¹⁴C acetate were then added and the shaking was continued for a further 72 hr. After butanol extraction and precipitation with light petroleum, carrier riboflavin was added and the labelled product was crystallised. Less than 0.01 per cent. of the added ¹⁴C was recovered from the riboflavin.

A small amount of radio-active riboflavin was made alkaline, degraded by the action of light and then hydrolysed. The resulting products were extracted and separated by paper chromatography. They consisted of lumiflavin and lumichrome

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which had high activity while the hydrolysis product of the lumiflavin had not. Similar results were obtained with washed myosium. Carbon no. 2 in the riboflavin nucleus is lost when lumiflavin is hydrolysed, so it evidently was the one which was labelled. A tentative scheme for the incorporation of acetate into riboflavin by way of the purine nucleus is suggested.—A. Hepburn.

423

PLAUT, G. W. E. Biosynthesis of riboflavin. 1. Incorporation of C^{14} -labeled compounds into rings B and C. *J. Biol. Chem.*, 1954, 208, 513-520. [Inst. Enzyme Res., Univ. Wisconsin, Madison.]

The yeast *Ashbya gossypii*, which synthesises riboflavin, was used and, when the rate of riboflavin production was at a peak, compounds labelled with ^{14}C were added to the medium. Degradation procedures were elaborated for identifying C atoms from rings B and C of the riboflavin molecule. The pattern of incorporation of ^{14}C from specific precursors into rings B and C showed a striking resemblance to the pattern of incorporation observed in the pyrimidine portion of uric acid (Title 892, Vol. 18). The effect of different vehicles of ^{14}C was highly specific and the results are discussed with reference to the ability of purines and other substances to stimulate biosynthesis of riboflavin.—A. M. Copping.

424

SVOBODOVÁ, S., HÁIS, J. M. and KOŠTĚ, J. V. Vliv pH a světla na riboflavinové roztoky. [The influence of pH and light on riboflavin solutions.] *Chem. listy*, 1953, 47, 205-212. [Biochem. Inst., Fac. Nat. Sci., Karl's Univ., Prague.]

The decomposition of riboflavin (6:7-dimethyl-9-(D-1'-ribityl)-isocalloxazine) by light was studied by paper chromatography. The main products of photolysis in alkaline solution were lumiflavin (6:7:9-trimethyl-isocalloxazine), lumichrome (6:7-dimethylalloxazine) and the substance 27 CX, which was transformed by photolysis into lumiflavin and lumichrome. Photolysis in acetic acid caused the formation of lumichrome and substance 69 CX from riboflavin. Light converted substance 69 CX to lumichrome.

A. Jančařík (Czechoslovakia).

425

YAGI, K. Action inhibitrice des pterines sur la décomposition photochimique de la riboflavine dans la peau de *Rana nigromaculata*. [Inhibitory effect of pterins on the photochemical decomposition of riboflavin in the skin of *Rana nigromaculata*.] *C.R. Soc. Biol.*, 1954, 148, 752-753. [Fac. Med., Univ. Nagoya.]

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A piece of skin from the back of the frog was exposed for 1 hr. to artificial lighting equivalent to daylight. Paper chromatography of an extract of the skin showed no lumichrome and hence no photochemical decomposition of the riboflavin known to be present in the skin.

In a solution of riboflavin containing 200 μg . of the pterin 2-amino-4-hydroxypteridine-6-carboxylic acid, only half the amount of riboflavin was destroyed that was destroyed in a solution in water alone. The interposition of a solution of the pterin between the light and the riboflavin had no protective effect. It is concluded that pterins in the skin of the frog's back probably prevented the photochemical decomposition of riboflavin.—A. Hepburn.

426

MERKEL, J. R. and NICKERSON, W. J. Riboflavin as a photocatalyst and hydrogen carrier in photochemical reduction. *Biochim. biophys. Acta*, 1954, 14, 303-311. [Inst. Microbiol., Rutgers Univ., New Brunswick, N.J.] French and German summaries.

Experiments are described to show the reversible reduction of riboflavin by visible light in the presence of agents promoting the formation of metal complexes. It is considered that the reaction may be of biological significance in view of the abundance of riboflavin in natural materials and the presence of many natural metal chelators (substances forming metal complexes) which could control light-activated reactions.—V. R. Jackson.

427

DECKER, L. E. and BYERUM, R. U. The relationship between dietary riboflavin concentration and the tissue concentration of riboflavin-containing coenzymes and enzymes. *J. Nutrition*, 1954, 53, 303-315. [Dept. Foods Nutr., Michigan State Coll., East Lansing.]

Concentrations of free riboflavin and of the coenzymes flavin adenine dinucleotide and flavin mononucleotide were estimated in the tissues of rats on a dietary intake of riboflavin varying from 0.1 to 43.1 μg . daily. In general a daily intake of 30 μg . was required to give maximum concentrations of the two coenzymes in all tissues. In the brain their concentration was nearly independent of the riboflavin intake; in the heart greater increases were found with increasing intake, and in the kidneys and liver the coenzyme concentrations were almost doubled when the riboflavin intake was increased from 0.1 to 30 μg . daily.

The enzymic activity of the liver was similarly dependent on the riboflavin intake. Xanthine oxidase activity reached a maximum with an

intake of about 30 μ g. riboflavin daily, but D-amino-acid oxidase activity continued to increase up to an intake of over 60 μ g.—M. B. Richards.

428

ERSHOFF, B. H. Effects of riboflavin deficiency on insulin sensitivity in the rat. *Metabolism*, 1954, 3, 357-363. [Emory W. Thurston Labs., Los Angeles, Calif.]

Of 12 rats fed on a diet deficient in riboflavin, 8 developed coma with a blood sugar value below 20 mg. per cent. and died, on the average, 123 min. after the injection of insulin. The blood sugar of rats fed on a complete diet to appetite or with intake the same as that of the deprived rats fell to a minimum after about 90 hr. There were no deaths, and tests showed that riboflavin did not affect the sugar tolerance of the rats.

Rats deprived of riboflavin were less sensitive to insulin than adrenalectomised rats fed on a complete diet.—A. Hepburn.

429

WHITBY, L. G. Transglucosidation reactions with flavins. *Biochem. J.*, 1954, 57, 390-396. [Dept. Biochem., Univ. Cambridge.]

An enzyme with transglucosidase and possibly glucosidase activity was prepared from rat liver. Optimum production of riboflavinyl glucoside and glucose from maltose and riboflavin was obtained at pH 6.7. α -D-Glucose-1-phosphate inhibited the reaction competitively. There was a steady uptake of oxygen as glucose was oxidised only when the enzyme and notatin were incubated in phosphate buffer with maltose, but not with cellobiose, lactose or α -methyl glucosides. Incubation of synthetically prepared riboflavinyl β -D-glucoside or enzymically prepared riboflavinyl glucoside with the enzyme from liver showed that no riboflavin was formed by breakdown of the synthetic form, and the rate of formation of a substance assumed to be glucosflavin from maltosflavin was less than 5 per cent. of the rate of formation of riboflavin from the enzymically prepared riboflavinyl glucoside.

Flavin glucosides were synthesised by the enzyme from a number of isoalloxazine derivatives in the presence of maltose. Maltose could be replaced in the transglucosidase reaction whereby riboflavinyl glucoside was produced by maltulose or turanose, but not by a number of other sugars.

When riboflavinyl glucoside was shaken in phosphate buffer for 2 days at 20° and 37° C., it was stable, and had solubilities at the 2 temperatures of 2.2 and 3.5 mg. per ml., compared with 0.1 and 0.2 mg. per ml. for riboflavin. It is sug-

gested that the much higher solubility of the glucoside may be of importance in the transport of riboflavin.—V. R. Jackson.

430

FORKEE, B. R. and MORGAN, A. F. Effect of adrenocortical hormone on the riboflavin-deficient rat. *J. Biol. Chem.*, 1954, 209, 303-311. [Dept. Home Econ., Univ. California, Berkeley.]

The effect of deprivation of riboflavin was to reduce glyconeogenesis in rats exposed for 24 hr. to an oxygen tension equivalent to an altitude of 20,000 ft. The tests were made after 1, 3, 5, 8 and 12 weeks of a diet without riboflavin, and the defect of carbohydrate metabolism was not apparent until the fifth week of deprivation. From that time there was a rapid decrease in production of sugar in response to anoxia. Administration of riboflavin or adrenal cortical extract or cortisone before exposure to anoxia restored the glycogenic function completely. Deoxycorticosterone was without effect, and riboflavin given to adrenalectomised rats did not improve their ability to counteract anoxia by increased sugar production. It is suggested that "a riboflavin-containing enzyme may be a necessary link in the trigger mechanism of the pituitary-adrenal system".—A. M. Copping.

431

WEISBURGER, J. H., WEISBURGER, E. K. and MORRIS, H. P. The effect of riboflavin on the metabolism of 2-acetylaminofluorene-9-C¹⁴ in rats. *J. Nat. Cancer Inst.*, 1954, 15, 37-47. [Nat. Cancer Inst., Bethesda, Md.]

A single dose of 9.18 mg. 2-acetylaminofluorene-9-¹⁴C in propylene glycol was given to rats on normal diet, rats which had been deprived of riboflavin for 7 weeks and 2 rats which had received a riboflavin supplement for one week. The animals were killed 36 hr. later and radioactivity was measured in certain organs and tissues. The residual radioactivity in the upper gastrointestinal tract was higher in rats deprived of riboflavin, showing that riboflavin deficiency delayed the absorption of the radio-active material. The distribution of radioactivity in other organs and tissues was similar for all the animals. The deprived animals excreted a greater proportion of water-soluble metabolites and a smaller amount of ether-soluble metabolites than normal animals. The amount of radioactivity bound to tissue proteins was not demonstrably different in normal and deprived animals.—A. M. Copping.

See also Absta. 387, 1353.

NICOTINIC ACID (NIAcin)

432

ROSENTHAL, H. L. On the fluorometric determination of N¹-methylnicotinamide. *Science*, 1954, 120, 231. [Rochester 8, N.Y.]

The use of H₂O₂ in preparing samples for fluorimetric estimation of N¹-methylnicotinamide sometimes led to complete destruction of the nicotinamide. Salts of cerium and iridium in very low concentration were more effective catalysts than H₂O₂ in the formation of the fluorescent naphthyrindine compound. A full report on conditions affecting its formation is in preparation.

A. M. Copping.

433

OKA, Y. Studies on hydrolytic enzyme of nicotinamide. 1. Nicotinamidase of beer yeast. 2. Purification of nicotinamidase of beer yeast. *J. Biochem., Tokyo*, 1954, 41, 89-99; 101-106. [Dept. Med. Chem., Fac. Med., Univ. Kyoto.]

1. The amidase of a dried acetone preparation of brewer's yeast, tested by measuring ammonia production in Conway's apparatus, hydrolysed nicotinamide and asparagine but not acetamide or benzamide. Nicotinamidase was separated from asparaginase by autolysing pressed yeast with ethyl acetate. The enzyme was inhibited to a varying extent by Hg, Cu, Fe and Co salts but not by MnCl₂. Cysteine, KCN, iodoacetic acid, sodium fluoride and sodium fluoride hydrofluoride had no apparent effect at the pH optimum of from 7 to 7.5. Very little nicotinamidase was found in liver and kidney, which were rich in asparaginase.

2. Fractionation with 45 per cent. acetone produced considerable concentration of the nicotinamidase activity of yeast, and subsequent adsorption on calcium phosphate gel and elution with phosphate buffer at pH 7 produced a fraction with 15 times the enzyme potency of the starting material.—A. M. Copping.

434

SALMON, W. D. The tryptophan requirement of the rat as affected by niacin and level of dietary nitrogen. *Arch. Biochem. Biophys.*, 1954, 51, 30-41. [Dept. Animal Husb., Agric. Exp. Stat., Alabama Polytech. Inst., Auburn.]

Growing rats were fed for 4 weeks on basal diets containing purified casein supplemented with L-cystine, salts, maize oil, choline chloride, sucrose and all vitamins except nicotinic acid. Additions were made at the expense of the sucrose.

When the diet contained 40 per cent. maize grits, the normal weight gain of 25 g. weekly was achieved with a minimum of 21 per cent. casein in the diet, the total tryptophan content being 0.3 per cent., or with 9 per cent. casein and added

DL-tryptophan to make the total 0.19 per cent., or with from 6 to 9 per cent. casein and 2 mg. per cent. added nicotinic acid. The utilisation of N was much more economical on the last 2 diets. The results showed that added DL-tryptophan was more effective than that contained in casein and that a diet of low casein content could be made adequate for growth if supplemented with nicotinic acid.

When the casein in the diet with maize grits was replaced by 12 per cent. of an acid hydrolysate of casein, normal growth was obtained with 0.2 per cent. of added DL-tryptophan, or with 0.1 per cent. if 2 mg. per cent. of nicotinic acid also was included, in which case the casein hydrolysate could be reduced to 7 per cent. without significantly reducing the rate of weight gain. If the extra tryptophan was omitted, massive doses of nicotinic acid, up to 200 mg. per cent., were of no benefit. Growth on a diet containing 7 per cent. casein and 40 per cent. maize grits was depressed, and utilisation of food and nitrogen reduced, even when 4 mg. per cent. of nicotinic acid was present, if 12 per cent. casein hydrolysate or 11.3 per cent. gelatine was included. To secure normal growth extra tryptophan, 0.1 per cent., was needed, which made the total equal to twice the amount in the basal diet. Similar results were obtained when the maize grits were replaced by 7 per cent. maize gluten meal. Even when the casein was increased to 20 per cent., the total tryptophan content being 0.3 per cent., addition of 10 per cent. gelatine depressed growth unless counteracted by 2 mg. per cent. nicotinic acid. The action of added glycine, from 2.6 to 5 per cent., was similar to that of gelatine. In a diet containing 9 per cent. casein but no maize grits, casein hydrolysate, from 2 to 12 per cent., depressed still further the subnormal growth; inclusion of 2 mg. per cent. nicotinic acid improved matters, but extra tryptophan was needed to secure normal weight gain and good utilisation of food and N.

It is concluded that the requirement of the rat for tryptophan is not constant. With adequate nicotinic acid in the diet the requirement at a dietary protein level of 10.8 per cent. was 0.13 per cent. and in absence of nicotinic acid 0.19 per cent. With a protein, casein, level of about 20 per cent. without nicotinic acid, the requirement was 0.3 per cent. Tryptophan-deficient protein or protein hydrolysate, even in presence of excess nicotinic acid, consistently depressed growth; the effect could be corrected by adding DL-tryptophan. The effect of such tryptophan-deficient materials was to reduce utilisation of tryptophan and thus to increase the requirement.—H. Chick.

435

SUBRAHMANYAM, K. **Tryptophane-sparing effect of nicotinic acid.** *Indian J. Med. Res.*, 1954, **42**, 211-214. [Sriram Chandra Bhanj Med. Coll., Cuttack.]

The effect of nicotinic acid on tryptophan requirement was studied in N balance experiments with rats given a basal diet of low tryptophan content, alone or with supplements of tryptophan with or without nicotinic acid. The biological value of protein low in tryptophan was enhanced by additional tryptophan and with a small supplement the effect was further increased by giving nicotinic acid. With adequate addition of tryptophan, nicotinic acid had no further effect. The interrelation of tryptophan and nicotinic acid metabolism is briefly discussed.—A. M. Copping.

436

GHOSH, N. C., CHATTERJEE, K., CHATTOPADHYAY, D. P. and BANERJEE, S. **Liver as the site of synthesis of nicotinic acid from tryptophan in rats.** *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 346-347. [Dept. Physiol., Presidency Coll., Calcutta.]

Rats, of bodyweight 125 to 175 g., fed for one week on a basal diet deficient in nicotinic acid but containing 1 per cent. DL-tryptophan, received by intraperitoneal injection 0.03 ml. carbon tetrachloride per kg. bodyweight, daily for one week. Estimation in 24-hr. samples of urine of nicotinic acid, quinolinic acid and N-methylnicotinamide showed a great reduction in the amount of them after the injections, the respective values in g. falling from 50 to 29, 474 to 117 and 603 to 187.

Livers were homogenised immediately after death from two groups of rats on the same basal diet, of which one group had received injections of carbon tetrachloride for 7 days. Nicotinic acid and quinolinic acid were estimated in portions of the liver from both groups, before and after 30 minutes' incubation with DL-tryptophan, 10 mg. in 5 ml. of a suitably buffered solution. The results showed that the livers from neither group could convert tryptophan to nicotinic acid, but that the livers from the normal rats could convert it to quinolinic acid more efficiently than the livers damaged with carbon tetrachloride.

It is suggested that the liver is the principal site for synthesis of nicotinic acid from tryptophan.

H. Chick.

437

FRIED, R. and CARVALHO DA SILVA, A. **Some effects of nicotinamide, diammonium citrate and urea as supplements to low-protein diets.**

Effects of nicotinamide and nitrogen supplements in low-protein diets containing sulfonamides. *Internat. Ztschr. Vitaminforsch.*, 1954, **25**, 281-294; 295-302. [Dept. Physiol., Sch.

Med., Univ. São Paulo, Brazil.] French and German summaries.

The first paper describes the growth of weanling rats on purified diets containing 8 per cent. casein. Supplements of urea or of diammonium citrate, of nitrogen content equivalent to 10 per cent. protein, were added to the diet of some groups. In some, nicotinamide was given alone or with one of the non-protein nitrogen supplements. Both urea and diammonium citrate produced good growth in the presence of nicotinamide and both tended to be toxic if given without nicotinamide. The diammonium citrate was more toxic than urea. Nicotinamide alone caused some improvement of growth on the low-protein diet. When the casein content of the diet was reduced to 6, 4 or 2 per cent., nicotinamide increased the growth rate or prevented loss of weight and death. Urea and diammonium together permitted growth with very low intakes of casein.

Studies were made also of weight recovery after 23 or 27 days of protein depletion on a diet with 8 per cent. casein, and again nicotinamide alone or combined with urea was an effective supplement. Diammonium citrate did not permit weight recovery.

The xanthine oxidase activity of the liver reflects protein utilisation, so the activity of this enzyme was measured in the livers of rats from some of the experiments. Nicotinamide, urea and small amounts of diammonium citrate in the diet stimulated xanthine oxidase activity; the most marked activity occurred in livers from rats given nicotinamide and urea.

Tests with weanling mice showed growth responses to nicotinamide and urea similar to those of rats. Supplements of urea or diammonium citrate given alone depressed the growth of mice.

In the second paper the effects are reported of some insoluble sulphonamides on rats having diets with 8 per cent. casein and supplements of urea or diammonium citrate with or without nicotinamide. Sulphasuxidine proved more toxic than sulphathalidine incorporated as 2 per cent. of the diet, and the toxicity of the sulphasuxidine was less easily counteracted by nicotinamide and urea. A supplement of nicotinamide or urea given separately was not protective against the effects of sulphasuxidine. With sulphathalidine nicotinamide alone improved growth. The problem of the toxicity of sulphonamides with low-protein diets is discussed.—A. M. Copping.

438

JONES, K. M. and ELLIOTT, W. H. **The synthesis of nicotinic acid by rat kidney mitochondria.** *Biochim. biophys. Acta*, 1954, **14**, 536-587. [Dept. Biochem., Univ. Oxford.]

N.A. and R., January 1955

Slices of rat kidney cortex incubated with nicotinic acid and sodium fumarate synthesised nicotinic acid, which was identified by chromatography. Synthesis did not occur in anaerobic conditions. Rat liver preparations also synthesised nicotinic acid.—A. M. Copping.

439

FLYNN, L. M., ZUBER, M. S., LEWEKE, D. H., GRAINGER, R. B. and HOGAN, A. G. **Relation between protein content of corn and concentration of amino acids and nicotinic acid.** *Cereal Chem.*, 1954, **31**, 217-228. [Dept. Agric. Chem., Univ. Missouri, Columbia.]

Tryptophan, lysine, methionine and nicotinic acid were estimated microbiologically, and cystine chemically, in hydrolysates of the kernels of Jumbo Yellow Dent maize of varying protein content.

Whole dry maize of low protein content contained on the average 9.9 per cent. crude protein and that of high protein content 14.3 per cent. Contents in mg. per 100 g. dry matter in low-protein maize were tryptophan 87, lysine 314, methionine 199, cystine 144 and nicotinic acid 2.53. Corresponding values for high-protein maize were 99, 380, 239, 182 and 2.40. The amount per g. protein of each of the nutrients decreased as the protein content increased, though the changes in sulphur-containing amino-acids were slight.

As the percentage of crude protein increased, the proportion of zein in the protein increased also, causing a decrease in the concentration of the essential nutrients tryptophan and lysine, which, it is thought, should be taken into account when protein yields are increased heavily by use of fertilisers.—V. R. Jackson.

440

TEAS, H. J., TEAS, A. N. and CAMERON, J. W. **Niacin relationships in developing and mature maize endosperms of brittle and related genotypes.** *Cereal Chem.*, 1954, **31**, 250-256. [U.S. Dept. Agric., Fed. Exp. Stat., Mayaguez, Puerto Rico.]

Two mutant recessive genotypes of brittle-type maize were studied. The kernels were similar in appearance, with their colour darker than normal, and a degree of wrinkling and transparency intermediate between sugary and normal types. The endosperms had 46 and 66 per cent. of normal weight. Nicotinic acid was estimated in the kernels and in normal kernels at intervals of from 14 to 46 days after pollination. In one of the 2 types, after 14 days, there was a slight but significant difference in nicotinic acid content from the normal and after 21 days no difference. After 25 days and subsequently the mutant had a content higher than normal. In the other type, the differences from normal were significant from 14 days

on. Both the brittle types had the higher nicotinic acid content which increased rapidly from 14 to mid-development after 39 days, and then decreased. The differences were larger on a dry weight basis than for individual endosperms, as the dry weight of the endosperms was considerably below normal from 25 days on.

Kernels showing both recessive sugary and brittle characters contained no more nicotinic acid than sugary kernels from the same ear, but on a weight basis their content was twice as high, giving the greatest value yet recorded for nicotinic acid in maize kernels.—V. R. Jackson.

441

BRESSANI, R., MARCUCCI, E., ROBLES, C. E. and SCRIMSHAW, N. S. **Nutritive value of Central American beans. 1. Variation in the nitrogen, tryptophane, and niacin content of ten Guatemalan black beans (*Phaseolus vulgaris*, L.), and the retention of the niacin after cooking.** *Food Res.*, 1954, **19**, 263-268. [Inst. Nutric. Centro América y Panamá, Guatemala.]

Ten samples of black beans, *Phaseolus vulgaris*, from the 1950 autumn crop were obtained in different regions of Guatemala. Estimation was made in September 1951 of N, tryptophan and nicotinic acid in the beans raw and boiled for 3½ hr. at 96°C.

The percentage of moisture ranged from 5.1 to 11.1, average 8. On a 10 per cent. moisture basis, the percentage of N ranged from 2.92 to 3.64, corresponding to 18.3 and 22.8 per cent. protein. The differences in protein content between varieties were highly significant. The percentage of tryptophan ranged from 0.13 to 0.19, average 0.17, and was not related to variations in the N content. The nicotinic acid content ranged from 2.14 to 2.53, average 2.42, mg. per 100 g., and the values tended to vary with the tryptophan but not with the N content. Differences in vitamin content between varieties were significant.

The percentage retention of nicotinic acid in the cooked beans ranged from 84.2 to 95.1, average 88.5. The average percentage of moisture after cooking was 76.3. Differences in vitamin content were greater than between raw samples.

It is estimated that the Guatemalan Indian diet of maize and black beans provides 0.36 g. tryptophan and nearly 8 mg. nicotinic acid daily, which may explain the absence of pellagra from Central America, where the popular diet contains large quantities of maize.—V. R. Jackson.

442

ROHRLICH, M. **Die Nicotinsäure im reifenden Sauermilchkäse. [Nicotinic acid in ripening sour milk cheese.]** *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, **99**, 109-117.

In view of the known importance of nicotinic acid in the metabolism of lactobacilli, the occurrence of the vitamin in milk curd during ripening was investigated. During 8 days there was an increase in total nicotinic acid in the curd from an original value of about 6 to about 20 μg . per g. in the fully ripe sour milk cheese. The content of the crust was always greater than of the curd. If ripening was hastened by raising the temperature of the cheese room to from 22° to 24° C., the nicotinic acid content of the curd was higher than at the usual temperature of from 16° to 17° C. The high concentration in the crust was associated with

the growth of yeasts which were shown to be capable of synthesising nicotinic acid. In the later stages of ripening an increase of lactobacilli and other organisms occurred and was associated with the development of the typical flavour of the cheese. It is considered probable that the nicotinic acid synthesised by the yeasts in the crust was important for the growth of the other organisms in the centre of the cheese. The acidity of the curd was shown to influence the distribution of nicotinic acid between the crust and the centre of the ripened cheese.—A. M. Copping.

VITAMIN B₆ (PYRIDOXINE, ADERMIN)

443

McHENRY, E. W. Studies on the functions of vitamin B₆. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 7*, 1953, 21-30. [Sch. Hyg., Univ. Toronto.]

444

BUTLER, L. C. and MORGAN, A. F. Weight, ascorbic acid and cholesterol changes in adrenals of pyridoxine-deficient adult male rat. *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 264-266. [Dept. Home Econ., Univ. California, Berkeley.]

The functional capacity of the adrenal glands of rats deprived of vitamin B₆ was measured by their response to adrenocorticotrophic hormone after removal of the pituitary gland, and by the response of intact animals to low oxygen tension. In hypophysectomised rats deprivation of vitamin B₆ did not arrest the removal of ascorbic acid or the increase of adrenal gland weight in response to the hormone. There was no change in the cholesterol content of the adrenal glands. At low oxygen tension, normal intact animals showed characteristic loss of adrenal cholesterol, but rats deprived of vitamin B₆ did not do so, and the weight and ascorbic acid content of the adrenal glands were maintained.—A. M. Copping.

445

MAKINO, K., KINOSHITA, T., ARAMAKI, Y. and SHINTANI, S. Atoxypyrimidine action of vitamins of the B₆ group. *Nature*, 1954, **174**, 275-276. [Dept. Biochem., Med. Sch., Univ. Kumamoto, Japan.]

In extension of a previous report that pyridoxamine had a strong inhibitory action on the toxic effects of 2-methyl-6-amino-5-hydroxymethylpyrimidine in mice (*Nature*, 1954, **173**, 34) it was shown that pyridoxine and pyridoxal exerted a similar action.—A. M. Copping.

446

BEATON, J. R. and GOODWIN, M. E. Thyroid feeding and vitamin B₆ deprivation in the rat. *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 426-428. [Dept. Pub. Health Nutrit., Univ. Toronto.]

Previous studies (Abst. 3053, Vol. 24) showed that neither thyroidectomy nor administration of thiouracil altered the vitamin B₆ deficiency syndrome. The effect of giving 1 mg. desiccated thyroid per g. diet was investigated with rats weighing about 100 g., given a purified diet with or without vitamin B₆. Thyroid feeding was continued for 21 days and, although it further reduced the weight gain of rats deprived of vitamin B₆, it did not alter the Hb concentration, packed cell volume or amino-N of the blood. It reduced the high value for blood urea of deprived rats, but it had no demonstrable effect on the development of skin lesions or other signs of vitamin B₆ deficiency.

A. M. Copping.

447

BEATON, J. R. The relation of vitamin B₆ and riboflavin to protein metabolism. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 8*, 1954, 1-13. [Dept. Pub. Health Nutrit., Univ. Toronto.]

448

BRAUNSHTEIN, A. E. and SHEMYAKIN, M. M. Teoriya protsessov aminokislotoznogo obmena, kataliziruemykh piridoksalevymi enzimami. [Theory of the process of amino-acid metabolism, catalysed by pyridoxal enzymes.] *Biokhimiya*, 1953, **18**, 393-411. [Inst. Biol. Khim., Akad. Med. Nauk SSSR.]

A detailed account is given of a theory advanced earlier (see Abst. 4277, Vol. 23), according to which reactions involving amino-acids that are catalysed by phosphopyridoxal enzymes can be explained by the capacity of the aldehyde group of the phosphopyridoxal-protein to interact with the amino

groups of the amino-acids to form the respective azomethines (Schiff bases). In the azomethines, redistribution of the electron density may occur such that the character of carbon atom 1 is changed. The electron density on this atom should be less than on the α -carbon atom of the original amino-acid, which accounts for the difference in the character of these carbon atoms. It is because of the difference in electron density that the azomethine formed can undergo reactions which the original amino-acid could not. Some of these reactions are, no doubt, related to changes in the hydrogen atom and in electron density on atoms 1, 3, 5, 7 and 9 in the anion formed; tautomeric forms of the azomethines are possible which are N-substituted α -amino-acids. Hence in their chemical character the azomethines are nearer to the α -keto-acids than to the original α -amino-acids, and therefore react more like the keto-acids. The type of conversion which any given amino-acid undergoes depends on the nature of the protein moiety of the enzyme and on the structure of the amino-acid concerned. The theory is applied to illustrative reactions.—W. Hughes.

449

BEREZOV, T. T. Rol' vitamina B₆ v obmene L- i D-aminokislot v organizme zhivotnykh. Vliyane B₆-avitaminoza na prizhiznennye prevrashcheniya L- i D-fenilalanina u kryss. [The role of vitamin B₆ in the interchange of L- and D-amino-acids in animal organisms. The influence of vitamin B₆ deficiency on the transformation of L- and D-phenylalanine in living rats.] *Dokl. Akad. Nauk S.S.S.R.*, 1952, **86**, 605-608. [Inst. Biol. Khim., Akad. Med. Nauk SSSR.]

The urine of 4 rats deprived of vitamin B₆ and of 4 non-deprived rats was analysed for total N, urea, ammonia, amino- and peptide N, and undetermined N calculated by difference, before and after oral administration of L- or D-phenylalanine. Before administration of L- or D-phenylalanine, urea N was significantly less in the deprived animals than in the non-deprived, and undetermined N was correspondingly higher; the values for ammonia, amino- and peptide N were normal. In deprived animals as soon as L- or D-phenylalanine was given, retention of N occurred, and when the amount was increased total urine N was somewhat less even than before the amino-acid was given, which is regarded as a manifestation of enhanced phenylalanine toxicity during vitamin B₆ deficiency.

Administration of phenylalanine, particularly the D-form, led to a slight increase in excretion of peptide and amino-N. L-Phenylalanine gave a further strong decrease in urea, both absolute and relative, and a corresponding increase in undetermined N. On the other hand, on giving D-

phenylalanine, excretion of urea by test rats increased and there was a sharp decrease in undetermined N. In comparison with non-deprived rats, when L-phenylalanine was given, the total aromatic products increased from 3.5 to 4 times, primarily at the expense of phenolic acids. There was only an insignificant increase on giving the D-form, and there was a sharp increase in excretion of phenylpyruvic acid balanced by reduced excretion of hydroxy-aromatic products. The results are in harmony with the assumption that the decomposition of L-phenylalanine and its formation from phenylpyruvic acid in the rat organism proceed by transamination.—W. Hughes.

450

BEREZOV, T. T. Vliyane B₆-avitaminoza na prizhiznennye prevrashcheniya L- i D-triptofana. [Influence of vitamin B₆ deficiency on changes of L- and D-tryptophan *in vivo*.] *Dokl. Akad. Nauk S.S.S.R.*, 1953, **90**, 623-626. [Inst. Biol. Khim., Akad. Med. Nauk SSSR.]

Four rats deprived of vitamin B₆ and 4 not deprived were given from 1.7 to 4 m.mol. of L- or D-tryptophan by mouth. Before and after administration, N fractions, α -keto-acids, tryptophan, kynurenine and xanthurenic acid were estimated in the urine. Tryptophan and its cyclic metabolic products in the urine were investigated also by paper chromatography. From his results the author concluded that transamination occurs in the synthesis of L-tryptophan from keto-acid (indolepyruvic acid) and in the formation of urea from the amino group of L-tryptophan, directly or after conversion of L-tryptophan into L-kynurenine or L-alanine. In accordance with the concept of "indirect" mechanisms for urea formation and deamination of L-amino acids, L-tryptophan behaves like L-phenylalanine in deficiency of vitamin B₆ (see previous Abst.); it is not used for urea synthesis and is consequently not deaminated. The amino group of D-tryptophan is split off by D-amino-acid oxidase, and in vitamin B₆ deficiency goes directly into urea. But, just as when D-phenylalanine is given to rats deprived of vitamin B₆, breakdown of transamination hinders the conversion of the α -keto-acid formed into the L-amino-acid (i.e., inversion of D-tryptophan), and this leads to excretion of large amounts of indolepyruvic acid and unused D-tryptophan.

The formation of D-kynurenine from D-tryptophan as found by Kotake was not observed in the present experiments.—W. Hughes.

451

BEREZOV, T. T. Vliyane B₆-avitaminoza na obmen L-glyutaminovoi i L-asparaginovoi kislot, glitsina i uksusnokislologo ammoniya v

organizme krysy. [Effect of vitamin B₆ deficiency on metabolism of L-glutamic and L-aspartic acids, glycine and ammonium acetate in the rat organism.] *Dokl. Akad. Nauk S.S.S.R.*, 1953, 90, 1087-1090. [Inst. Biol. Khim., Akad. Med. Nauk SSSR.]

Experiments on rats deprived of vitamin B₆ showed that the N of L-aspartic acid and ammonia was freely changed to urea, but the synthesis of urea from L-glutamic acid was severely disrupted. The formation of urea from glycine was not affected. The author concludes, therefore, that transamination probably does not play an essential part in the disappearance of glycine. The decrease of urea formation in vitamin B₆ deficiency is, therefore, not caused by a breakdown in one of the stages of the ornithine cycle. The N of those acids which are deaminated without the participation of vitamin B₆ enzymes, such as D-acids oxidised by D-amino-acid oxidase, and of certain L-amino-acids, is easily converted by way of ammonia into urea during vitamin B₆ deficiency. The cessation of urea formation from L-glutamic acid indicates that glutamic acid can proceed to urea only by way of aspartic acid, that is to say, by transamination. It follows further that deamination of glutamic acid in the liver and other organs by active glutamic dehydrase, with the participation of the coenzyme, does not play an essential part in the catabolism of L-glutamic acid in the rat organism.—W. Hughes.

452

GORYACHENKOVA, E. V., VOLOVNIK, B. Ya. and ZAIDEL'MAN, F. R. Vliyaniye nedostatochnosti vitamina B₆ na obrazovanie merkapturovoi kisloty i na peresul'pirovanie v organizme krysy. [The effect of vitamin B₆ deficiency on the formation of mercapturic acid and on sulphur transfer in the rat organism.] *Dokl. Akad. Nauk S.S.S.R.*, 1953, 93, 111-114. [Inst. Biol. Khim., Akad. Med. Nauk SSSR.]

It was established in tests on normal rats and rats deprived of vitamin B₆ that, after administration of bromobenzene, additional excretion of mercapturic acid for a 24-hr. period during which DL-methionine was administered was almost the same for both sets of animals. No difference was found between the 2 groups in the amount of radio-active S transferred from labelled methionine to the mercapturic acid excreted. There was also no difference in the amount of radio-active S transferred from the methionine to the cysteine of the proteins from internal organs when the rats were killed 24 hr. after they had been given methionine. When the experimental time was reduced to 4 or 6 hr., and an additional amount of unlabelled methionine was given in addition to the ³⁵S-methionine, less radio-active S was transferred

from methionine to the cysteine of protein from the liver and other organs in the rats deprived of vitamin B₆.—W. Hughes.

453

GORYACHENKOVA, E. V. Aktivnost' fermentnoi sistemy peresul'firovaniya v razlichnykh organakh krysy v norme i pri B₆-avitaminoze. [The activity of the sulphur-transfer enzyme system in organs of rats kept in normal conditions and deprived of vitamin B₆.] *Dokl. Akad. Nauk S.S.S.R.*, 1953, 93, 319-320. [Inst. Biol. Khim., Akad. Med. Nauk SSSR.]

It was shown experimentally, in the present work, that transfer of S (see Abst. 458, Vol. 22) could occur in healthy rats not only in the liver but also in the spleen, kidney and heart, in that order of activity, but did not occur in brain tissue or in skeletal muscle. In deficiency of vitamin B₆, transfer of S was greatly disturbed; it disappeared completely from the heart and almost completely from the liver; in the kidneys and spleen transfer of S was reduced by from 30 to 40 per cent. but still remained at a fairly high level.—W. Hughes.

454

BEATON, J. R., GOODWIN, M. E., OZAWA, G. and MCHENRY, E. W. The effects of vitamin B₆ and deoxyypyridoxine on urea formation in rats. *Arch. Biochem. Biophys.*, 1954, 51, 94-101. [Dept. Pub. Health Nutrit., Sch. Hyg., Univ. Toronto.]

The formation of urea in liver slices was increased in rats deprived of vitamin B₆ but not significantly in rats given the antivitamin deoxyypyridoxine, which increased the external signs of deficiency. The increase in urea was probably mediated through the ornithine cycle, as liver arginase activity was similarly increased by deprivation of vitamin B₆. The ratio of blood urea to arginase activity was constant in the presence or absence of vitamin B₆. Deoxyypyridoxine decreased the arginase activity in vitamin-B₆-depleted rats.

The failure of deoxyypyridoxine to accentuate the abnormal N metabolism produced by deficiency of vitamin B₆ seemed to favour the absence of any direct relation between N metabolism and the external signs of vitamin B₆ deficiency.

A. Hepburn.

455

KOTAKE, Y. (Jr.), INADA, T. and MATSUMURA, Y. Studies on xanthurenic acid. 5. Experiments of protracted accumulative effects of xanthurenic acid causing chronic diabetic symptoms in white rats.

KOTAKE, Y. (Jr.) and INADA, T. 6. Effect of xanthurenic acid upon glycogen contents in liver, heart muscle and skeletal muscle. *J.*

Biochem., Tokyo, 1954, **41**, 255-261; 263-266.
[*Biochem. Dept., Med. Coll., Wakayama.*]
See *Abst.* 4443, Vol. 24.

456

KOTAKE, Y., KOTAKE, Y. (JR.) and INOUE, A. Research on xanthurenic acid. 7. On the "xanthurenicase".

KOTAKE, Y. (JR.) and KAMADA, J. 8. Interactions between xanthurenic acid and acetone bodies in rats. *Proc. Japan Acad.*, 1954, **30**, 36-41; 122-127. [*Biochem. Dept., Med. Coll., Wakayama.*]

7. Since xanthurenic acid was found to be a diabetogenic substance occurring naturally in the organism, some agency was sought which might counteract it.

When the liver or kidney tissue of rat or rabbit was incubated with xanthurenic acid and phosphate buffer at pH 7.0, the xanthurenic acid progressively disappeared. The conditions most favourable to the destruction were studied with rabbit liver. The most favourable pH and temperature were 7.2 and 38° C. Activity was destroyed at 80° C., and was considerably inhibited by KCN, NaF and moniodoacetic acid, in suitable concentration. On fractionation with saturated ammonium sulphate, the activity went with the globulin fraction. The activity was adsorbed on kaolin and eluted with sodium carbonate. The active agent is presumed to be an enzyme and is called xanthurenicase. After disappearance of xanthurenic acid through the activity of the enzyme, hydrolysis did not restore it, and an unidentified spot appeared on paper chromatography. The extraction liquid of the spot, presumed to represent a decomposition product of xanthurenic acid, was tested spectrophotometrically and had a maximum of absorption at 276 mμ.

8. Xanthurenic acid and total acetone bodies were estimated in the urine of rats weighing from

150 to 200 g., fed on a diet high in fat or on one low in vitamin B₆.

In rats [presumably fed on normal diet] 50 mg. per kg. bodyweight xanthurenic acid were injected every other day for many weeks. The total acetone bodies in the urine progressively increased till the value reached 7 times the initial one. When the rats thus injected were fed on either of the 2 experimental diets, acetone bodies increased to 10 times the initial value.

Rats were given for 3 days 0.4 g. daily of Na butyrate with and without daily injection of 1 mg. anthranilic acid. With the butyrate alone, the total acetone bodies increased greatly, but to only half that extent if anthranilic acid was given as well. In a similar experiment 2 mg. pyridoxine had the same effect.

Excretion of xanthurenic acid in the urine after administration of 100 mg. tryptophan was greatly increased when 1500 mg. acetoacetic acid were given as well. Smaller and larger amounts had less effect.—E. M. Hume.

457

HASSINEN, J. B., DURBIN, G. T. and BERNHART, F. W. The vitamin B₆ content of milk products. *J. Nutrition*, 1954, **53**, 249-257. [Res. Development Dept., Nutrit. Div., Wyeth Laboratories, Inc., Mason, Mich.]

Vitamin B₆ was estimated with *Saccharomyces carlsbergensis* in fresh milk and milk products. It was found that the heat used to sterilise liquid products caused a considerable decrease in vitamin B₆ potency which progressed for as long as 7 days after the initial heating. Added pyridoxine was more resistant to heat treatment of milk products than pyridoxal, pyridoxamine, or the form of the vitamin occurring naturally in the milk. Liquid products contained from 33 to 64 per cent. of the vitamin in the fresh milk, dried ones from 69 to 89 per cent.—A. M. Copping.

PANTOTHENIC ACID

458

WIELAND, O. Funktion und physiologische Bedeutung des Coenzym A. [The function and physiological significance of coenzyme A.] *Klin. Wochenschr.*, 1954, **32**, 385-392. [*Biochem. Abt., Chem. Lab., Univ. Munich.*]
A review.

459

LEFEBVRES, J. Influence d'une déficience pantothenique légère sur les résultats de la gestation chez la ratte. [Effect of slight pantothenic acid deficiency on the results of gestation in the rat.] *C.R. Acad. Sci.*, 1954, **238**, 2123-2125.

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For from 3 to 11 days before mating and throughout gestation rats were given a basal synthetic diet without pantothenic acid, alone or with 10, 20 to 25, 30 to 35, 40 to 45 or 50 μg. pantothenic acid daily. The number of resorptions and of abnormal and normal foetuses was recorded.

With less than 10 μg. daily all the foetuses were resorbed; above that amount the number of resorptions decreased as the amount of pantothenic acid increased. The largest number of abnormal foetuses occurred with 20 μg.; for completely normal development 50 μg. was the minimum amount.—V. R. Jackson.

460

GUGGENHEIM, K. Studies on water metabolism of pyridoxine and pantothenic acid deficient rats. *Endocrinology*, 1954, 55, 156-162. [Lab. Nutrit., Dept. Biochem., Hadassah Med. Sch., Hebrew Univ., Jerusalem.]

Rats given purified diets lacking pyridoxine or pantothenic acid exhibited a delayed diuretic response to a water load. Their response to injection of pitressin was, however, similar to that of normal rats, which suggested that the delayed diuresis was not due to failure of the liver to inactivate the antidiuretic hormone (cf. Abst. 4755, Vol. 23). The role of adrenal cortical hormones was then examined. None of them had any effect on diuresis in normal rats, but cortisone or adrenocorticotrophic hormone increased excretion of water in rats deprived of pyridoxine and pantothenic acid.—A. M. Copping.

461

KOCH, R. Der Einfluss der Pantothensäure auf die adrenaletomierte Ratte. [Effect of pantothenic acid on the adrenaletomized rat.] *Arch. exp. Pathol. Pharmacol.*, 1954, 221, 460-465. [Radiol. Inst., Univ. Freiburg i. Br.]

Administration of 20 or 50 mg. pantothenic acid by intramuscular injection or by stomach tube did not prolong the survival time of adrenaletomized rats already receiving adequate pantothenic acid. The effect was the same with animals on a mixed diet of oats, meat and shrimps with a mash twice weekly of baker's yeast, wheatmeal and cod liver oil, or a diet of palm oil, wheat flour, dried skimmed milk, salt mixture, yeast and cod liver oil and a comprehensive vitamin supplement. After the operation the rats had 1 per cent. NaCl to drink, and additional saline given by stomach tube did not appear to increase the survival time. The

results are discussed with reference to those of Ralli and co-workers who during the past 10 years have claimed that extra pantothenic acid and NaCl prolong the life of adrenaletomized rats (see Abst. 4346, Vol. 18).—A. M. Copping.

462

VERZAR, F. Die Beeinflussung innersekretorischer Störungen der Nebennierenrinde durch Nahrungsfaktoren. [Effect of dietary factors on disturbances of the internal secretion of the adrenal cortex.] *Internat. Ztschr. Vitaminforsch.*, 1954, 25, 304-305. *Proc. [Physiol. Inst., Basle.]*

463

ARTOM, C. Effects of pantothenic acid and its analogs in radiation injury by P^{32} . *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 162-165. [Dept. Biochem., Bowman Gray Sch. Med., Wake Forest Coll., Winston-Salem, N.C.]

In continuation of studies on the effect of dietary protein and vitamin B complex in modifying the damage due to ^{32}P in mice, pantothenic acid derivatives were given to mice with a diet deficient in pantothenate (cf. Absts. 2333, Vol. 20; 1885, Vol. 21; 1967, Vol. 22). Considerable protection against injury from ^{32}P was given by injection of Ca pantothenate or of pantoyltaurine, and slight protection by injection of taurine. No effect was shown with co-methyl pantothenate.

A. M. Copping.

464

KLINE, I. T. Reduction of response to gonadotropin in chicks deficient in pantothenic acid or injected with squalene. *J. Clin. Endocrinol.*, 1954, 14, 793. *Proc. [Dept. Biochem., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]*

BIOTIN

465

WRIGHT, L. D. and CRESSON, E. L. Biotin *l*-sulfoxide. 1. The occurrence of a previously unrecognized form of biotin in certain fermentation sources.

WRIGHT, L. D., CRESSON, E. L., VALIANT, J., WOLF, D. E. and FOLKERS, K. 2. The isolation of a crystalline factor with biotin activity from *Aspergillus niger* culture filtrates. 3. The characterization of biotin *l*-sulfoxide from a microbiological source. *J. Amer. Chem. Soc.*, 1954, 76, 4156-4160; 4160-4163; 4163-4166. [Sharpe and Dohme Div., Merck and Co., Inc., West Point, Pa.]

1. On addition of pimelic acid to a culture of *Aspergillus niger* a substance appeared with the

activity of biotin as shown by tests with *Neurospora crassa*. Paper bio-autographs showed the substance to be distinct from biotin and desthiobiotin but similar to biocytin. Several species of penicillium synthesised the same substance from pimelic acid.

2. From a large volume of medium in which *A. niger* had been given, the unknown substance was crystallised from aqueous acetone after a procedure involving adsorption on charcoal, elution with alcoholic NH_3 , chromatography on Superfilitrol-Celite, alumina and ion exchange columns, and counter-current distribution between butanol and water.

3. Chemical and microbiological comparison of the unknown substance with an authentic

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sample showed it to be biotin *l*-sulphoxide. It appeared to originate by enzymic reaction and not from atmospheric oxidation.—A. Hepburn.

466

MELVILLE, D. B., GENGHOFF, D. S. and LEE, J. M. **Biological properties of biotin *d*- and *l*-sulfoxides.** *J. Biol. Chem.*, 1954, 208, 503-512. [Dept. Biochem., Cornell Univ. Med. Coll., New York.]

Biotin sulphoxides, obtained as intermediate oxidation products between biotin and its sulphone,

were tested for their growth effects on *Saccharomyces cerevisiae*, *Lactobacillus casei* and *L. arabinosus*. They had very varying activity for the 3 organisms, but were never inhibitory like biotin sulphone. They had no curative effect on biotin deficiency in rats, even in very large doses. Chromatographic analysis showed that the sulphoxides were partly converted to biotin during their utilisation by micro-organisms. The sulphoxides were capable of combining with avidin.

A. M. Copping.

See also Abst. 556.

p-AMINO BENZOIC ACID

467

THOMSON, J. F. and MIKUTA, E. T. **Acetylation of *p*-aminobenzoic acid in X-irradiated rats.** *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 487-488. [Div. Biol. Med. Res., Argonne Nat. Lab., Lemont, Ill.]

Rats with their renal vessels and ureters tied

received intravenous injections of 50 mg. *p*-aminobenzoic acid or sulphanilamide per kg. bodyweight. Blood samples taken for 3 days after exposure to X-rays, 1000 r, showed no impairment of acetylation, from which it was concluded that coenzyme A was not destroyed by whole-body exposure to X-rays.—A. Hepburn.

FOLIC ACID (PTEROYLGLUTAMIC ACID)

468

KOMENDA, J. **Detekce kyseliny listové při chromatografii na papíře. [The detection of folic acid by paper chromatography.]** *Chem. listy*, 1953, 47, 1877-1878. [Lachema, Brno.]

A method is described for the reduction of folic acid on the chromatogram with TiCl_3 , the excess of which is removed by oxidation with atmospheric oxygen. The minimum amount of folic acid that could be estimated was 0.25 mg.

M. Prokšová (Czechoslovakia).

soya bean oilmeal in addition, growth was not affected by the type of grain used. When the diet contained herringmeal as sole protein supplement, growth with maize was inferior to that with milo, the chicks were poorly feathered and the incidence of perosis was high. The depression of growth with the rations containing herringmeal was corrected by a supplement of folic acid, 50 μg . per 100 g., or by a percentage addition of brewer's yeast 2.3, liver meal 2.5, dehydrated grass 5.0, or soya bean oilmeal 8.3.—E. M. Cruickshank.

469

SLAVÍK, K. and MATOUŠKOVÁ, V. **O metabolismu kyseliny listové. 2. Podmínky formylace kyseliny listové. [Folic acid metabolism. 2. Conditions for the formylation of folic acid.]** *Chem. listy*, 1954, 48, 765-769. [Cent. Lab., State Fac. Hosp., Prague.]

470

SAXENA, H. C., BEARSE, G. E., MCCLARY, C. F., BLAYLOCK, L. G. and BERG, L. R. **Deficiency of folic acid in rations containing natural feed-stuffs.** *Poultry Sci.*, 1954, 33, 815-820. [Dept. Poultry Sci., W. Washington Exp. Stat., Pullallup.]

Day-old crossbred chicks were given rations containing 78 per cent. maize from different sources or milo, with herringmeal as the source of supplementary protein. When the diet contained

471

DINNING, J. S., NEATROUR, R. and DAY, P. L. **The effect of folic acid deficiency on the metabolism of choline by chick bone marrow.** *J. Biol. Chem.*, 1954, 209, 717-721. [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

The incorporation of choline into phospholipins by chick bone marrow *in vitro* was investigated manometrically with choline chloride labelled with ^{14}C . The process was stimulated by presence of adenosine triphosphate. When bone marrow was obtained from chicks given purified diets it was found that deprivation of folic acid caused a rise of oxygen consumption and a loss of choline oxidase with increased incorporation of choline into phospholipins. There was also increase of succinoxidase activity in the bone marrow cells from deprived chicks.—A. M. Copping.

472½

VEJDELEK, Zd. Kyselina listová a její analoga. [Folic acid and its analogues.] *Chem. listy*, 1953, 47, 1879-1889. [Res. Inst. Pharm., Prague.]

A review with 139 references.

473

COLLIER, H. O. J. and PHILLIPS, M. Some 2:4-diaminopteridines as folic acid antagonists. *Nature*, 1954, 174, 180-181. [Res. Div., Allen and Hanburys, Ltd., Ware, Herts.]

The inhibitory effect of 2:4-diaminopteridines substituted in the 6- and 7-positions of the pteridine ring was investigated with *Leuconostoc citrovorum*, in presence of pure folic acid. Maximum antagonism was obtained with disecbutyl- and diisopropylpteridines. Some of the compounds tested had antimalarial activity, but no correlation was established between antimalarial activity and antagonism to folic acid.—A. M. Copping.

474

KIRSAKOVA, V. A. and TRUFANOV, A. V. O biologicheskikh svoystvakh aminoproizvodnykh pteroglyutaminovoi kisloty i ee gomologov. [Biological properties of amino-derivatives of pteroglyutamic acid and its homologues.] *Biokhimiya*, 1953, 18, 484-489. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

A series of 4-amino-derivatives of pteroylglutamic acid and its homologues was synthesised, and tested for their effect on growth of *Lactobacillus casei* and *Streptococcus faecalis* R. There was no effect on *S. faecalis* R. On *L. casei* there was an inhibitory effect which decreased with increasing carbon chain length of the amino-acid residue of the 4-amino-homologue, and the same was true of their effect with folic acid in relation to the bodyweight and Hb value of rats.

W. Hughes.

475

BÍLEK, O. Kvantitativní působení pterinů na vly obraz krevní. [Quantitative influence of pterins on the white blood picture.] *Lékařské listy*, 1954, 9, 348-352. [Inst. Gen. Exp. Pathol., Masaryk Univ., Brno.] English, French and Russian summaries.

Of 7 groups of 10 leucaemic mice, one received aminopterin, produced in the laboratory, in a curative dose; 5 received one-tenth, twice, 5 times, 10 times or 100 times the curative dose. In the seventh group the mice received daily at first the curative dose and after 16 days, when the white blood count increased and the animals became resistant to aminopterin, the daily dose was doubled and after a further 8 days trebled. Treatment was followed first by a fall and then by a rise of the leucocyte count, showing the develop-

ment of resistance to aminopterin which yielded and developed again as the amount given was raised even in the same animals. It is supposed that after a time the organism forms a generation of cells that are resistant to aminopterin.

M. Prokšová (Czechoslovakia).

476

NICHOL, C. A. Studies of the mechanism of resistance to folic acid antagonists by leukemic cells. *Cancer Res.*, 1954, 14, 522-526. [Dept. Pharmacol., Sch. Med., Yale Univ., New Haven, Conn.]

The ability of lymph node, spleen and lymphomatous tissue from leucaemic mice to synthesise citrovorum factor from folic acid was investigated in the presence and absence of aminopterin and A-methopterin, and found to vary considerably and to be inhibited by the folic acid antagonists. Spleen tissue from mice carrying leucaemia resistant to A-methopterin was less sensitive to this inhibitor than similar tissue from mice carrying leucaemia sensitive to A-methopterin.

A. M. Copping.

477

GOLDIN, A., MANTEL, N., GREENHOUSE, S. W., VENDITTI, J. M. and HUMPHREYS, S. R. Factors influencing the specificity of action of an antileukemic agent (aminopterin). Time of treatment and dosage schedule. *Cancer Res.*, 1954, 14, 311-314. [Lab. Chem. Pharmacol., Nat. Cancer Inst., Bethesda, Md.]

Aminopterin was administered in one or several doses to mice with leucaemic tumours at different intervals after implantation of the tumour. A single dose had the maximum effect in increasing survival time when administered from 3 to 4 days after implantation. Toxicity of the drug for the host was constant within the first 6 days; the results, therefore, showed that the drug had an increased effect on the tumour when given after from 3 to 4 days. Of the treatments with multiple doses, those after 2 and 4 days, and after 2, 4, and 6 days, had greater antileucaemic effect than a single dose, without greatly increasing the total toxicity to the host.

The results are examined statistically.

V. R. Jackson.

478

DE RENZO, E. C. and DESSAU, F. I. Prevention of bone-marrow aplasia induced by aminopterin with folacin and folic acid. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 231-233. [Chem. Biol. Res. Sect., Lederle Labs. Div., Amer. Cyanamid Co., Pearl River, N.Y.]

Bone marrow aplasia was induced by feeding weanling albino rats on a purified diet and giving by mouth 10 µg. aminopterin daily for 5 days. Some rats received from 20 µg. to 5 mg. folic acid or from 10 to 150 µg. folic acid daily at the same

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time as the aminopterin. A system was evolved for assessing the extent of the bone marrow changes by which it was found that the protection given by the doses of 150 µg. folic acid was complete and of 5 mg. folic acid almost complete. Smaller doses of folic or folinic acid had less effect. Simultaneous administration of ascorbic acid or vitamin B₁₂ did not increase the protective effect of folic acid.—A. M. Copping.

479

VITALE, J. J., ZAMCHECK, N., DiGEORGIO, J. and HEGSTED, D. M. Effects of aminopterin administration on the respiration and morphology of the gastrointestinal mucosa of rats. *J. Lab. Clin. Med.*, 1954, 43, 583-594. [Mallory Inst. Pathol., Boston City Hosp., Mass.]

Adult female rats received a basal synthetic diet containing 18 or 60 per cent. protein supplemented with B vitamins in adequate amounts, alone or with daily subcutaneous injections of aminopterin, 60, 120 or 240 µg. per kg. bodyweight. The animals were killed and the tips of some duodenal villi were removed for manometric estimation of oxygen uptake. The rest of the intestine was examined histologically.

Survival time was roughly in inverse proportion to the dose of aminopterin, 9 days for 120 µg. per kg. and twice as long for half that dose. High protein did not have a protective effect but when to high protein 0.3 per cent. cystine was added, there was some effect. All animals receiving

aminopterin had a rough coat and watery diarrhoea, and the gastro-intestinal tract contained blood.

In the duodenal mucosa from animals receiving no aminopterin the oxygen uptake fell by 65 per cent. 24 hr. after administration of 240 µg. aminopterin per kg. bodyweight and 48 hr. after 120 µg. Respiration often returned to normal after 4 days even when the drug was continued. After a single dose of 480 µg. per kg. bodyweight, values fell rapidly but were normal after 48 hr.

Morphological changes occurred less rapidly than metabolic changes. They included reduction in the number of mitotic figures in the crypts of Lieberkühn, followed by cellular necrosis. At this stage the epithelium of the villus tips was not greatly affected; their rate of respiration corresponded with the rate of mitosis in the crypts. In animals killed just before death, the *tunica propria* of the villus was infiltrated with leucocytes; in advanced lesions there was degeneration of the villus tip with loss of epithelium and haemorrhage.

V. R. Jackson.

480

GREENBERG, J. The effect of analogues of folic acid on the activity of sulfadiazine against *Plasmodium gallinaceum*. *Exp. Parasitol.*, 1954, 3, 351-357. [U.S. Dept. Health, Pub. Health Serv., Nat. Inst. Health, Bethesda, Md.]

See also Absts. 506, 1011.

VITAMIN B₁₂

481

LILLIE, R. J., BIRD, H. R., SIZEMORE, J. R., KELLOGG, W. L. and DENTON, C. A. Assay of feedstuffs and concentrates for vitamin B₁₂ potency. *Poultry Sci.*, 1954, 33, 686-691. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

The vitamin B₁₂ potency of feeds and commercial vitamin B₁₂ concentrates used in poultry feeding were compared by a standard microbiological method and by a biological method with chicks. The results obtained by the two methods were similar for some sewage sludges, defatted liver substance, crabmeal, fishmeal, poultry viscera meal, dried skimmed milk and dried whey. With other sludge preparations, fish solubles, meatmeal, egg yolk and some vitamin B₁₂ concentrates the results were widely divergent. In general where the results were divergent, the value obtained with chicks was the higher, and the problem of unidentified growth factors is discussed. None of the food materials examined except some sludges contained more than 1 µg. vitamin B₁₂ per g., and

it is, therefore, suggested that commercial vitamin B₁₂ concentrates of higher potency may have value in poultry feeding.—A. M. Copping.

482

SHENOY, K. G. and RAMASARMA, G. B. Extraction procedure and determination of the vitamin B₁₂ content of some animal livers. *Arch. Biochem. Biophys.*, 1954, 51, 371-378. [Res. Control Div., Raptakos, Brett and Co., Ltd., Bombay.]

A turbidimetric modification of the U.S.P. XIV microbiological method for estimating vitamin B₁₂ was used with *Lactobacillus leichmannii* as the test organism. The most satisfactory release of vitamin B₁₂ from liver samples was obtained by digestion with pancreatic extract at 50° C. for 1 hr. with sodium metabisulphite as stabiliser of the vitamin during subsequent heat treatment. Mean values obtained by the method were, in µg. per g. fresh liver, ox 1.18, buffalo 1.30, sheep 1.33, goat 1.20, pig 0.59, rabbit 0.60, chicken 0.27, rat 0.052 and mouse 0.75. Values for alkali-stable vitamin B₁₂ activity were obtained for some samples. The

results are discussed with reference to other values reported in the literature.—A. M. Copping.

483

ROBINSON, F. A., FITZGERALD, M. E. H., FEHR, K. and GRIMSHAW, J. J. Vitamin B₁₂ in crude liver extracts. *Nature*, 1954, 174, 558-559. [Res. Div., Allen and Hanburys, Ltd., Ware, Herts.]

Part of the vitamin B₁₂ in crude liver extracts could not be measured with a certain mutant of *Bacterium coli*, and cyanocobalamin added to such extracts was not available for it. The non-available vitamin B₁₂ was not liberated by boiling for a short time but was released in about 4 hr. The released vitamin was apparently recombined if the boiled extract was allowed to stand. The nature of the complex and of the binding substance in liver is discussed with reference to the observations of Wijmenga *et al.* (Absts. 406, Vol. 21; 3089, Vol. 24) and Cooley *et al.* (Abst. 1838, Vol. 21).

A. M. Copping.

484

BECK, M. J. Méthode de dosage microbiologique de la vitamine B₁₂ dans les extraits opothérapiques complexes. [Microbiological method for the estimation of vitamin B₁₂ in organo-therapeutic complexes.] *Ann. pharm. franç.*, 1954, 12, 132-145. [Lab. Recherches, Indust. Biol. France.]

Certain modifications are suggested for making the usual method of estimating vitamin B₁₂ applicable to solutions containing contaminants.

K. H. Coward.

485

BANDELIN, F. J. and TUSCHHOFF, J. V. The microbiological determination of vitamin B₁₂ utilising a mutant strain of *Escherichia coli*. *J. Amer. Pharm. Assoc.*, 1954, 43, 474-477. [Res. Labs., Flint, Eaton and Co., Decatur, Ill.]

Results comparable with those obtained with *L. leichmannii* were found when *Bacterium coli* was used in experiments with cyanocobalamin standards and various biological tissues.—K. H. Coward.

486

BACHER, F. A., BOLEY, A. E. and SHONK, C. E. Radioactive tracer assay for vitamin B₁₂ and other cobalamins in complex mixtures. *Anal. Chem.*, 1954, 26, 1146-1149. [Merck and Co., Inc., Rahway, N.J.]

Vitamin B₁₂ in fermentation broths, feeding mixtures, liquid concentrates, solid concentrates and mixed vitamin capsules was estimated spectrophotometrically after concentration and purification of the vitamin with selective solvents and adsorbing and precipitating reagents. Mixtures of cresol, butanol and Zephiran were used with various resins. In order to confirm the validity

of the method vitamin B₁₂ containing radio-active ⁶⁰Co was added and its recovery at every stage was measured. Samples containing as little as 0.1 µg. vitamin B₁₂ per ml. could be handled successfully. In a series of difficult materials the standard deviation of the results was ± 4.3 per cent.

A. M. Copping.

487

WOLFF, R. and DUBOST, S. Fixation de la vitamine B₁₂ par *Lactobacillus leichmannii* et application au dosage de la vitamine B₁₂ combinée dans les extraits d'organes. [Fixation of vitamin B₁₂ by *Lactobacillus leichmannii* and its application to the estimation of bound vitamin B₁₂ in organ extracts.] *Biochim. biophys. Acta*, 1954, 14, 576-577. [Lab. Chim. Biol., Fac. Méd., Nancy.]

The ability of *Lactobacillus leichmannii* to bind free vitamin B₁₂ was used for the differential estimation of free and bound forms of the vitamin in natural materials.—A. M. Copping.

488

CHAIET, L., MILLER, T. and BOLEY, A. E. Vitamin assay, determination of vitamin B₁₂ content of feed supplements and effect of pseudo-vitamin B₁₂. *J. Agric. Food Chem.*, 1954, 2, 784-786. [Res. Labs., Chem. Div., Merck and Co., Inc., Rahway, N.J.]

The vitamin B₁₂ content of commercial fermentation products and sewage sludges used in poultry feeding was estimated by an isotope dilution method, by microbiological and biological methods and by spectrophotometric procedures. The microbiological and spectrophotometric methods did not differentiate between vitamin B₁₂ and pseudo-vitamin B₁₂ and sometimes led to a gross over-estimate of the vitamin B₁₂ potency of a feed supplement. Some observations on the physico-chemical properties of pseudovitamin B₁₂ are reported.—A. M. Copping.

489

FIRTH, J. and JOHNSON, B. C. Pseudo-B₁₂ activity in the baby pig. *Science*, 1954, 120, 352-353. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Pseudovitamin B₁₂ failed to replace vitamin B₁₂ for growth and blood formation in pigs reared from 2 to 3 days of age on a diet containing soya bean protein, DL-methionine, cerelose, fat, salt mixture and all vitamins except vitamin B₁₂. Injection of vitamin B₁₂ produced a reticulocyte response in pigs previously given the pseudovitamin.

A. M. Copping.

490

DOCTOR, V. M. and COUCH, J. R. An unusual example of symbiosis in bacteria. *Arch. Biochem. Biophys.*, 1954, 51, 530-531. [Dept.

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Biochem. Nutrit., Texas Agric. Exp. Stat., Agric. and Mech. Coll. System, College Station.]

A relationship of reciprocal advantage was demonstrated between *Lactobacillus leichmannii*, which requires both vitamin B₁₂ and folic acid and produces citrovorum factor in a purified medium, and *Leuconostoc citrovorum*, which requires citrovorum factor and produces vitamin B₁₂ activity.—A. M. Copping.

491

BRADLEY, J. E., SMITH, E. L., BAKER, S. J. and MOLLIN, D. L. The use of the radioactive isotope of cobalt Co⁵⁸ for the preparation of labelled vitamin B₁₂. *Lancet*, 1954, 267, 476-477. [Postgrad. Med. Sch., London.]

The radio-active isotope ⁵⁸Co was incorporated into vitamin B₁₂ by a method previously described for ⁶⁰Co (Abst. 1666, Vol. 23) and found to be as useful as ⁶⁰Co for measuring excretion of vitamin B₁₂. The advantage of ⁵⁸Co in human and biological studies is that it has a half-life of 72 days, whereas that of ⁶⁰Co is 5 years; it is thus possible to use ⁵⁸Co safely in larger amounts. The use of ⁵⁸Co is limited at present by scarcity; when supplies become available, it is considered that it should replace ⁶⁰Co in clinical investigations.

A. M. Copping.

492

ZELLER, R. Innenkörperanaemien beim Pferde. [Anaemia with inclusion bodies in the horse.] *Berl. Münch. tierärztl. Wochenschr.*, 1954, 67, 270-273. [Med. Tierklin., Freie Univ., Berlin.] English summary.

Two trotter horses, brought for treatment because of their poor nutritional condition and lack of appetite, were found to be suffering from anaemia, with large numbers of inclusion bodies in the erythrocytes. After treatment with Cyto-bion, a preparation of vitamin B₁₂, the inclusion bodies rapidly disappeared, and there was clinical improvement and finally cure of the anaemia.

M. B. Richards.

493

KUPKA, J. Vliv vitaminu B₁₂ na růst plůdku pstruha duhového. [The influence of vitamin B₁₂ on the size of the fins in rainbow trout.] *Storn. ěsl. Akad. Zěměd.*, 1954, 27, 253-260. Russian summary.

The large losses of rainbow trout which occur under certain conditions in ponds are due to insufficiency of vitamin B₁₂, which results in reduction in the size of the fins. The best results to counter the losses were obtained by adding to the water cow dung, which supplies, in addition to vitamin B₁₂, all the vitamins of the B group and possibly useful hormones. (From summary.)

D. Harvey.

494

FRÖLICH, A. Relation between vitamin D and vitamin B₁₂. *Nature*, 1954, 174, 462-463. [Nat. Animal Exp. Stat., Upsala 7.]

Chicks from a breeding flock not specially depleted of vitamin B₁₂ were fed from one day old to 4 weeks of age on an all-vegetable diet of soya bean oilmeal 16.6, sunflower seed meal 10.5, alfalfa meal 4.0, wheat bran 11.0, minerals 4.6, a vitamin concentrate rich in vitamin B₁, riboflavin, nicotinic acid 1.0, and mixed cereals to 100. At 1 week of age they were divided into 6 groups each with 4 sub-groups of 9 chicks. Each of the 6 main groups was given 200, 640 or 1400 I.U. vitamin D₃ as Deltafor per kg. diet, each level of dosing being given with and without a supplement of 30 µg. vitamin B₁₂ per kg. diet.

With increasing amounts of vitamin D, and with vitamin B₁₂ also, the mean weight gains in 3 weeks were 134, 141 and 144 g., respectively. The corresponding gains without vitamin B₁₂ were 128, 110 and 106 g.—K. J. Carpenter.

495

BALIGA, B. R., BALAKRISHNAN, S. and RAJAGOPALAN, R. Biological value of proteins as influenced by dietary vitamin B₁₂. *Nature*, 1954, 174, 35-36. [Dept. Biochem., Indian Inst. Sci., Bangalore.]

Previous studies (*Current Sci.*, 1954, 23, 51) showed that vitamin B₁₂ improved the biological value of unheated soya bean protein. It is here reported that the biological value of the protein in soya bean meal tested on rats by the method of Mitchell (*J. Biol. Chem.*, 1924, 58, 873) was enhanced by vitamin B₁₂ or aureomycin irrespective of previous heat treatment. Tests made with rats given casein as protein with heated or unheated inhibitor substance from soya bean showed that although vitamin B₁₂ could overcome the inhibitory effect of the unheated soya preparation it could not raise the biological value of the casein above its normal level. The possibility that greater amounts of vitamin B₁₂ might increase the biological value of casein is under investigation.

A. M. Copping.

496

PERDUE, H. S. and PHILLIPS, P. H. Failure of vitamin B₁₂ to increase survival of progeny of rats fed an all-plant diet. *J. Nutrition*, 1954, 53, 259-263. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Rats receiving a diet with maize and soya bean as sources of protein failed to lactate satisfactorily or rear their young to weaning. An injection of 0.05 µg. vitamin B₁₂ given within 6 hr. of parturition did not improve the survival of the young. Starvation and dehydration of the young rats occurred and caused an increase in the blood



urea concentration which was not prevented when fish solubles were added to the plant protein diet.

A. M. Copping.

497

SHERMPTON, D. H. The retention of vitamin B₁₂ by the chick receiving all-vegetable rations. *Proc. Nutrition Soc.*, 1954, 13, i-ii. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

498

YOUNG, R. J., NORRIS, L. C. and HEUSER, G. F. The utilization by vitamin B₁₂-deficient chicks of monomethylaminoethanol, homocystine and betaine as precursors of choline and methionine. *J. Nutrition*, 1954, 53, 233-248. [Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

Chicks from hens receiving a maize and soya bean meal diet were given diets based on soya bean protein and adequate in all amino-acids except methionine and cystine. A supplement of choline alone improved growth and survival, and choline with vitamin B₁₂ was still better. Monomethylaminoethanol combined with betaine permitted good growth and survival with or without vitamin B₁₂; it was slightly more effective in replacing choline when the total methionine and cystine in the basal diet amounted to 0.75 instead of 0.55 per cent. Vitamin B₁₂ did not seem to be essential to the process of transmethylation. A combination of homocystine and betaine also replaced methionine for chicks. If inadequate amounts of betaine were included in the mixture the presence of vitamin B₁₂ was essential, which was evidence that the vitamin was concerned in the synthesis of methyl groups by the chick.

A. M. Copping.

499

DESSI, P., BARBIERI, L. L., BRUNELLI, M. A. and GIANNI, A. M. Intorno all'azione della vitamina B₁₂ nella steatosi epatica dietetica del ratto albino. [Effect of vitamin B₁₂ on fatty liver induced by diet in the white rat.] *Arch. Sci. biol., Bologna*, 1954, 38, 286-293. [Ist. Chim. Biol., Univ. Bologna.]

When groups of 6 adult rats received the diet of Handler (Abst. 749, Vol. 18) with or without vitamin B₁₂ given orally or subcutaneously, there was no difference in the liver content of total lipids. The experiment lasted for from 22 to 45 days.

When the experiment was repeated with less protein and more fat in the diet, and an amount of L-cystine to supply 10 mg. per kg. bodyweight daily, subcutaneous injection of 100 µg. vitamin B₁₂ per kg. bodyweight daily greatly reduced the amount of total fat, and increased the amount of glycogen, in the liver.

When young rats for 63 days from weaning were given the diet of Handler without added L-cystine,

addition of vitamin B₁₂ reduced liver total fat and choline, considerably at first, but the effect disappeared gradually as the age of the animals increased. There was a beneficial effect also on growth.

Histological examination of the livers was made.

E. M. Hume.

500

AMSOHLER, J. W. and PAMMER, H. Brat- und Backhühnermastversuch mit Terramycin und Vitamin B₁₂ (Bi-Con TM3 + 3) bei verschiedenen Stufen tierischen Eiweisses. [Fattening of roasting fowls with terramycin and vitamin B₁₂ at different intakes of animal protein.] *Arch. Geflügelk.*, 1954, 18, 197-202. [Inst. Tierzucht, Hochsch. Bodenkultur, Vienna.] English summary.

Diets in which 49.3, 36.4 or 26.3 per cent. of the protein was from animal sources were given to year-old chicks with addition of vitamin B₁₂ and terramycin concentrate. A fourth group received the highest amount of animal protein but no concentrate. In all, 248 birds were fattened for 8 weeks; in comparison with the group without supplement, the addition of the concentrate improved the weight gain and feed utilisation by 16.4, 15.1 and 12.6 per cent., respectively. It thus appeared that with vitamin B₁₂ and terramycin added half the protein in the ration could be replaced by plant protein to give better growth and utilisation of feed.—A. M. Copping.

501

CARLSON, C. W., GUENTHNER, E., KOHLMAYER, W. and OLSON, O. E. Some effects of selenium, arsenicals, and vitamin B₁₂ on chick growth. *Poultry Sci.*, 1954, 33, 768-774. [S. Dakota Agric. Exp. Stat., College Station.]

Crossbred and New Hampshire chicks were given a practical diet or the same diet modified by replacing part of its maize by seleniferous maize so that the ration contained 10 p.p.m. Se. The addition to either of the diets of sodium arsenite, arsenic acid or 3-nitro-4-hydroxyphenylarsonic acid significantly improved the growth of the crossbred chicks, the improvement being, in general, greater with the practical diet. The growth of the New Hampshire chicks was only slightly influenced by any of the compounds. In another experiment, in which the diet contained maize and soya bean meal, with or without the addition of 10 p.p.m. Se as sodium selenite, toxic signs, as reflected in impaired growth, were observed only when a vitamin B₁₂ supplement was given. The toxicity was only partly counteracted by sodium arsenite or arsenic acid. The results suggested that different breeds differ in their tolerance to Se poisoning and in their response to arsenical drugs.

E. M. Cruickshank.

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502

MAGRUDER, N. D., BLETNER, J. K., CLARK, T. B. and WEAKLEY, C. E. (Jr.) The variable response of normal chicks to stress rations and a vitamin B₁₂ supplement. *Poultry Sci.*, 1954, **33**, 511-518. [W. Virginia Agric. Exp. Stat., Morgantown.]

Chicks from New Hampshire hens receiving rations containing vitamin B₁₂ were given diets containing 35 or 70 per cent. soya bean meal with or without the addition of iodinated casein. Growth was retarded, with decreasing degrees of severity, when the ration contained: 70 per cent. soya bean meal with 0.1 per cent. iodinated casein; 70 per cent. soya bean meal; 35 per cent. soya bean meal with 0.1 per cent. iodinated casein. When the rations were supplemented with vitamin B₁₂, growth and efficiency of feed utilisation were much increased. The response of the chicks to the abnormal rations and to supplements of vitamin B₁₂ varied between hatches, and the difference was ascribed to variation in the amount of vitamin B₁₂ transmitted to the chick through the egg. Faulty feather structure was seen in chicks given the ration containing 70 per cent. soya bean meal, and was not prevented by supplements of folic acid or vitamin B₁₂ or both. In chicks receiving iodinated casein for 4 weeks, an excessive amount of black colour appeared in the feathers.

E. M. Cruickshank.

503

BENTLEY, O. G. and HERSHBERGER, T. V. The effect of antibiotics on hatchability of hens' eggs and progeny growth performance. *Poultry Sci.*, 1954, **33**, 641-648. [Dept. Animal Sci., Ohio Agric. Exp. Stat., Wooster.]

Experiments, lasting for from 16 to 20 weeks, were made on one-year-old pullets receiving an all-vegetable ration and maintained in pens on wood shavings which were changed monthly. The hatch from the eggs was not consistently improved by giving bacitracin, terramycin, aureomycin HCl or procaine penicillin. Bacitracin added to a breeding diet lacking vitamin B₁₂ significantly improved the growth of the progeny if the rearing diet also lacked vitamin B₁₂. Aureomycin had a similar but less pronounced effect. If the hens' diet contained vitamin B₁₂ the further addition of antibiotics had no significant effect on the growth of the chicks. The addition of bacitracin or aureomycin did not affect the vitamin B₁₂ content of the egg yolks or of the livers of the chicks or hens. It is suggested that a growth factor other than vitamin B₁₂ may be transmitted to the egg when bacitracin or aureomycin is given.

E. M. Cruickshank.

504

RUSOFF, L. L. and HAQ, M. O. Studies on aureomycin and vitamin B₁₂ supplementations for

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dairy cows. 2. Effect on production, composition, and vitamin B₁₂ content of the milk. *J. Dairy Sci.*, 1954, **37**, 677-683. [Dairy Dept., Louisiana State Univ., Baton Rouge.]

Three groups of 5 lactating Holstein cows were given a protein and grain ration with or without an aureomycin supplement supplying 130 mg. per head daily, or a vitamin B₁₂ supplement giving 0.83 mg. daily. Neither supplement had any effect on milk production or on the fat, total solids, solids-not-fat, total protein, casein, ash, Ca or P of the milk. Addition of vitamin B₁₂ did not increase the amount of the vitamin in the milk. A further trial was made on 4 groups of 5 cows having no vitamin B₁₂ supplement or 1.66, 2.49 or 3.32 mg. per head daily in the grain ration. No difference in milk production or in the vitamin B₁₂ content of the milk was recorded, but there was a significant decrease in the fat content of the milk of the cows given vitamin B₁₂. With only 0.83 mg. vitamin B₁₂ per head daily in the ration there was no decrease in the fat content.—A. M. Copping.

505

FERRANDO, R., PHILIPPE, J. and PETIT, A. La vitamine B₁₂ dans la ration du porc. [Vitamin B₁₂ in the ration of pigs.] *Rev. Méd. vét., Toulouse*, 1954, **105**, 355-360.

In tests with young pigs lasting 105 days, no significant difference in weight gain or food consumption was recorded between groups given a mixed diet with or without a supplement of 20 µg. vitamin B₁₂ per kg. diet. In a further study lasting 60 days some animals received only vegetable protein and others had mixed animal and vegetable protein. Again supplements of vitamin B₁₂ had no demonstrable effect on growth. The results are discussed with reference to the literature, and it is suggested that attention to the balance of the ration is more important than the addition of special supplements. A plea is made for wise use of new knowledge in animal nutrition.

A. M. Copping.

506

MUSTAKALLIO, K. K. and TELKKÄ, A. Effect of aureomycin, vitamin B₁₂, folic acid and aminopterin on the metamorphosis of tadpoles. *Ann. Med. exp. Biol. Fenn.*, 1954, **32**, 9-14. [Dept. Anat., Univ. Helsinki.]

Eight groups of 50 tadpoles, from 13 to 15 mm. long, without discernible hind legs, were kept in tap water with ground beef as food and added aureomycin, vitamin B₁₂, folic acid, or aminopterin alone or with aureomycin, vitamin B₁₂ or folic acid. At the stage when the forelegs developed the tadpoles were killed and weighed. Metamorphosis to this stage was delayed in those given aureomycin or aminopterin, and the two together caused severe retardation. Vitamin B₁₂ or folic

acid was without effect on metamorphosis. Vitamin B₁₂ showed some protective action against the growth-retarding effect of aminopterin, but folic acid did not.—A. M. Copping.

507

KANO, A. K., ANDERSON, J. A., HUGHAM, D. F. and CHARKEY, L. W. A possible role of iodinated casein in intestinal assimilation of vitamin B₁₂. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 8-11. [Dept. Chem., Colorado Agric. and Mech. Coll., Fort Collins.]

Groups of 50 day-old chicks were given a diet of maize and soya bean meal with or without addition of iodinated casein for a preliminary period of 15 days, after which some of each group were killed. The remaining birds in each group were then divided into two groups, one continued as before and the other given 25 µg. crystalline vitamin B₁₂ per kg. diet. At 4 weeks of age all the birds were killed and vitamin B₁₂ in the liver and caecal contents was measured. Iodinated casein in the diet reduced the vitamin B₁₂ content of the liver unless the vitamin was given in the diet. When the vitamin was added to the diet containing iodinated casein, vitamin B₁₂ increased in the caecal contents. The findings suggested that iodinated casein interfered in some way with the absorption of vitamin B₁₂ from the intestine, which might partly explain the increased sensitivity to vitamin B₁₂ depletion of chicks given iodinated casein.—A. M. Copping.

508

VENKATARAMAN, P. R. and FRIEDEL, M. T. The effects of induced hyperthyroidism and vitamin B₁₂ on the synthesis of some phosphate fractions in the rat liver. *Endocrinology*, 1954, 54, 612-619. [Hektoen Inst. Med. Res., Cook County Hosp., Chicago, Ill.]

Weanling rats were given a purified diet with 2 µg. vitamin B₁₂ a week, or with 0.2 per cent. iodinated casein alone or supplemented for 2 weeks with vitamin B₁₂. After 4 weeks on the diets the animals were fasted for from 10 to 12 hr. and were then injected with about 10 µg. radio-active disodium phosphate per 100 g. bodyweight. Six hr. later the rats were killed by bleeding under Nembutal anaesthesia, and the livers were removed for analysis. Total acid-soluble, phospholipin, pentose nucleic acid, deoxypentose nucleic acid, and phosphoprotein phosphorus fractions were estimated and their radio-activity was measured. Hyperthyroidism induced by iodinated casein reduced the uptake of ³²P in the total acid-soluble fraction and the effect was counteracted by administration of vitamin B₁₂; there was an increase in the phospholipin content of the liver tissue which was not affected by vitamin B₁₂.

Pentose nucleic acid synthesis was increased and reduced again when vitamin B₁₂ was given. No effect of hyperthyroidism or of vitamin B₁₂ was seen on the deoxypentose nucleic acid and phosphoprotein fractions.—A. M. Copping.

509

GUGGENHEIM, K. and HALEVY, S. The effects of vitamin B₁₂, organ extracts, yeast and antibiotics on emetine toxicity in rats. *J. Nutrition*, 1954, 53, 129-138. [Lab. Nutrit., Dept. Biochem., Hadassah Med. Sch., Hebrew Univ., Jerusalem.]

Rats of from 40 to 50 g. weight were given purified diets containing 3, 9, 15 or 18 per cent. casein for 3 weeks before daily injection was begun of 0.3 mg. emetine per 100 g. bodyweight. The survival time before death from emetine poisoning was used as the index of drug tolerance, and the effect on it was studied of giving extracts of dried liver powder, fresh beef muscle, heart, or kidney, or aureomycin, streptomycin, amino-acids, yeast, or vitamin B₁₂. Resistance to emetine was less on a low-protein diet and was significantly improved by all the supplements except yeast. In rats given adequate protein, extracts of liver, muscle, heart and kidney increased resistance to emetine but antibiotics and vitamin B₁₂ were without effect.

In another experiment without emetine, the N content of the liver was estimated in protein-depleted rats, of which some were given amino-acids, liver extract, hydrolysed liver extract, vitamin B₁₂ or aureomycin. The amino-acids and hydrolysed liver extract increased the N content of the liver, but the unhydrolysed liver extract had no such effect, and it is concluded that the protective effect of liver extract against emetine was not due to its amino-acid content.—A. M. Copping.

510

ROSENTHAL, H. L. and BROWN, C. L. (Jr.) (with ATEs, W. and GEER, B.) Vitamin B₁₂ activity of plasma and whole blood from various animals. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 117-120. [Dept. Med., Tulane Univ. Sch. Med., New Orleans, La.]

Vitamin B₁₂ activity was measured with *Lactobacillus leichmannii* in the whole blood and plasma before and after treatment with alkali and in some samples after hydrolysis. Wide variations were found in the values, in µg. per ml., ranging from 0.38 for human blood to 43.3 for rabbit blood, and from 0.16 for human plasma to 31.3 for rabbit plasma. Dog, calf, chicken and alligator blood gave values of 0.33, 0.31, 8.57 and 7.14, respectively. In mammals vitamin B₁₂ appeared to be almost equally divided between the blood cells and plasma. In the chicken and alligator most of the activity was in the nucleated erythrocytes.—A. M. Copping.

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511

KARLIN, R. La vitamine B₁₂ dans le lait humain et bovin. [Vitamin B₁₂ in human and cow's milk.] *C.R. Soc. Biol.*, 1954, 148, 371-373.

Vitamin B₁₂ was satisfactorily extracted from human milk, which offers certain difficulties, by treatment with a solution of CaCl₂ in presence of KCN, and was estimated with *Lactobacillus leichmannii* in human and cow's milk. In 12 samples of human milk in Lyons obtained during the first week of lactation, the values ranged from 0.25 to 2.36, mean 0.92, μg . per ml. From the first to the eighth month the mean values ranged from 0 to 0.66, with a tendency to decrease as lactation progressed. In 16 samples of mixed cow's milk in Lyons the mean value was 3.9.—A. M. Copping.

512

VIALARD-GOUDOU, A., LAMBIN, S., GERMAN, A. and BRIEAT, J. Étude de l'activité vitaminique B₁₂ de la sauce de poisson vietnamienne "nuoc-nam". [Vitamin B₁₂ content of the Viet-Nam fish sauce nuoc-mam.] *C. R. Acad. Sci.*, 1954, 238, 2193-2195.

A microbiological method with a mutant of *Bacterium coli* was used to measure the vitamin B₁₂ potency of nuoc-mam, which is prepared from fish decomposed by anaerobic bacteria. Values ranging from 25 to 200 μg . per litre were found for preparations from different areas. The highest value was for a sauce made from freshwater fish. All others were from marine fish. (See Abst. 2781, Vol. 23).—A. M. Copping.

See also Absts. 900, 1299.

OTHER B VITAMINS

513

FRAENKEL, G. The distribution of vitamin B₇ (carnitine) throughout the animal kingdom. *Arch. Biochem. Biophys.*, 1954, 50, 486-495. [Dept. Entomol., Univ. Illinois, Urbana.]

Vitamin B₇ activity was estimated with larvae of *Tenebrio molitor* by methods previously described (Absts. 554, Vol. 22; 3114, Vol. 24) in single organs or in the whole body of marine invertebrates and in some organs of marine vertebrates. An amount of 0.35 μg . carnitine per g. dry weight of material was taken as the smallest required for maximum survival and good growth; in some cases longevity did not correspond with maximum growth.

Carnitine was found in all preparations, but there were great differences of concentration. Low values were generally attributable to the nature of the original material, which sometimes contained large amounts of inorganic salts.

A very high value, 35 mg. per g. dry weight, was found in the muscle of horseshoe crab, *Limulus polyphemus*. High values were found also in the hepatopancreas and intestine of the same crab, in the worm, *Arenicola*, the adductor muscles, both smooth and striated, of the bivalve, *Venus*, the hepatopancreas and foot of the snail, *Busycan*, the muscle of the crab, *Libinia*, and the hepatopancreas of the crab, *Pagurus*. The electric organ of *Torpedo*, which is a modified gelatinous muscle of high water content, contained from 2240 to 5600 μg . per g. dry matter.

The carnitine content of muscle was studied in relation to the muscle's activity. Carnitine content was relatively high in the flight muscles of the housefly, *Musca domestica*, but the sarcosomes, the principal site of enzyme activity in intermediary

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carbohydrate metabolism, had none. In the livers and skeletal muscles of chicks receiving normal or sterilised diets the amounts were the same, as well as in normal rabbits and in one suffering from muscular dystrophy due to vitamin E deficiency; a calf with muscular dystrophy had normal values. The breast muscle of the bat, *Myotis lucifugus*, had values slightly below the average for mammals though its liver values were extremely high. It thus appeared that there was no correlation between carnitine content and activity of muscle.—V. R. Jackson.

514

MORUZZI, G., RABBI, A., VIVIANI, R. and MARCHETTI, M. Ricerche sul contenuto in acido orotico della caseina priva di F.P.A. [Studies on the orotic acid content of casein free from animal-protein factor.] *Acta vitaminol.*, 1954, 8, 135-136. [Ist. Chim. Biol., Univ. Bologna.] French, English, German and Spanish summaries.

Casein, purified as previously described (Absts. 425, 3530, Vol. 21) and unpurified, was extracted with water. The extract was filtered and concentrated. The content of orotic acid in the extracts, estimated with *Lactobacillus bulgaricus* by the method of Wright *et al.* (Abst. 797, Vol. 21), for 4 samples, was equivalent in μg . per g. casein to from 25.43 to 26.76 in crude casein, and to from 3.85 to 4.74 in purified casein.—E. M. Hume.

515

SMITH, L. H. (Jr.) and STETTEN, D. (Jr.) Biosynthesis of orotic acid from citrulline. *J. Amer. Chem. Soc.*, 1954, 76, 3864-3865. [Div.

Nutrit. Physiol., Pub. Health Res. Inst., City of New York, Inc.]

Slices from pigeon or rat liver were incubated in a medium containing bicarbonate, glucose, adenosine triphosphate, carrier orotic acid and either L-citrulline labelled with ^{14}C in the ureide C atom together with L-aspartate, or L-arginine HCl labelled in the amidine C atom together with fumarate. Orotic acid was recovered from the medium and converted to BaCO_3 , in which the radio-activity was measured by Geiger Müller counter.

A significant amount of radio-active orotic acid from citrulline was found in the rat but not in the pigeon liver preparation. The probable pathway is suggested as citrulline + aspartate \rightarrow (argino-succinate) \rightarrow ureidosuccinate \rightarrow (dihydro-orotate) \rightarrow orotic acid. Radio-active orotic acid was not obtained from arginine in either rat or pigeon liver slices.—A. Hepburn.

516

HURLBERT, R. B. and REICHARD, P. Conversion of orotic acid to uridine phosphates by soluble enzymes of liver. *Acta chem. scand.*, 1954, 8, 701-702. [Dept. Biochem., Karolinska Inst., Stockholm.]

Soluble enzymes were prepared from rat or pigeon liver by the method of Saffran and Scarano (*Nature*, 1953, 172, 949) and conversion of orotic acid-2- ^{14}C was obtained with fructose-1 : 6-diphosphate or ribose-5-phosphate in presence of diphosphopyridine nucleotide, adenosine triphosphate and Mg ions. Products were separated chromatographically and 5 radio-active fractions were obtained, uridine-5-phosphate, 3 others shown by acid hydrolysis to contain uridine-5-phosphate and a fifth, in the effluent from the column. Uridine-5-phosphate was the first detectable product of the reaction and uridine appeared not to be an intermediate in the incorporation of orotic acid into the uridine-5-phosphate derivatives. The preparations from the rat and pigeon differed in their effectiveness for promoting the incorporation.

D. Harvey.

517

TRIA, E. and BARNABEI, O. Ricerche su un fattore di accrescimento dei lieviti e dei ratti presente nel fegato. [Studies on a growth factor for yeasts and for rats, present in the liver.] *Arch. Sci. biol., Bologna*, 1954, 38, 383-416. [Ist. Fisiol. Gen., Univ. Ferrara.]

A considerable review of the subject is given. The amount was measured by CO_2 evolved by cultures of brewer's yeast, in a medium of glucose and salts, on addition of liver preparations. A protein-free filtrate of fresh ox liver pulp had the same stimulatory activity as the filtrate before removal of protein. Autolysis of the liver pulp did not affect the activity of the extract, and subsequent boiling for an hour reduced it only slightly. Removal of amino-acids and polypeptides had no effect on the activity. When the culture medium contained, as well, asparagine, vitamin B₁, nicotinamide, vitamin B₆, Ca pantothenate, inositol and biotin, the response to addition of liver extract was even greater, and the foregoing results were confirmed. Activity of the liver extract was maintained after it had been autoclaved at 125°C. for an hour. Growth was measured turbidimetrically, and the results agreed with those obtained by measuring evolution of CO_2 . The substance was soluble in ethanol and acetone, and insoluble in ether, butanol and amyl alcohol. It was dialysable and stable to acid and, unlike vitamin B₁₂, to alkali. It did not give the biuret or ninhydrin reaction. It had an absorption maximum at 262 m μ . The activity of the substance in any preparation was not proportional to the preparation's anti-anæmic activity.

Twenty synthetic thiazole compounds and certain formyl compounds were tested for their power to stimulate fermentation in the conditions described. Some of them had some activity.

Experiments with rats showed that the substance was able to counteract the unfavourable effect of desiccated thyroid on growth, and that growth was stimulated by giving the substance to rats already receiving vitamin B₁₂.

It is stressed that the factor is stimulatory but probably not indispensable.—E. M. Hume.

VITAMIN C (ASCORBIC ACID)

518

FABIANEK, J. Recherches sur les "vitamines P", le scorbut expérimental et la fragilité vasculaire. 4. Essais de régimes alimentaires artificiels en vue de l'établissement d'une formule convenant au cobaye. 5. Régimes artificiels assurant au cobaye une bonne croissance et une longue survie. [Research on "vitamin P", experimental scurvy and vascular fragility.

4. Tests with artificial diets to find a formula suitable for the guineapig. 5. Artificial diets producing good growth and survival in the guineapig.] *Bull. Soc. Chim. biol.*, 1954, 36, 851-858; 859-868. [Lab. Chim. Agric., Conservatoire Nat. Arts et Métiers, Paris.]

For previous parts see Absts. 3575, Vol. 21; 607, 2172, Vol. 22.

4. Two artificial diets were made up and tested

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on guineapigs. They were modifications of one previously described. Only 40 per cent. of animals survived more than 35 days. Those which accepted the diets grew well for from 3 to 4 months and then began to lose weight, at first slowly and then rapidly, until they died. With the rapid loss of weight, general debility and indefinite intestinal disturbances were seen but no sign of scurvy or of vascular fragility. The fault in the diet was not repaired by making it alkaline, or by adding certain B vitamins or galacturonic acid.

5. A diet suggested by Elvehjem and his colleagues (Abst. 5180, Vol. 19) was then tested and found satisfactory. One of the diets mentioned in Part 4 was modified to contain soya bean oil and cellulose with a vitamin B complex supplement similar to that of Elvehjem's diet. On the modified diet good growth was obtained with survival beyond 300 days. The guineapigs on the artificial diet were given 20 mg. ascorbic acid daily and showed no sign of scurvy.

A. M. Copping.

519

GORI, E. Modifiche al metodo di Roe-Kuether per il dosaggio dell'acido ascorbico tessutale. [Modification of Roe and Kuether's method for estimating tissue ascorbic acid.] *Arch. Sci. biol., Bologna*, 1954, 38, 221-233. [Inst. Pharmacol., Univ. Milan.]

It was sought to adapt the method of Roe and Kuether (Abst. 261, Vol. 13), as originally described, to the rapid estimation of ascorbic acid in the adrenal cortex and other organs. Incubation for 30 min. at 80° C. gave the same result as for 3 hr. at 37° C. It was found possible for convenience to store the fresh tissue for 24 hr. at 2° C. or to suspend for several hours or a whole night the process of extracting the tissue with trichloroacetic acid. Preparation of a satisfactory sample of activated carbon is described, and the possibility was examined of substituting for that stage of the method, the oxidation with Br water recommended by Meyer *et al.* (Abst. 1709, Vol. 23); the results obtained were, however, always much too high.—E. M. Hume.

520

KOCHI, Y. and KASAHARA, S. Colorimetric determination of vitamin C by 2-nitro-4-methoxyaniline. *J. Pharm. Soc. Japan*, 1953, 73, 443-446. [Nat. Hyg. Lab., Osaka.]

521

BACKE-HANSEN, K. Iodometrisk bestemmelse av askorbinsyre-innholdet i tørrede nyper. Sammenligning med dinitrofenyl-hydrazinmetoden. [Iodimetric estimation of ascorbic acid in dried rose-hips. A comparison with the

dinitrophenylhydrazine method.] *Dansk Tidsskr. Farm.*, 1954, 28, 93-99. [Statens Farmakopélab., Oslo.] English summary.

Closer correlation between the two methods was obtained when the extraction was made by boiling for 5 min. than when made by grinding at room temperature. (From summary.)

K. H. Coward.

522

MARX, T. Über den Oxydationsschutz der l-Ascorbinsäure in frischem Pflanzenmaterial. [Protection of l-ascorbic acid in fresh plant material against oxidation.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, 99, 181-188. [Inst. Landwirtschaft. Chem., Berlin-Dahlem.]

Metaphosphoric acid was less protective of pure ascorbic acid against oxidation than saturated $(\text{NH}_4)_2\text{SO}_4$ or NaCl solutions with or without added oxalic acid; the effect was investigated with a number of fruits and vegetables. In some instances apples from the same trees were tested in different years and widely varying results were obtained. Values were obtained for apples, pears, quinces, several berries, potatoes, and a few vegetables. They are discussed with reference to those of other workers.—A. M. Copping.

523

PROCHÁZKA, Ž. O vázané formě kyseliny askorbové. [The combined form of ascorbic acid.] 6. Příspěvek k chemické povaze askorbigenu. [6. Contribution to the chemical nature of ascorbigen.]

PROCHÁZKA, Ž. and ŠANDA, V. 7. Výskt askorbigenu v některých druzích seleniny. [7. Ascorbigen content of certain vegetables.] *Chem. listy*, 1953, 47, 1643-1646; 1954, 48, 898-901. [Inst. Org. Chem. ČAV, Prague.]

Two substances containing ascorbic acid were isolated chromatographically from crude ascorbigen. They contained nitrogen, probably in the form of an indol derivative.

A. Jančářík (Czechoslovakia).

524

PROCHÁZKA, Ž. Ascorbigen. [Ascorbigen.] *Šborn. pathofys. tráv.*, 1954, 8, 13-20. [Inst. Org. Chem. ČAV, Prague.] English and Russian summaries.

A historical summary is given of knowledge about ascorbigen and of some early information about its importance in diet. The known properties of ascorbigen from *Brassica oleracea* are described in detail. Ascorbigen is not a protein; its molecular weight is 400; hydrolysis with HCl produces a violet-coloured derivative. The ultraviolet spectrum of ascorbigen is similar to that of leucoanthocyanins or tannins. On paper chromatograms, it gives a weak reaction for phenols with the Folin Denis reagent. It is highly labile at low

pH, but is resistant to oxidising agents. The molecule of ascorbigen has antiscorbutic activity about $\frac{1}{2}$ or $\frac{1}{3}$ that of ascorbic acid.

M. Prokšová (Czechoslovakia).

525

MEYER-DÖRING, H. Chemotherapeutic experiments with natural constituents of the body. *Nature*, 1954, 174, 555-556. [Bakteriol. Abt., Lohmühlenkrankenhaus, Hamburg.]

Studies on the chemotherapeutic effect of cysteylasorbic acid and of combinations of cysteine and ascorbic acid were made with mice infected with *Pneumococcus mucosus*, *Staphylococcus aureus*, *Streptococcus pyogenes haemolyticus* and *Bacterium coli*. Cysteylasorbic acid showed a definite protective effect.—A. M. Copping.

526

YASHIMA, K. Biochemical studies on 2-ketogulonic acid methylester. 5. On the mechanism of the formation of vitamin C from 2-ketogulonic acid methylester. *Kurume Med. J.*, 1954, 1, 1-10. [Dept. Med. Chem., Sch. Med., Univ. Kurume, Kurume-shi, Japan.]

From a series of experiments on the production of vitamin C from 2-ketogulonic acid methyl ester in presence of an extract prepared from fresh cow's muscle, the conclusion is drawn that vitamin C is formed from 2-ketogulonic acid methyl ester directly and not through an intermediary product. The results support the hypothesis that enolisation of the substance takes place, and that the cis-forms of the enol compounds form a lactone which yields ascorbic acid.—M. B. Richards.

527

GANGULI, N. C., ROY, S. C. and GUHA, B. C. Biosynthesis of L-ascorbic acid. *Nature*, 1954, 174, 511-512. [Univ. Coll. Sci. Technol., Calcutta 9.]

Previous work by Roy *et al.* (Abst. 2885, Vol. 16) and Ghosh (*J. Indian Chem. Soc.*, 1946, 23, 99) suggested that pyruvic acid is a precursor of ascorbic acid in the rat. The incubation of liver tissue with sodium pyruvate under suitable conditions has also been shown to produce an increase of from 15 to 20 per cent. ascorbic acid. In the presence of vitamin B₁ the increase was more than 30 per cent.

Radio-active ascorbic acid and the 2:4-dinitrophenylhydrazine derivative of dehydroascorbic acid were isolated by column chromatography from the urine of rats treated with chlorotone and radio-active pyruvamide (CH₃¹⁴COCOONH₂). With the use of paper chromatography and radioautography, glucose-1-phosphate, glucose-6-phosphate, fructose-1:6-phosphate, dl-glyceraldehyde phosphate, dihydroxyacetone phosphate, 3-phosphoglyceric acid, phosphopyruvic acid, citric,

α-ketoglutaric, succinic, fumaric and malic acids, and 15 amino-acids were isolated from the liver, and the absence from them of ¹⁴C was demonstrated, but liver glycogen was found active.

A. Hepburn.

528

KUSANOV, V. A., KRAIKO, E. A., PENAR, O. I., TRUFANOV, A. V. and YANOVSKAYA, B. I. Biosintez vitamína C u tsipyat v zavisimosti ot nalichiya v ratsione folievoi kisloty ili ee proizvodnykh. [Biosynthesis of vitamin C in the chicken in relation to the amount of folic acid or its derivatives in the diet.] *Biokhimiya*, 1953, 18, 351-353. [Inst. Pitan., Akad. Med. Nauk SSSR.]

Deprivation of pteroylglutamic acid in chickens was followed by an increase in the ascorbic acid content of the spleen, from 35.6 to 50.7 mg. per cent., the cause of which is considered to be a compensating increase in the functional activity of the spleen. When pteroylaminoipimelic acid was given to chicks suffering from pteroylglutamic deficiency, the high level of ascorbic acid in the spleen was maintained, 55.3, 46.7 and 46.4 mg. in 3 tests. Pteroylaminoazelaic acid behaved like pteroylglutamic acid, the ascorbic acid content of the spleen being 37.8 mg. per cent. The conclusion that the aminoazelaic compound had vitamin activity was confirmed by observations on the development of feathers in the chickens.—W. Hughes.

529

HILL, C. R. and BOURNE, G. H. Histochemical changes in scurvy. *Proc. Nutrition Soc.*, 1954, 13, x-xi. [Dept. Histol., London Hosp. Med. Coll., London, E. 1.]

530

PROZOROVSKAYA, L. L. Soderzhanie magniya v zubakh i kostyakh morskikh svinovok pri eksperimental'noi tzyznye i posle ee lecheniya. [Content of magnesium in teeth and bones in guinea pigs in experimental scurvy and after its cure.] *Stomatologiya*, 1954, No. 1, 20-24. [Dept. Biol. Chem., Med. Stomatol. Inst., Leningrad.]

In experimental scurvy the Mg content of guinea pigs' teeth was considerably less than normal. It continued to fall for 2 weeks while vitamins C and P were being given, and when signs of scurvy were disappearing; after 2 months of supplementary feeding, however, the Mg content of the molars was normal and that of the incisors nearly so. The Mg content of the bones was little affected by the disease.—H. Scherbatoff.

531

BONOMO, E. and CHIRICO, M. Sul comportamento dei glicoproteidi serici nello scorbutto sperimentale della cavia. [The behaviour of the

serum glycoproteins in experimental scurvy of the guinea pig.] *Acta vitaminol.*, 1954, 8, 173-176. [Inst. Clin. Med., Univ. Milan.] French, English, German and Spanish summaries.

Of 20 guineapigs fed on a scorbutogenic diet, 10 received 75 mg. ascorbic acid daily by mouth. After 20 days they were killed, and analyses were made on the blood serum. In the scorbutic animals there was a great increase in the perchloride-soluble mucoproteins, the total protein polysaccharides, and the glucosamines bound to the total serum protein.—E. M. Hume.

532

ALLEGRETTI, N. and VUKADINOVIĆ, G. (with URAIC, G.) Effect of ascorbic acid on insulin sensitivity in the rat. *Amer. J. Physiol.*, 1954, 177, 264-268. [Inst. Physiol., Med. Fac., Univ. Zagreb, Yugoslavia.]

The medulla of the adrenal glands was destroyed by paravertebral incision in albino rats weighing from 110 to 135 g., and 3 weeks were allowed for regeneration of the adrenal cortex. Together with normal rats they then received an intraperitoneal injection of 0.1 g. ascorbic acid every hour for 4 hr. The fasting blood sugar value of the treated rats was below that of the normal rats, and the injections of ascorbic acid had no significant effect.

Ascorbic acid or saline was given as just described to rats previously injected subcutaneously with 0.1125 units of insulin. Half the animals had the adrenal medulla destroyed and half were intact. Removal of the medulla increased the sensitivity to insulin. Administration of ascorbic acid heightened the action of insulin in intact rats and rats with the medulla destroyed. The same experiment was made with a dose of 0.0625 units of insulin but it proved too small to show a difference between animals given and not given ascorbic acid.—A. Hepburn.

533

SANFORD, P. E., WEI, A. J. and CLEGG, R. E. Vitamin C and tyrosine metabolism in the chicken. *Poultry Sci.*, 1954, 33, 585-589. [Kansas Agric. Exp. Stat., Manhattan.]

Groups of chicks were fed on a basal diet supplemented with 2.5, 5.0, 7.5 or 10 per cent. tyrosine, up to the age of 3 or 4 weeks. With more than 5 per cent. tyrosine, growth was slowed; with 7.5 and 10 per cent. there was high mortality and abnormal feathering. Ascorbic acid added to the tyrosine diet eliminated these effects but when it was given separately into the mouth the chicks developed soft beaks and did not eat well. Folic acid, 100 mg. per 100 g. feed, had no effect with a 7.5 per cent. tyrosine diet. When tyrosine metabolites were estimated in the urine of 3 hens fed on a commercial ration with 7 g. tyrosine daily,

homogentisic acid and keto-acid values were low for 12 days, then rose sharply. Administration of ascorbic acid lowered the values to the original level.—A. Hepburn.

534

REDDI, K. K. and NÖRSTROM, A. Influence of vitamin C on the utilization of sulphate labelled with sulphur-35 in the synthesis of chondroitin sulphate of the costal cartilage of the guinea pig. *Nature*, 1954, 173, 1232-1233. [2. Chem. Dept., Caroline Inst., Stockholm.]

Of 2 groups of 26 guineapigs of both sexes, maintained on a scorbutogenic diet, one group received no supplement, and developed scurvy; the other received 4 mg. l-ascorbic acid daily and remained healthy. On the 19th day the animals in both groups were given intraperitoneally 0.02 mC. $\text{Na}_2^{35}\text{SO}_4$ per 100 g. bodyweight in dilute aqueous solution. After 48 hr. they were killed and the costal cartilage was removed; chondroitin sulphate prepared from it was precipitated as BaSO_4 , and the radio-activity was measured by Geiger Müller counter. The amount of radioactive sulphate incorporated into the chondroitin sulphate of the costal cartilage by the normal animals was 3 times that by the deprived. No significant difference was found between the sexes. The technique appeared to offer a sensitive measurement of the disturbance of cartilage metabolism in scurvy.—A. Hepburn.

535

GOLDZIEHER, J. W. and MATTHEWS, R. L. The adrenal cortex and sulfur metabolism: the non-effect of glutathione on adrenal ascorbic acid. *Endocrinology*, 1954, 55, 163-165. [Res. Dept., St. Clare's Hosp., New York.]

In rats from which the pituitary gland had been removed, intravenous injection of 10 mg. glutathione did not affect the ascorbic acid content of the adrenal glands or the fall in their content of ascorbic acid produced by injection of adrenocorticotrophic hormone.—D. Duncan.

536

BOOKER, W. M., TUREMAN, J. R., DaCOSTA, F., POULSON, J. and MITCHELL, S. Metabolic relation of ascorbic acid, glutathione and adrenocortical hormone in survival of mice during cold stress. *J. Clin. Endocrinol.*, 1954, 14, 819-820. *Proc.* [Dept. Pharmacol., Med. Sch., Howard Univ., Washington, D.C.]

537

MULAY, A. S., SASLAW, L. D. and NADEL, E. M. Interrelationships of liver glycogen deposition, corticosteroids and ascorbic acid in scorbutic

guinea pigs. *J. Clin. Endocrinol.*, 1954, **14**, 805-806. *Proc. [Nat. Insts. Health, Bethesda, Md.]*

538

BACCHUS, H. Ascorbic acid and urinary steroid excretion. *J. Clin. Endocrinol.*, 1954, **14**, 744-746. [Dept. Physiol., Sch. Med., George Washington Univ., Washington, D.C.]

In a letter referring to the report of Klein *et al.* (Abst. 3708, Vol. 24) that the administration of ascorbic acid to human subjects reduced the excretion of "blue chromogen" substances but not of 17-ketosteroids in the urine, the author recalls his own findings (Title 3019, Vol. 23; Abst. 4412, Vol. 23) that the rise in excretion of 17-ketosteroids seen in adrenalectomized female rats given cortisone was prevented by ascorbic acid. Unpublished results (1952) showed that ascorbic acid had no effect on the increase of urinary 17-ketosteroids after injection of dehydroepiandrosterone into similar rats. Intact rats treated with ascorbic acid had only a slight decrease.

The results suggested that ascorbic acid acted not on endogenous or secreted 17-ketosteroids but on their formation from the injected cortisone. Experiments *in vitro* with liver tissue (Abst. 1873, Vol. 24; *Endocrinology*, 1953, **53**, 617) confirmed the conclusion. The probable reason why ascorbic acid fails to produce any great change in the amount of urinary 17-ketosteroids in the intact organism is that the greater part of the urinary 17-ketosteroids is derived from the testes or ovaries and from the secretion of the adrenal cortex. Some is derived from the metabolism of C-21 corticosteroids.

The "blue chromogens", which include dehydroepiandrosterone, are considered to be derivatives of certain C-21 corticosteroids and constitute only from 20 to 30 per cent. of the total 17-ketosteroids in urine. Hence a large decrease affects the total urinary 17-ketosteroids to only a small extent. The results of Klein *et al.* were essentially in agreement with the author's, and were interpreted as indicating that, in the intact subject, ascorbic acid can depress the excretion of certain substances including metabolites of certain adrenocortical hormones.—A. Hepburn.

539

BELAVADY, B. and BANERJEE, S. Metabolism of cholesterol in scorbutic guinea pigs. *J. Biol. Chem.*, 1954, **209**, 641-645. [Dept. Physiol., Presidency Coll., Calcutta.]

Chronic scurvy was produced in male guineapigs by feeding them on the diet described by Banerjee (Abst. 2319, Vol. 15). To prolong their survival time they received daily an oral supplement of 0.25 mg. ascorbic acid. The ability to acetylate

p-aminobenzoic acid was tested over several weeks in them and in animals given 5 mg. ascorbic acid daily. They were then killed and cholesterol was estimated in certain organs.

During the progress of scurvy the capacity to acetylate *p*-aminobenzoic acid diminished; the cholesterol content of the adrenal glands, spleen and lungs fell, that of the testes and small intestine increased significantly; the liver and kidney showed no change. It is suggested that the disturbance of cholesterol metabolism in the guineapig deprived of vitamin C may be responsible for the lowered function of the adrenal gland which was previously demonstrated.—G. A. Garton.

540

PELLEGRINO, C. and MONTELLA, A. Colesterolo e acido ascorbico nel surrene rigenerante. [Cholesterol and ascorbic acid in the regenerating adrenal gland.] *Arch. Sci. biol., Bologna*, 1954, **38**, 338-348. [Ist. Patol. Gen., Univ. Pisa.]

541

TAYLOR, D. J., GREENBERG, J., JOSEPHSON, E. S. and NADEL, E. M. Non-parallel changes in the cholesterol and ascorbic acid content of the adrenals of malaria-parasitized chicks. *J. Clin. Endocrinol.*, 1954, **14**, 822-823. *Proc. [Nat. Insts. Health, Bethesda, Md.]*

542

ČERMÁK, O. Vylučování kyseliny askorbové u králků po aplikaci hormonů předního laloku hypofyzy. [Excretion of ascorbic acid by the rabbit after administration of hormones of the anterior pituitary gland.] *Sbor. VŠZ, Brno*, 1953, 155-162. [Inst. Anat., Agric. Univ., Brno.] English and Russian summaries.

The excretion of ascorbic acid given by intramuscular injection, and its relation to the previous administration of an extract of the anterior pituitary gland (Antephysol) was studied in non-pregnant doe rabbits.

The excretion of doses of from 40 to 60 mg. in 6 of 8 animals occurred in 2 phases, from 17 to 30 hr., and from 94 to 122 hr., after the administration. When 100 mg. Antephysol was injected before the administration of 60 mg. ascorbic acid, the first phase did not take place at all in 7 of 11 animals, and the second was delayed in 7 of 11 animals by 30 hr. on the average. The total amount of ascorbic acid excreted in most of the does was less than in control rabbits.

A. Jančařík (Czechoslovakia).

543

SKOLOFF, B., EDDY, W. H., POWELL, R., BEAUMONT, J. and RELOS, H. Ascorbic acid analog in experimental leukemia. *Cancer*

N.A. and R., January 1955

Res., 1954, 14, 307-310. [Southern Bio-Res. Lab., Florida Southern Coll., Lakeland.]

Of 45 normal mice aged about 5 months, 15 were maintained on Purina chow, 15 on a scorbutogenic diet with 0.75 per cent. of the ascorbic acid analogue, D-glucoscorbic acid, and 15 on the same diet with 1 per cent. analogue. Forty-five mice of a strain with a high incidence of lymphocytic leukaemia, and already at 8 months showing signs of it, were treated in the same way. Ascorbic acid was estimated in the blood plasma; the value after 15 days had fallen from 1.05 mg. per 100 ml. almost to nil in all 4 groups having the experimental diets.

In a similar experiment, the ascorbic acid content of the spleen and adrenal glands fell to a very low value after 13 days of the diet with 1 per cent. analogue. All the values for the leukaemic mice were higher than for the non-leukaemic.

When groups of normal mice were given intraperitoneally a dose of one million lymphatic cells from leukaemic mice, and were maintained on Purina chow or on the experimental diet with 0.75 per cent. analogue, there was no difference in their survival time.

When mice of the leukaemic strain were maintained on Purina chow or on the experimental diet with 0.75 per cent. analogue, there was no difference in the incidence of leukaemia, but the analogue gave a slight increase in mean survival time.

The lack of effect of the ascorbic acid analogue on lymphocytic anaemia was considered to be due probably to the biosynthesis of sufficient ascorbic acid for conversion of folic acid to citrovorum factor.

Cortisone acetate reduced the incidence of spontaneous leukaemia in mice, whether receiving Purina chow or the experimental diet; on the latter with 0.75 per cent. D-glucoscorbic acid the effect was greater.—A. Hepburn.

544

PINO, A. and FERRACUTI, B. Au sujet des variations de la teneur en protéines, vitamine C et lactose dans le lait de chèvres traitées avec "Helichrysrum Italicum G. Don." [Variations in the content of protein, vitamin C and lactose in the milk of goats given *Helichrysrum italicum*, G. Don.] *Lait*, 1954, 34, 369-388.

After a preliminary period of 8 days, 3 adult lactating goats were treated for 30 days with equivalent amounts of different preparations of the plant *Helichrysrum italicum*. Two preparations were aqueous and the third was a syrup. The animals remained healthy and their weight and milk production did not vary. Analysis of the milk for protein, ascorbic acid and lactose before and after treatment showed no significant differ-

ence between the goats. Protein values fluctuated and rose to a maximum after about 26 days' treatment with an increase of about 26 per cent. Ascorbic acid rose to a secondary peak after 10 days' treatment before reaching a maximum at the same time as protein with an increase of about 180 per cent. Both then fell but to a value higher than the original. Lactose fluctuated widely and decreased on the whole throughout the experiment to reach a minimum 2 days after the end of treatment with a decrease of about 11 per cent.

A. Hepburn.

545

SOKOLOV, F. Obogashchenie sgyschennogo moloča s sakharom askorbinovoi kislotoi i vitaminom A. [Enrichment of sweetened condensed milk with ascorbic acid and vitamin A.] *Mol. Prom.*, 1954, 15, No. 1, 34-35. [Latvian Agric. Acad.]

The addition of from 200 to 500 mg. ascorbic acid per kg. condensed milk formed a product of good quality, with great vitamin activity and stability during 9 months' storage at low temperatures. When more than 2 mg. vitamin A was added to the milk, the taste deteriorated. It is recommended that the ascorbic acid should be added as an aqueous solution.—H. Scherbatoft.

546

DJORDJEVIĆ, N. Vitamin C u žiru (semen *Quercus*). [Vitamin C in the acorn.] *Acta vet.*, Belgrade, 1954, 4, No. 2, 49-51. [Inst. Pharmacol.] English summary.

Ascorbic acid was estimated by indophenol titration. In the mature acorn the maximum content was 54.8 mg. per cent. During storage there was a gradual decrease and 40 per cent. only of that originally present was found after 2½ months. (From summary.)—A. Hepburn.

547

WISHART, J. W. Ascorbic acid (vitamin C) content of varieties of blackcurrants. *Tasmanian J. Agric.*, 1954, 25, 164-167. [Govt. Analyst's Lab., Hobart.]

Studies over 6 seasons showed considerable differences in ascorbic acid content between varieties of black currant grown in Tasmania; White Bud was consistently best and Goliath worst, with 390 and 220 mg. per 100 g. fruit, respectively, in 1954. Such variety differences should be remembered in selecting black currants for juice manufacture. In any one variety there was no differences between early and late maturing berries, but, as was found by Oliver (Abst. 485, Vol. 8), the smaller fruits had a higher ascorbic acid content than the larger.

Ascorbic acid was estimated by the potentiometric method of Harris *et al.* (Abst. 1146, Vol. 12) or that of Liebmann and Ayres (Abst. 3251, Vol. 15).—W. M. Deans.

548

PAUL, P. and FERLEY, M. **Palatability and ascorbic acid content of broccoli frozen under different conditions.** *Food Res.*, 1954, 19, 272-275. [Dept. Food Nutrit., Michigan State Coll.]

Ascorbic acid was estimated in samples of broccoli exposed, wrapped in cellophane, and in the final boxed state, and then frozen in still and in moving air; the temperature was recorded by thermocouples. Different rates of freezing were thus obtained, and the broccoli was tested after 1 week, and after 3, 9 and 13 months' storage.

Flavour, appearance, texture and palatability were not significantly affected by the rate of freezing but with the slower rate of freezing in packaged material, the ascorbic acid content was less. The length of storage had no effect on the ascorbic acid content.—A. Hepburn.

549

HUGGART, R. L., HARMAN, D. A. and MOORE, E. L. **Ascorbic acid retention in frozen concentrated citrus juices.** *J. Amer. Dietetic Assoc.*, 1954, 30, 682-684. [Florida Citrus Exp. Stat., Lake Alfred.]

Freshly frozen concentrates of juice from 3 different varieties of orange, 2 of grapefruit and one of tangerine were stored at temperatures of -8° , 10° , 20° , 32° and 40° F., and ascorbic acid was estimated by indophenol titration initially, after 1 and 2 weeks, and at intervals up to 12 months.

After 12 months at -8° F. the concentrates

showed an average retention of ascorbic acid of slightly over 98 per cent., less at higher temperatures, down to 95 per cent. at 40° F. The tangerine concentrate had the lowest percentage retentions, 94 and 89.7 per cent. at -8° and 40° F., respectively.

After storage for from 15 to 18 months, the juices were reconstituted by diluting 25 ml. of the concentrate with 75 ml. water; they were then stored for 2 days in a refrigerator at 50° F. The percentage retention of ascorbic acid in the reconstituted juices was over 94 for orange and grapefruit juice and over 91 for tangerine juice.

A. Hepburn.

550

WOJNA-NOWICKA, L. **Straty kwasu askorbinowego w surowkach powstałe na skutek przyrządzenia. [Losses of ascorbic acid in raw vegetable dishes following their preparation.]** *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 195-206. Russian and English summaries.

The percentage loss of ascorbic acid in cucumber immediately after preparation was 22, after 1 hr. from 33 to 35, and after 3 hr. from 41 to 49. For white cabbage and cabbage and apple dishes the loss was less with corresponding values of 7, from 7 to 12 and from 7 to 20 per cent., respectively. Tomato dishes lost only 9 per cent. in 3 hr.

Cream and table salt reduced the loss of ascorbic acid; vinegar had the opposite effect. (From summary.)—A. Hepburn.

OTHER VITAMINS

551

TIKKHOMIROVA, A. N. **Sposob prigotovleniya gidrolizata kazeina, lishennogo triptofana, dla vosproizvedeniya PP-avitaminoza u zhivotnykh. [Method of preparing tryptophan-free casein hydrolysate for producing vitamin PP deficiency in animals.]** *Vop. Pitan.*, 1954, 13, No. 2, 47-50. [Lab. Izuchen. Vitamin, Inst. Pitan., Akad. Med. Nauk SSSR., Moscow.]

552

LECOQ, R., CHAUCHARD, P. and MAZOUÉ, H. **Étude chronaximétrique de l'avitaminose P et des facteurs vitaminiques P. [Study of vitamin P deficiency and vitamin P factors by measurement of chronaxie.]** *Ann. pharm. franç.*, 1954, 12, 179-190. [Hôp. St.-Germain-en-Laye, École Hautes-Études, Paris.]

Lack of vitamin P was easily demonstrated by measurement of nervous chronaxie. The condition is thought to be due to acidity for it was counteracted by giving preparations likely to promote alkalosis such as hesperidose, rutoside, epicatechin and leucocyanidol.—K. H. Coward.

553

ZAPROMETOV, M. N. **O vitamine, ukreplyayushchem stenki krovenosnykh kapillyarov. [The vitamin which strengthens the capillary walls.]** *Priroda*, 1954, No. 2, 103-106. [A. N. Bakh Inst. Biochem., Acad. Sci. USSR.]

One of the most active materials for strengthening the capillary walls was found to be the catechins of tea, present in the fresh leaves and in green tea. Vitamin P can be extracted from the rough leaves of tea which are useless in the tea trade. Subcutaneous injection of a preparation of catechins considerably increased the resistance of the capillary walls in white mice. The complex preparation of catechins from tea leaves (so-called tea tannin) has the effect of regulating the activity of the thyroid gland.

In human beings daily doses of from 100 to 150 mg. tea tannin established normal resistance of the capillaries in a few weeks even in deep-seated haemorrhages. It was a means also of healing trophic ulcers. The production of vitamin P from tea leaves is now being undertaken by the food industry.—H. Scherbatoff.

4. PHYSIOLOGY OF NUTRITION

ENZYMES

554

GÓMEZ, F., RAMOS GALVÁN, R., CRAVIOTO, J. and FRENK, S. Estudio sobre el niño desnutrido. 11. Actividad enzimática del contenido duodenal en niños con desnutrición de tercer grado. [Studies on the undernourished child. 11. Enzymic activity of the duodenal contents in children affected with third degree malnutrition.] *Pediatrics*, 1954, 13, 544-548 (in English, 548-552). [Serv. Nutrición, Hosp. Infantil, Mexico.]

The study included 40 children between 5 months and 7 years old with "third degree malnutrition", i.e., showing delayed growth, skin changes, dyspigmentation, oedema, anaemia, liver changes, low protein levels in serum and spinal fluid, anorexia, apathy and periodic diarrhoea. Samples of duodenal contents were obtained by Levin tube and tested for amylase, trypsin and lipase activity, within 5 days after admission to hospital and again shortly before discharge.

All 3 enzymes were much below normal at the initial sampling and rose towards normal as the children recovered. There was no statistical correlation between enzyme levels and anorexia or diarrhoea. Absorption of protein appeared to be slow in early stages of treatment.—D. Duncan.

555

ROSENTHAL, O. and VARS, H. M. (with NOVACK, B. G. and ZERBE, J. W.) Response to fasting of hepatic arginase, alkaline phosphatase, and rhodanese in protein-depleted rats. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 555-558. [Harrison Dept. Surg. Res., Sch. Med., Univ. Pennsylvania, Philadelphia.]

Male rats fed on a protein-free diet for 2 weeks were fasted for 2 or 4 days and then killed. Arginase in the liver increased by 20 and 58 per cent. after 2 and 4 days; alkaline phosphatase decreased by 7 and 58 per cent. Rhodanese increased by 26 per cent. after 2 days and then no further.

The initial increase in arginase content was of an order similar to that of rhodanese, a functionally unrelated enzyme, and to the total protein. This was considered a non-specific response due to an increase in hepatic protein. The more significant increase in arginase after 4 days and the decrease in alkaline phosphatase were considered specific and probably related to the increased protein metabolism.—A. Hepburn.

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556

RAMACHANDRAN, S. and SARMA, P. S. Rôle of inositol in the activity of alpha-amylase. *Indian J. Med. Res.*, 1954, 42, 201-209. [Biochem. Lab., Univ. Madras.]

Rats given 2 or 5 mg. of the γ -isomer of hexachlorocyclohexane per 100 g. diet had, by the end of 10 to 12 weeks, all developed alopecia, but others given supplements of inositol showed no alopecia. No difference was found between the weights of the groups. The amylase activity of plasma and of pancreas was higher in the group with than in the group without inositol. In a rabbit given 250 mg. of the isomer at the rate of 25 mg. on alternate days amylase activity in blood was lower than in a control animal; in one of 2 others receiving the isomer 100 μ g. biotin had no restoring effect, but in the other 2500 mg. inositol maintained the activity at a level near normal. Further work with larvae of the rice moth, *Corcyra cephalonica*, showed that the reduction of their amylase activity caused by the γ -isomer could be prevented by giving them inositol; this contradicted the earlier finding by one of the authors (Sarma, *Current Sci.*, 1950, 19, 315) that inositol had no such effect.

Experiments *in vitro* showed that the inhibiting effect of the γ -isomer on synthesis and secretion of amylase by slices of pigeon pancreas was limited by both inositol and biotin to an extent which increased with their concentrations. This effect of biotin was studied also in rats and rice moth larvae with induced biotin deficiency. The presence or absence of biotin was without effect on the amylase activity of the plasma or pancreas of the rats or of the tissue of the larvae. It is suggested that in the pancreas slices the biotin acted indirectly by stimulating synthesis of inositol.

D. Harvey.

557

DESNUELLE, P. Proteolytic enzymes. *Annu. Rev. Biochem.*, 1954, 23, 55-78. [Lab. Chim. Biol., Fac. Sci., Marseilles.]

558

GUILBERT, P. W. and BARBERO, G. J. The importance of trypsin in infancy and childhood. 2. Clinical considerations. *Amer. J. Med. Sci.*, 1954, 227, 672-682. [Child. Hosp., Philadelphia, Pa.]

A review with 86 references. For part 1 see Title 3155, Vol. 24.

- 559
BUCHS, S. Fundamental observations on the existence, extraction and activation of gastric cathepsin. *Enzymologia*, 1954, **16**, 193-214. [Child. Hosp., Univ. Basle.]
- 560
BUCHS, S. Über den Pepsin- und den Kathepsin-Gehalt des Duodenums und des Antrum Pylori des Menschen. [Pepsin and cathepsin contents of the duodenum and pyloric antrum of man.] *Hoppe-Seyler's Ztschr.*, 1954, **296**, 129-141. [Kinderklin., Univ. Basle.]
- Extracts of the mucosa of the upper duodenum and pyloric antrum contain pepsin and cathepsin which differ from the stomach enzymes in activity, resistance to destruction by alkali and temperature optimum. Extracts taken lower in the duodenum give a protease still more resistant to alkali.—I. Leitch.
- 561
HERRINGTON, B. L. Lipase: a review. *J. Dairy Sci.*, 1954, **37**, 775-789. [Dept. Dairy Indust., Cornell Univ., Ithaca, N.Y.]
- 562
GAMBASSI, G. and MAGGI, V. La lipasi tributir-
inolitica e la malattia aterosclerotica sperimentale: ricerca sul ruolo antiateromassico dell'ATP. [Tributyrin-splitting lipase and experimental atherosclerosis; research on the role of ATP against atheroma.] *Acta gerontol.*, 1954, **4**, 89-96. [Ist. Patol. Med., Univ. Bari.] French and English summaries.
- Rabbits received cholesterol in olive oil in doses of 1 g. daily for 50 days or 0.5 g. for 140 days and the experimental animals, but not the controls, received 2.5 mg. adenosine triphosphate (ATP) daily by vein or subcutaneously or 1 mg. by vein. Finally all were killed and the tributyrin-splitting activity was estimated of serum, liver, kidney and in one experiment of intestine.
- In serum the enzyme activity in groups treated with ATP was always greater than in controls. The greatest protection against the effects of cholesterol on liver and kidney was obtained when ATP was given subcutaneously, and in these animals enzyme activity of liver and kidney was low. ATP had no effect on the intestinal enzyme.
- D. Duncan.
- 563
STOVNER, J. and LIND, B. Succinylcholinapne og serumcholinesterase. [Apnoea caused by succinylcholine, and serum cholinesterase.] *Nord. Med.*, 1954, **52**, 1223-1225. [Rikshosp., Oslo.] English summary.
- Succinylcholine is destroyed by serum cholinesterase (pseudocholinesterase). Prolonged apnoea after relatively small amounts of succinylcholine has been shown to be associated with low values of serum cholinesterase. Six further cases are described. In 5 of them serum cholinesterase was inversely related to the duration of apnoea. Blood transfusion may shorten the apnoea, since the enzyme survives in the blood bank.—I. Leitch.
- 564
McLEAN, J. R. and BEVERTIDGE, J. M. R. Hepatic necrosis induced by dietary means. 7. The effect of a necrogenic diet on plasma pseudocholinesterase levels in the rat. *Rev. canad. Biol.*, 1953, **12**, 1-5. [Dept. Biochem., Queen's Univ., Kingston, Ont.] French summary.
- For other parts see Absts. 2269, Vol. 22; 749, Vol. 23; 4827, Vol. 24.
- The value of plasma cholinesterase concentration as criterion for early assessment of the necrogenic properties of a diet was examined. Thirty-three pairs of rats weighing about 105 g. were given a necrogenic diet containing, per cent., primary grown yeast 18, lard 5, maize starch 69, salts 3, Cellu flour 2, cod liver oil 2, and sugar vitamin mixture 1. Each rat received about 8 g. diet, and one of each pair had 4 mg. α -tocopherol incorporated in it. Pairs of rats were killed from 15 to 49 days later and pseudocholinesterase in the plasma was estimated by the method of Mendel *et al.* (Abst. 2827, Vol. 13).
- Among 27 pairs the value was lower in 16 rats not given tocopherol, higher in 3 given tocopherol, and the same in 8 pairs. The variation was too great for a single estimation to be used to assess the necrogenic potency of a diet.—E. M. Hume.
- 565
ANFINSEN, C. B. and KIELLEY, W. W. Biological oxidations. *Annu. Rev. Biochem.*, 1954, **23**, 17-54. [Lab. Cellular Physiol., Nat. Heart Inst., Bethesda, Md.]
- 566
REIF, A. E., BROWN, R. R., POTTER, V. R., MILLER, E. C. and MILLER, J. A. Effect of diet on the antimein titer of mouse liver. *J. Biol. Chem.*, 1954, **209**, 223-226. [McArdle Mem. Lab., Med. Sch., Univ. Wisconsin, Madison.]
- Discusses succinoxidase activity.
- 567
RICHERT, D. A. and WESTERFELD, W. W. The relationship of iron to xanthine oxidase. *J. Biol. Chem.*, 1954, **209**, 179-189. [Dept. Biochem., Med. Coll. State Univ. New York, Syracuse.]
- For earlier work see Absts 4940, 4941, Vol. 21; 858, Vol. 24.
- The omission from the purified diet of Mn, Cu or Zn had no effect on the xanthine oxidase

response to Mo, but omission of Fe reduced the response. Both Fe and Mo are thus required for formation of intestinal xanthine oxidase. Increasing the intake of Cu or Zn to 10 times the normal or that of Mn to 20 times had no effect on the response.

Rats fed on fresh milk showed only a partial response of intestinal xanthine oxidase to Mo, but maximum response to Mo + Fe. In the absence of Fe addition of Cu or Mn reduced the response to Mo. Liver xanthine oxidase was not affected by the presence or absence of Fe, Cu or Mn in the diet, except that in absence of Fe it was increased by Cu. Similar but smaller responses were obtained with a purified casein diet.

Xanthine oxidase prepared from fresh raw cream and dialysed gave atomic Fe:Mo ratios between 8 and 10. Two riboflavin molecules were present in the enzyme for each atom of Mo. The minimum molecular weight was estimated as about 320,000. No evidence of porphyrin structure was found.

Absorption spectra showed that Fe accounts for at least part of the hitherto unidentified component in the spectrum of xanthine oxidase.

The enzyme was not inhibited by Versene, $\alpha\alpha$ -dipyridyl or sodium azide, and Fe did not reactivate it after inhibition by KCN.—D. Duncan.

568

KALCKAR, H. M. and KLENOW, H. Nonoxidative and nonproteolytic enzymes. Biosynthesis and metabolism of phosphorus compounds. *Annu. Rev. Biochem.*, 1954, **23**, 527-586. [Inst. Cytophysiol., Univ. Copenhagen.]

572

BROBECK, J. R. Physiology of appetite. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 6*, 1953, 36-48 (with discussion 48-51). [Sch. Med., Univ. Pennsylvania, Philadelphia.]

573

HENNING, N., KINZLMEIER, H. and KIMBEL, K. H. Die H-Ionenkonzentration im Magen während der Verdauung. [Hydrogen-ion concentration in the stomach during digestion.] *Gastroenterologia*, 1954, **81**, 284-292. [Med. Klin., Univ. Erlangen.] English and French summaries.

The pH was measured with an antimony electrode tube of small calibre on 24 normal subjects. The test meals were *breakfast*: milk; milk with bread and butter; or oat flakes with milk and grated apple; *lunch*: meat, egg, bread and butter; apple; boiled ham; or yoghourt; *dinner*: soup,

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569

BAMANN, E., FISCHLER, F. and TRAPMANN, H. Verhalten und Spezifität von Cer, Lanthan, Eisen und Aluminium als Phosphatase-Modelle gegenüber physiologisch wichtigen Phosphorsäureverbindungen wie Zuckerphosphorsäuren, Adenylsäuren, Adenosintriphosphorsäure und anderen. [Behaviour and specificity of cerium, lanthanum, iron and aluminium as phosphatase models in relation to physiologically important phosphates such as sugar phosphates, adenylic acids, adenosine triphosphoric acid and others.] *Biochem. Ztschr.*, 1954, **325**, 413-428. [Inst. Pharm. Lebensmittelchem., Univ. Munich.]

570

MONCHE, J. Observaciones sobre procesos fosfatásicos. [Phosphatase action.] *Rev. española Fisiol.*, 1954, **10**, 29-37. [Inst. Fisiol., Fac. Med., Barcelona.] English summary.

A critical review of knowledge on phosphatase processes, based on a comparison of the author's experimental results with those of others.

M. B. Richards.

571

HELMAN, E. Z. and MITCHELL, D. F. Phosphatase in human saliva: its relationship to calculus and lactobacillus counts. *J. Dent. Res.*, 1954, **33**, 335-338. [Sch. Dent., Univ. Minnesota, Minneapolis.]

See also Abst. 427.

DIGESTION AND ABSORPTION

mince, potato in milk; egg, dumplings and savoy; veal, potato in milk; meat, potato and carrot; fish, potato salad; noodles and butter; veal and potato; starch pudding with or without apple compote; *afternoon coffee*: thick cream; coffee with a bun or coffee alone; *supper*: curd; pickled raw herring with bread; boiled eggs; mince with salt.

Digestion occurred chiefly in the pH range 3 to 5, i.e., the cathepsin zone. Protein had most and carbohydrate least buffering effect. With protein, in spite of its stimulating effect on gastric secretion, the buffering action was so strong that the optimum pH for peptic digestion was not reached.

I. Leitch.

574

PATHAK, J. D. and PAI, M. L. Gastric response, digestion and evacuation time of some non-vegetarian foods. 3. *Indian J. Med. Res.*, 1954, **42**, 191-196. [Dept. Physiol., Med. Coll., Baroda.]

In continuation of previous work on milk and vegetarian foods (*Indian J. Med. Res.*, 1953, **41**, p. 47; Abst. 4595, Vol. 24) data are presented for fish and meat dishes.—F. C. Aitken.

575

VAN WAYJEN, R. G. A., GROEN, J., KUIJZER, P. J. and WILLEBRANDS, A. F. Voeding, resorptie en stofwisseling bij patiënten na totale maagresectie. [Diet, absorption and metabolism of patients after complete removal of the stomach.] *Nederl. Tijdschr. Geneesk.*, 1954, **98**, 2048–2060. [2. Clin. Inw. Ziekten, Wilhelmina Gasthuis, Amsterdam.] English summary.

Details are given for 10 patients of the energy value of food eaten and of N and fat balances; for 8 of the patients from 23 to 72 days after operation, for the other 2, after 11 months and 11.5 months. Weight and basal metabolic rates are also recorded. Absorption of protein and fat was poor and could not be improved by giving folic acid, liver preparations or vitamin B₁₂. But when small meals were taken frequently the patients gained on the average 4 kg. weight during the study, which lasted about 30 days.—I. Leitch.

576

WIRTS, C. W., REHFUSS, M. E., SNAPE, W. J. and SWENSON, P. C. Effect of tea on gastric secretions and motility. *J. Amer. Med. Assoc.*, 1954, **155**, 725–729. [Dept. Med., Jefferson Med. Coll., Philadelphia, Pa.]

The effect of tea and of water on pH and pepsin of gastric juice obtained from 10 fasting subjects without gastric disease was studied *in vitro*. Over 100 patients with gastro-intestinal disease were used in studies of the effects of tea and of water on pH, pepsin and gastric emptying time and in studies of gastric motility with intragastric balloons and X-ray.

The results indicate that tea stimulates gastric motility, but has approximately the same effect as water on gastric secretion. It would seem that tea may be allowed as a beverage in average amounts in the treatment of most gastro-intestinal conditions.—F. C. Aitken.

577

BRUMMER, P. The significance of intestinal decomposition products of cellulose on the effect of cellulose laxatives. *Gastroenterologia*, 1954, **82**, 10–14. [Med. Clin., Univ. Turku, Finland.] German and French summaries.

Faecal micro-organisms *in vitro* fermented lactose more readily than methyl cellulose or cellulose prepared from blackcurrant seeds. In tests on 14 hospital patients with constipation and 5 members of the hospital staff only methyl cellulose had a laxative effect. It is considered that this effect is

due to the hygroscopic action of methyl cellulose and not to irritant products of intestinal decomposition.—D. Duncan.

578

PLATT, B. S. The fate of successive portions of a meal in the rat's stomach. *Proc. Nutrition Soc.*, 1954, **13**, xvi–xvii. [Human Nutrit. Res. Unit, Med. Res. Coun. Labs., Holly Hill, London, N.W.3.]

579

PLATT, B. S. The behaviour of milk in the stomach of the infant rat. *Proc. Nutrition Soc.*, 1954, **13**, xvii–xviii. [Human Nutrit. Res. Unit, Med. Res. Coun. Labs., Holly Hill, London, N.W.3.]

580

COLE, A. S. Blood alanine concentration, alanine absorption rate and gastric emptying. *J. Physiol.*, 1954, **124**, 66P. [Dept. Physiol., Univ. Bristol.]

581

KIRILUK, L. B. and MERENDINO, K. A. An experimental study of the buffering capacity of the contents of the upper small bowel. *Surgery*, 1954, **35**, 532–537. [Dept. Surg., Sch. Med., Univ. Washington, Seattle.]

In adult dogs both pH and buffering capacity of intestinal secretions, as estimated by lavage of consecutive 10-cm. sections of the small intestine with intact blood supply, decreased from the pylorus to the fifth section and rose again in the eighth. The range of pH was approximately 7.30 to 7.15. Buffering capacity decreased all the way. I. Leitch.

582

FRAZER, A. C. Fatty acid absorption and chylomicrons.

SINGER, H., SPORN, J. and NECHERLES, H. Fatty acid absorption and chylomicrons. *Science*, 1954, **120**, 39; 39–40. [Med. Sch., Hosp. Centre, Birmingham.]

Frazer earlier (Abst. 745, Vol. 16) concluded that saturated fatty acids were partitioned between the oil and water phases in the intestine "according to chain length and water-solubility and that this differential distribution affected their absorption". Later isotopic studies in the United States confirmed these observations. The absorption of unsaturated fatty acids depends on whether they are taken in the free state or as glyceride esters; no intraluminal emulsification occurred with free oleic acid, though significant amounts were absorbed: under different circumstances it is admitted that oleic acid may undergo emulsification.

Singer, Sporn and Necheles "do not doubt the general truth of the partition hypothesis of fat absorption", but consider that some of their experiments may modify it. Intraluminal emulsification occurred when oleic acid was introduced into a Thiry loop of intestine, although bile and pancreatic juice were absent; the number of chylomicrons was equal to that found after oral administration of oleic acid at 0.5 g. per kg. bodyweight.—G. A. Garton.

583

HEWITT, W. A histochemical study of fat absorption in the small intestine of the rat. *Quart. J. Microscop. Sci.*, 1954, 95, 153-157. [Dept. Anat., Univ. Liverpool.]

Male albino rats weighing 190 to 233 g. were starved for 48 hr. but allowed free access to water. Each animal then received 225 mg. triolein by stomach tube. The rats were killed 2½ hr. later and sections of intestine were removed and examined with Sudan black and the acid haematin test with and without Sudan red colouration. Details are given of the histochemical appearance of the epithelial cells of the mucous membrane. Lipid was observed within the epithelial cells and their free border and it also occurred as particles between the cells. It is concluded, therefore, that triolein is absorbed not only by passing through the epithelial cells of the intestinal mucosa, but also by passing between these cells.

G. F. Garton.

584

DONNET, V. and GARNIER, L. Absorption intestinale des solutions de chlorure de sodium. [Absorption from the intestine of sodium chloride solutions.] *C.R. Soc. Biol.*, 1954, 148, 549-551.

Experiments were made on 2 dogs with Thiry Vella loops; one had also most of the thyroid removed. The loops were perfused with NaCl solutions at concentrations from 1 to 18 per thousand, at 20 ml. per min.

In both dogs the greatest absorption was at concentrations of 4 to 5 per thousand. The curve of absorption showed a linear relation between absorption and concentration, but the relation was inverse at concentrations above 16 per thousand.—D. Duncan.

585

EJARQUE, P. and JIMÉNEZ-VARGAS, J. Sobre la absorción intestinal de cloro. [Absorption of chlorine from the intestine.] *Rev. española Fisiol.*, 1953, 9, 243-256. [Inst. Fisiol., Fac. Med., Barcelona.] English summary.

Chloride absorption was studied in rats by the Sols and Ponz technique (Abst. 1663, Vol. 18), with solutions of 0.3, 0.9 and 1.5 per cent. NaCl and a

constant pressure of 20 cm. water. Absorptions lasted 30 min. and were repeated after washing out the segment with isotonic glucose solution.

With the hypotonic solution chloride secretion exceeded absorption, but with the isotonic and hypertonic solutions chloride was absorbed, more rapidly from the latter. Differences in secretion and absorption between loops of jejunum and of ileum were slight.

The mechanism of chloride absorption is discussed.—D. Duncan.

586

WEISS, K. E. Physiological studies on eructation in ruminants. *Onderstepoort J. Vet. Res.*, 1953, 26, No. 2, 251-283. [Onderstepoort Lab.]

A study of the relation of eructation to rumen contractions showed that belching occurred immediately after the secondary rumen contraction and that the occurrence of the secondary contraction was erratic. After the introduction of air into the rumen its incidence was increased.

The efficiency of belching was estimated by the time taken for air introduced into the rumen to be removed, as judged by the time taken for the pressure within the rumen to fall to its initial level. The introduction of alkali into the rumen, abdominal vagotomy, or distension of the abomasum or caecum all reduced the efficiency of belching, principally by inhibition of contractions of the reticulum. Drugs inhibiting movements or causing spasms of the rumen similarly reduced the efficiency of belching.—A. T. Phillipson.

587

DOWNIE, H. G. Photokymographic studies of regurgitation and related phenomena in the ruminant. *Amer. J. Vet. Res.*, 1954, 15, 217-223. [Dept. Physiol., New York State Vet. Coll., Cornell Univ., Ithaca.]

From a steer and 2 cows records were made of intranasal and intratracheal pressure, bolus movement in the oesophagus, abdominal movement, jaw movement and time. The records were made on a photokymograph with a series of segment capsule manometers and a variac transformer, with a straight filament bulb as source of light.

The method gave a precise picture of the pressures involved in regurgitation. Negative intratracheal pressures ranged from 120 to nearly 300 mm. bromoform. If a regurgitation failed to aspirate sufficient ingesta, a second attempt followed, with increased negative pressure, at the height of the rumen contraction. Positive pressure often preceded and followed the negative pressure, a plateau being maintained until the glottis opened.

The tracings also permitted accurate assessment

of the time taken by each stage of the process of regurgitation, and data were collected on the number and frequency of the jaw movements involved. Other recordings indicated that when the negative pressure of regurgitation is sustained the flow of blood to the heart from the jugular veins is significantly increased.—W. A. Greig.

588

WEISS, K. E. The significance of reflex salivation in relation to froth formation and acute bloat in ruminants. *Onderstepoort J. Vet. Res.*, 1953, 26, No. 2, 241-250. [Onderstepoort Lab.]

The consistency of rumen contents was compared by measuring the weight and time necessary to draw a mercury-weighted bulb through a measured distance in the contents.

When Merino sheep were fed on alfalfa in the flowering or pre-flowering stage, the consistency of digesta was always greater with the preflowering stage. A high index was related to the incidence of bloat.

The speed at which air, introduced into the rumen by bubbling it through the contents, was removed by belching was measured by the time needed for the pressure in the rumen to return to its initial level. This took longer when pre-flowering alfalfa was eaten, presumably owing to foam formation. Mechanical distension of the rumen with trapped gas is considered to be concerned in producing bloat, but in contrast it is also stated that the presence of saponins in alfalfa contributes towards the colloidal state of the contents.—A. T. Phillipson.

589

DALE, H. E., STEWART, R. E. and BRODY, S. Rumen temperature. 1. Temperature gradients during feeding and fasting. *Cornell Vet.*, 1954, 44, 368-374. [Dept. Vet. Physiol., Univ. Missouri, Columbia.]

The subject was a 3-year-old Jersey heifer neither pregnant nor lactating. Thermocouples soldered to a long probe were introduced into the rumen through a stab wound.

The rumen temperature was always higher than the rectal temperature, by about 4° F. under normal feeding conditions but by only 1.5° F. after a 24-hr. fast. The rumen showed a temperature gradient with the highest temperature at the uppermost thermocouple, nearest the most recently eaten material, except immediately after eating, when the temperatures fell most at the top and bottom of the rumen. When 14 lb. water at 62° F. was pumped into the rumen by a stomach tube the temperature rose in 2 phases, a rapid increase probably caused by mixing, and a slower warming of the chilled ingesta. The rectal temperature remained constant.—D. Duncan.

590

NANGERONT, L. L. Variations in intraruminal temperatures of sheep during normal and abnormal conditions. *Cornell Vet.*, 1954, 44, 403-416. [Dept. Physiol., New York State Vet. Coll., Ithaca.]

Four adult wethers weighing 100 to 120 lb. were provided with rumen cannulae. Temperatures in the rumen were recorded by a copper-constantan thermocouple, and in the rectum by a thermocouple or a clinical thermometer.

When sheep drank water the rumen temperature dropped, and the magnitude and duration of the drop were proportional to the amount of water. When alfalfa hay was eaten the temperature rose by 0.2° to 0.8° C., and clover hay gave increases of as much as 1.2° C. The rumen temperature was relatively constant during fasting. When sheep were allowed to eat a dairy ration with 16 per cent. protein to appetite, usually about 1 kg., the average rise in temperature was 0.6° to 0.8° C. When larger amounts were placed in the rumen through the cannula there was not a proportionately greater increase in temperature. Large quantities of freshly cut alfalfa either eaten or ground and introduced by the cannula lowered the temperature.

Introduction of pure oxygen into the rumen did not affect the temperature unless the volume was sufficient to cool the ingesta. Introduction of powdered glucose caused the temperature to rise by 0.5° to 1.0° C. unless water was available, but if allowed to do so the sheep would drink and the temperature then fell.

Toxic quantities of new wheat or rye, which killed one sheep and made another very ill, did not increase the rumen temperature more than did normal feeds.—D. Duncan.

591

CHAIGNEAU, M. and CHARLET-LÉRY, G. Composition des gaz de digestion chez les ruminants. [Composition of gases arising from digestion in ruminants.] *C.R. Acad. Sci.*, 1954, 239, 308-310.

Two sheep were fed on alfalfa hay and apple residues and direct samples of intestinal gases were taken by a tube inserted into the anus. A third sheep fed on alfalfa hay had a direct sample of the rumen gases taken by fistula 15 hr. after the last feed.

The mean contents of intestinal gases in volumes per cent. were CO₂ 9.8, CH₄ 51.3, N 39.0, and for rumen gases 34.0, 19.7 and 39.2, respectively, with oxygen 7.1. Ethane was not found in gases from either source.—A. Hepburn.

592

ANNISON, E. F. Some observations on volatile fatty acids in the sheep's rumen. *Biochem.*

N.A. and R., January 1955

J., 1954, **57**, 400-405. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The gas/liquid partition chromatogram was used to estimate volatile acids in the rumen contents of sheep fed on rations rich in protein or starch and on hay.

On all diets the proportions of acids present in the rumen decreased as the length of the hydro-

carbon chain increased; isobutyric, isovaleric and 2-methylbutyric acids were present, the latter in the dextro-rotatory form. Formic acid was occasionally found in traces and an unidentified C_6 acid was found when the sheep were starved. Branched-chain isomers were present in smaller quantities than n -acids.—A. T. Phillipson.

See also Absts. 887, 888, 892-94, 936, 1284, 1285.

COMPOSITION OF BODY FLUIDS AND TISSUES

BLOOD

593

HANSSLER, H. and RIEGEL, K. Studien zur Blutmorphologie des Neugeborenen. [Blood morphology of the newborn.] *Ztschr. Kinderheilk.*, 1954, **75**, 140-161. [Kinderklin., Univ. Tübingen.]

594

SEELEMAN, K. Untersuchungen über die Erythropoese beim Neugeborenen und jungen Säugling. [Erythropoiesis in newborn and young infants.] *Ztschr. Kinderheilk.*, 1954, **75**, 189-208. [Kinderklin., Univ. Hamburg, Eppendorf.]

595

JORDAN, P. Some notes on the haemoglobin levels of infants in the first year of life. *East African Med. J.*, 1954, **31**, 143-145. [E. African Med. Survey, Mwanza.]

Hb was estimated with the Medical Research Council grey-wedge photometer standardised to read 14.8 g. Hb per 100 ml. blood (100 per cent. Haldane). Hb values for 44 Wasukuma mothers just before parturition and for their infants at birth showed no correlation. It is the native custom not to cut the cord till after delivery of the placenta. The mean values on the first day for Hb, red cells and haematocrit, respectively, were for 10 infants thus treated 20.6 g., 5.5 million, and 60, and for 10 infants whose cord was clamped immediately, 16.4 g., 4.8 million, and 52. On the third day the reticulocyte count was 5.9 in the first and 2.9 in the second group.

Hb values estimated monthly up to 12 months of age showed a course not unlike that of London children, falling from 145 per cent. (Haldane) at birth to just over 70 per cent. at and after 3 months. In infants with malaria the course was similar, but at a lower level.—E. M. Hume.

596

ITANO, H. A., BERGREN, W. R. and STURGEON, P. Identification of a fourth abnormal human hemoglobin. *J. Amer. Chem. Soc.*, 1954, **76**, 2278. [California Inst. Technol., Pasadena.]

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Electrophoresis on filter paper of haemoglobin from a child with atypical anaemia revealed the presence of 2 components, one with the mobility of haemoglobin F and the other with mobility nearly that recorded for haemoglobin C. The haemoglobin, more detailed study of which will be reported, is considered to be a mixture of haemoglobin F and of a haemoglobin, hitherto undescribed, which it is proposed to call haemoglobin E.—D. Harvey.

597

EDINGTON, G. M. and LEHMANN, H. Haemoglobin G. A new haemoglobin found in a West African. *Lancet*, 1954, **267**, 173-174. [Med. Res. Inst., Accra, Gold Coast.]

A sample of Hb from a West African man was found by paper electrophoresis at pH 8.6 to separate into the normal variety A and another which migrated faster than the sickle-cell variety S. Agglutination tests excluded the foetal variety F. The only other with a similar migration rate is Hb D but, in the Tiselius apparatus, its behaviour has been reported (Itano, *Science*, 1953, **117**, 89) as identical with that of S. The new alphabetical designation Hb G is accordingly proposed.—D. Harvey.

598

GARRY, R. C., SLOAN, A. W., WEIR, J. B. DE V. and WISHART, M. The concentration of haemoglobin in the blood of young adult men and women: the effect of administering small doses of iron for prolonged periods. *Brit. J. Nutrition*, 1954, **8**, 253-268. [Inst. Physiol., Univ. Glasgow.]

The literature dealing with the Hb content of blood of adult man and of mature lower mammals is reviewed. In women the Hb content of the blood is known to be less than that in men, but evidence for this sex difference is not well established in lower mammals.

Two series of experiments were made on the Hb content of the blood of male and female university students whose ages and general environment were similar. In the first series the mean value for 24 men was 15.92 ± 0.23 g. Hb per 100 ml.

blood and that for 41 women was 14.20 ± 0.13 . The women were given a supplement of 7 mg. Fe daily for 5 months; the men received no Fe. The mean Hb content of the blood increased slightly in both the women and the men, so that there was no satisfactory evidence that small doses of Fe increase the Hb content of the blood of women.

In the second series the mean Hb content for men was 16.21 ± 0.11 g. Hb per 100 ml. blood and that for 55 women was 14.59 ± 0.10 . The men and women were divided each into 3 groups; one group of each sex received a supplement of 28 mg. Fe as ferrous sulphate together with 0.52 mg. copper sulphate and 0.47 mg. manganese sulphate; one group of each sex received a supplement of 14 mg. Fe with 0.26 mg. Cu and 0.24 mg. Mn and the remaining 2 groups acted as controls and received similar tablets containing no Fe, Cu or Mn. The tablets were taken for 1 year. After this time the difference between the mean Hb contents of the blood of men and women was still about 1.5 g. Hb per 100 ml. blood; administration of Fe had failed to decrease the difference, which could not, therefore, be attributed to lack of Fe in the women's diets. Relatively to the control groups the men and women who received Fe showed an increase in the Hb content of the blood. In both sexes, also, the lower the initial Hb value the greater was the response to Fe.

G. F. Garton.

599

GARROW, J. S. Some haematological and serum protein values in normal Jamaicans. *West Indian Med. J.*, 1954, 3, 104-107.

The haematological investigations were of Hb, packed cell volume, mean corpuscular Hb concentration (MCHC), red cell sedimentation rate, total protein, albumin and globulin in serum, and the subjects were healthy, well nourished and apparently normal undergraduates and laboratory technicians. The numbers of persons and the mean values for the sexes were, males: Hb, 126, 14.90 g.; packed cell volume, 76, 46.1 per cent.; MCHC, 76, 30.0 per cent.; sedimentation rate, 49, 8.2 mm. per hr.; total protein 112, 7.28 g.; albumin, 112, 3.90 g. and globulin, 112, 3.37 g. per 100 ml. For females corresponding numbers and means in the same order were: 79, 12.66; 48, 41.7; 48, 30.1; 48, 19.5; 67, 7.17; 67, 3.79 and 67, 3.37. The MCHC and albumin:globulin ratio are low in comparison with United Kingdom and Canadian standards.—D. Harvey.

600

STAUBACH, H. and SECKFORT, H. Inosit und Blutbild. [Inositol and the blood picture.] *Klin. Wochenschr.*, 1954, 32, 567. [Med. Klin., Univ. Mainz.]

There was no change in the number or structure of cells in the peripheral blood of 24 patients without metabolic disease, given a single intravenous injection of 2 mg. *meso*-inositol or the same daily for 16 days.—E. M. Hume.

601

THOMAS, J. W., OKAMOTO, M., JACOBSON, W. C. and MOORE, L. A. A study of hemoglobin levels in the blood of young dairy calves and the alleviation of anemia by iron. *J. Dairy Sci.*, 1954, 37, 805-812. [Dairy Husb. Res. Branch, U.S. Dept. Agric., Beltsville, Md.]

Holstein, Jersey, Red Danish, crossbred and Sindhi \times Jersey cross calves, in all 365 animals, were used. Hb values were estimated weekly or fortnightly from birth to 105 days of age.

Hb values were highest at birth and lowest at 40 to 60 days of age, after which they tended to increase coincidentally with increased consumption of alfalfa hay. Hb values of Jersey and Holstein calves were lower than those of crossbreds, Red Danish or Sindhi \times Jersey crosses. In breeds in which there were sufficient numbers of calves of both sexes available for comparison, females had higher Hb values than males. Supplements of Fe alone or with Cu, Co and Mn significantly increased Hb values. Cu, Co and Mn without Fe had no effect. When the bodyweight gains of Holstein and Jersey calves were expressed as a percentage of the normal for the respective breeds, calves with the highest percentage gains had higher Hb values than those with lower gains.

J. N. Aitken.

602

TANAKA, T. and ROSENBERG, M. M. Relationship between hemoglobin levels in chickens and certain characters of economic importance. *Poultry Sci.*, 1954, 33, 821-827. [Dept. Poultry Husb., Univ. Hawaii, Honolulu.]

New Hampshire chickens were given an adequate starter ration up to 6 weeks of age, grower's rations to 12 weeks and thereafter laying rations. All chickens received fowl pox vaccine at 4 weeks of age, and formalin-inactivated Newcastle vaccine at 6 weeks and again at 18 weeks. After 18 weeks the birds were housed individually and received artificial light for 14.5 hr. daily.

In order to study the effect of age on Hb value, 3 chickens from each of 40 dams were selected at hatching and reared as above to 80 weeks of age. There was no difference in blood Hb value between males and females until 8 weeks of age; thereafter the males were the higher, with 9.81 g. Hb per 100 ml. blood on the average compared with 8.92 g. Hb per 100 ml. for females. The Hb value in the males increased steadily to the forty-sixth week, when it began to vary irregularly. The Hb value of females increased slowly from the eighth

to the twentieth week and then fell by 1.67 g. per 100 ml. blood by the twenty-second week; many pullets matured during this period. A gradual decrease continued to the twenty-eighth week, followed by a gradual rise to the fortieth, whereafter the value was constant. The average Hb level from the twenty-fourth to the eightieth week of age was 13.19 ± 0.73 g. per 100 ml. for males and 8.61 ± 0.29 for females.

In the second experiment, 310 laying pullets and 59 non-laying, either moulting or pausing, pullets were used; the mean Hb values were 8.07 g. and 8.55 g. per 100 ml., respectively. The Hb value for 34 hens in production was 8.13 and for 33 non-laying hens 8.67 g. The group differences between laying and non-laying were not significant. Of the non-laying pullets 52 were bled 10 weeks later when in lay and gave a value 0.33 g. per 100 ml. lower than their previous value, a statistically significant difference. A more detailed study on fewer birds indicated that Hb values increased 2 weeks before the onset of pause and reached a peak 2 weeks after egg production resumed; thereafter a gradual decrease was found.

It was shown that Hb values and bodyweight at 6, 12, 18 or 24 weeks or 10 months of age were not correlated, in contradiction to a previous unpublished study. There were non-significant correlations between Hb values and age at sexual maturity and persistency of production.

M. J. Head.

603

RODECK, H. and RÖTTGER, H. Plasmavolumen und extracelluläres Gewebsswasser im Laufe der Entwicklung des Kindes. [*Plasma volume and extracellular tissue water in the growing child.*] *Ztschr. Kinderheilk.*, 1954, **74**, 610-621. [*Kinderklin., Med. Akad., Düsseldorf.*]

Plasma volume was estimated with Geigy Blue and extracellular tissue water by the Na thio-cyanate method in 106 healthy children of ages and stages of development from birth to 17 years. With increase of bodyweight there was a continuous increase in the absolute volumes of plasma and tissue water, but the reverse was true for the relative values. The percentage of plasma and tissue water referred to bodyweight was very high in children of low weight, but decreased more and more with increasing weight. The absolute amount of plasma increased from about 350 ml. at 5 kg. to about 2400 ml. at 63 kg., and the relative values for the same weights fell from 7 to 3.7 per cent. Similarly tissue water volume increased from 2000 ml. to 13,000 ml., and the relative values fell from 40 to 21.4 per cent. of bodyweight. Up to puberty no difference was found between the sexes, but after puberty the boys showed absolutely and relatively greater plasma volume and extracellular tissue water volume than the girls, though owing

to the smallness of the groups at this stage the difference was not significant. Five children with pre-puberty adiposity had a higher absolute water content than normal children of the same age, but the relative value was less. The big increase of weight in this disease is to be attributed much more to increased fat than to increased water storage.—M. B. Richards.

604

ELLIS, B. C. A comparison of the T1824 blood volume at sea-level and an altitude of 5,740 feet in normal South African European males. *S. African J. Med. Sci.*, 1954, **19**, 11-14. [*Dept. Clin. Pathol., Univ. Witwatersrand, Johannesburg.*]

Twenty healthy male medical students between 20 and 24 years of age and living at sea level in Cape Town were subjects for comparison with earlier work (Abst. 1924, Vol. 24) in Johannesburg at an altitude of 5740 ft. Mean values for the data, with standard deviations, were: height 180 ± 7.39 cm., weight 70.4 ± 8.17 kg., plasma volume 3060 ± 384.1 ml., total blood volume 5630 ± 722.8 ml., red cell volume 2570 ± 370.8 ml., venous packed cell volume 47.5 ± 2.10 per cent. In comparison with sea-level data from elsewhere these volumes, expressed in ml. per kg., plasma 43.5, total blood 80.1, and red cell 36.6, were within the normal range. In comparison with the Johannesburg values differences were statistically significant only when expressed as ml. per kg.; at altitude plasma and total blood volumes were, respectively, 9.7 and 6.2 per cent. lower than at sea level and red cell volume was no different. These findings support the view that, at moderate altitude, reduction of plasma volume causes haemoconcentration which compensates for the associated relative anoxia.—D. Harvey.

605

CRONIN, M. T. I. The determination of plasma volume and the estimation of blood volume in the horse. *Vet. Rec.*, 1954, **66**, 197-200. [*Animal Health Trust Equine Res. Stat., Newmarket.*]

A healthy 4-year-old thoroughbred gelding fed on a normal maintenance ration and given light exercise received 3 injections of 174, 100 and 108 mg. T 1824 with intervals of 102 and 210 min.; 19 samples of blood were taken in just over 10 hr. for estimation of the rate of disappearance of the dye.

The horse weighed 496 kg.; the plasma volume was estimated as 5.237 per cent. of this and the total blood volume by calculation as 8.114 per cent.—W. A. Greig.

606

MARINONI, U. and VOLTA, A. Il volume del sangue e del plasma, determinato col metodo

delle emazie segnate con P^{32} , nella poliglobulia sperimentale da cobalto. [The blood and plasma volume, estimated with red cells labelled with ^{32}P , in experimental cobalt polycythaemia.] *Arch. Sci. biol., Bologna*, 1954, 38, 197-205. [Ist. Patol. Med., Univ. Milan.]

In 12 rabbits treated with cobalt chloride, 5 or 10 mg. per kg. bodyweight daily for 35 to 40 days, the red cell count rose from 4 or 5 million per c.mm. to 7 or 7.5 million. Red cells labelled with ^{32}P were used to estimate blood volume after 20 days and at the end of treatment and again 20 to 25 days later.

Total blood volume increased in each animal during cobalt treatment, red cell volume increased in all and plasma volume in all except one; the changes were reversed when treatment ceased. Cobalt thus induced true polycythaemia.

D. Duncan.

607

RAFSTED, S. and SWAHN, B. Studies on lipids, proteins and lipoproteins in serum from newborn infants. *Acta paediat.*, 1954, 43, 221-234. [Paediat. Clin., Univ. Lund.] French, German and Spanish summaries.

A sample of cord blood was obtained at birth and a sample of capillary blood at 1 to 6 days of age from 50 healthy full-term infants. Mother's milk was the sole food of the infants studied. Total and free cholesterol, phospholipins and total lipids were estimated by micro-methods and protein and lipid fractions in 0.6 ml. serum were separated by electrophoresis. Mean values and ranges are tabulated. Cholesterol, total lipids and phospholipins increased greatly during the first few days of life. All the lipid fractions increased, the greatest increase being in the β -fraction. Of the protein fractions α - and β -globulins increased and γ -globulin decreased; albumin showed little change. These changes are shown graphically.

F. C. Aitken.

608

TÖRNBLOM, N. Venoarterial lipid, protein and polysaccharide differences. *Acta med. scand.*, 1954, 149, 369-376. [Med. Clin., Univ. Hosp., Upsala.]

Previous work is discussed which reports higher lipid levels in serum, plasma and blood from veins than in that from arteries. It is concluded that the apparent difference for whole blood cannot be real.

However, total proteins and polysaccharides were higher in venous than in arterial plasma, the difference being of the same relative magnitude as that in plasma lipid content, and the levels in CO_2 -treated arterial plasma resembled those in venous plasma. It is considered that the differences in plasma protein and polysaccharide values

can be explained by the Hamburger phenomenon, i.e., the increase in red cell volume when blood takes up CO_2 , caused by passage of water and Cl ions into the red cells, and the opinion is expressed that the difference in plasma lipid values is produced in the same way.

The method of Bloor (*J. Biol. Chem.*, 1914, 17, 377) is shown to give incomplete extraction of serum lipids.—D. Duncan.

609

HOMOLKA, J. Die Bluteiweisskörper und ihre Veränderungen in der elektrophoretisch-polarographischen Forschung. [Blood proteins and their changes in electrophoretic-polarographic studies.] *Ann. paediat.*, 1954, 183, 96-118. [I. Kinderklin., Univ. Prague.] English and French summaries.

A simple method for micro-electrophoresis on filter paper is described. After the paper is dried at $37^\circ C$. strips are immersed in a 0.9 per cent. NaCl solution. The proteins redissolve, Brdicka's Co^{++} solution is added and the polarographic analysis of the test tubes is made, with constant and reproducible results.

The average values for 12 normal samples of serum were: albumin 51.3 and α -, β - and γ -globulins 13.7, 22.6 and 12.4 per cent. By applying Brdicka's denaturation process to the electrophoretically separated proteins it is shown that only the albumins, and not the globulins, are subject to alkaline denaturation. The polarographic changes in the globulins are explained by the variations in their solubility with and without alkali. The different character of the proteins in health and disease is demonstrated graphically and numerically. The material on which this work was based consisted of 130 polarograms obtained from the sera of 75 patients.—M. B. Richards.

610

HOCH, H. and CHANUTIN, A. An electrophoretic study of human plasma stored at room temperature. *J. Biol. Chem.*, 1954, 209, 661-669. [Dept. Biochem., Sch. Med., Univ. Virginia, Charlottesville.]

Within 36 hr. of storage at room temperature of serum and plasma, electrophoretic patterns showed that a portion of the β -globulin, which varied from 25 to 50 per cent. of the total, had increased in mobility and appeared as a new peak between α_2 -globulin and the remaining β -globulin. After more than 1 month of storage 4 plasma samples had a component lying between α_1 - and α_2 -globulin, apparently the "labile" β -globulin which had increased in mobility. Two other plasma samples had a mobility of "labile" β -globulin similar to that of α_2 -globulin, and α_2 -globulin increased in concentration for at least 2 months. After 1 to 3

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months the mobilities of γ -globulin and fibrinogen increased until at 6 or 7 months fibrinogen no longer had a separate peak.

The plasma patterns obtained were much changed after 10 months' storage in the presence of glucose and at 77 months only 2 main components were seen. Storage with sodium citrate alone, even for 8 years, preserved the original pattern.

A. Hepburn.

611

MUKHERJEE, K. L. and WERNER, G. **Enzyme activity and protein concentration in the serum of patients with malnutrition.** *J. Lab. Clin. Med.*, 1954, **43**, 727-731. [Sch. Trop. Med., Calcutta.]

α -Amylase, lipase, total protein and albumin were estimated in 28 samples of blood serum from 15 patients [age not stated] with nutritional oedema. The amylase activity ranged from 33 to 261 Smith Roe units. There was a linear relation to albumin only when that was below 2.5 g. per 100 ml. serum; otherwise the amylase content was normal. The correlation of amylase with total protein content was not statistically significant. Lipase activity in Willstaetter units was related neither to albumin nor to total protein content.

The findings are compared with those of other workers on children with kwashiorkor (see Absts. 1754, 2194, Vol. 23). A shortage of precursor proteins is suggested as limiting the formation of serum amylase.—D. Harvey.

612

BAUER, F. K., BLAHD, W. H., FIELDS, M. and GETCHELL, G. **Ascitic fluid and plasma protein exchange in cirrhosis of the liver. Studies with radioiodinated human serum albumin and gamma globulin.** *Metabolism*, 1954, **3**, 289-296. [Radioisotope Unit, Wadsworth Hosp., Veterans Admin. Centre, Los Angeles, Calif.]

613

WATKIN, D. M., LAWRY, E. Y., MANN, G. V. and HALPERIN, M. **A study of serum beta lipoprotein and total cholesterol variability and its relation to age and serum level in adult human subjects.** *J. Clin. Invest.*, 1954, **33**, 874-883. [Sect. Gerontol., Nat. Heart Inst., Nat. Inst. Health, Bethesda, Md.]

Serum cholesterol and some classes of β -lipoproteins were estimated at intervals for several weeks in blood samples obtained from 68 adult and elderly men. The subjects were nearly all housed in an institution for reasons of poverty and none was studied in this investigation if he was known to be suffering from any disease.

The results showed no positive correlation between total cholesterol values and the values of

any or all of the classes of lipoproteins which were measured. No significant difference in variability for total cholesterol and lipoproteins was found among several age groups.—G. A. Garton.

614

LEINWAND, I. and MOORE, D. H. **Serum lipid and protein fractions. 9. Comparison of ninety-six patients with vascular disease and sixty normal controls (with additional notes on blood donors).** *Circulation*, 1954, **10**, 94-100. Spanish summary.

In the presentation of results patients were grouped according to their disease and for each group and for the controls mean values and standard deviations of albumin and globulin fractions in serum were tabulated. These showed a general increase in β -globulin in all the disease groups. In *arteriosclerosis obliterans* the increase in β -globulin was related to the occurrence of high serum lipid levels, but only about half of the patients in this group had abnormal serum lipid levels. All disease groups showed lower mean values for albumin. The lowest albumin and the highest β -globulin values were in the group of patients with primary, essential xanthomatosis. Among controls professional blood donors had a lower albumin and a higher globulin value than non-professional donors.—F. C. Aitken.

615

ROSENBERG, I. N., YOUNG, E. and PROGER, S. **Serum lipoproteins of normal and atherosclerotic persons studied by paper electrophoresis.** *Amer. J. Med.*, 1954, **16**, 818-821. [Ziskind Res. Labs., New England Centre Hosp., Boston, Mass.]

Serum samples were from a group of 18 women of whom 10 were healthy and 8 were in hospital but had no cardiovascular sign, and from a group of 21 patients, 16 men and 5 women, judged to have coronary atherosclerosis. The sera were examined by the method given in Title 1800, Vol. 23.

Electrophoretograms for lipids showed 2 zones for which the dividing line corresponded approximately with the β -globulin band for proteins. In normal subjects 81.6 per cent. of the total area was in zone 1 and 18.4 per cent. in zone 2; in the patients, 70.3 and 29.7 per cent. There was overlapping of the groups, which limited the value of the electrophoretogram as a test for atherosclerosis; it may be of more use for the estimation of the relative amounts of β - and α -lipoprotein in serum.

D. Harvey.

616

COLLENS, W. S., BANOWITCH, M. M. and COLSKY, T. **Lipoprotein studies in diabetics with arteriosclerotic disease.** *J. Amer. Med. Assoc.*,

1954, 155, 814-817. [Diabetic Res. Lab., Maimonides Hosp., Brooklyn, N.Y.]

Values for S_r 12-20 and S_r 20-100 lipoproteins in the blood of 34 men and 19 women with diabetes and advanced arteriosclerotic disease did not differ from Gofman's values for normal persons (Abst. 686, Vol. 20). Of 32 who had also diabetic renal disease (Kimmelstiel Wilson syndrome), 23 had an atherogenic index (Abst. 5143, Vol. 24) above normal, against only 7 of the other 21. The proportion with raised atherogenic index was even higher in those with coronary artery disease in addition, but not in those with coronary artery disease but without diabetic renal disease.

S_r 12-20 lipoproteins in the same patient at different times might vary by over 30 per cent. Gofman's finding that lipoproteins tend to be high in those with high serum cholesterol was confirmed.

In the discussion the view is expressed that "the significance of the concentration of the serum lipoproteins . . . needs to be further evaluated . . . the reason may lie in the fact that no satisfactory figure for the true normal has been established".

[Some of the tables are given only in authors' reprints.]—W. M. Deans.

617

HORLICK, L. Serum lipoprotein stability in atherosclerosis. *Circulation*, 1954, 10, 30-42. [Dept. Med., McGill Univ., Montreal.] Spanish summary.

The lecithinase turbidity test was applied to the sera of 50 patients with coronary disease, mean age 57.7 years, 131 young controls, mean age 22.1 years, and 50 older controls, mean age 50.2 years. Lipids were estimated in all sera. The degree of final turbidity was related to serum lipid levels. There was a higher percentage of high final turbidity values in the group with coronary disease. Onset of turbidity was early in a higher proportion of the group with coronary disease; this was attributed to relative instability of lipoproteins in these subjects.—F. C. Aitken.

618

WEHMEYER, P. Concentration of plasma proteins in guinea-pig. *Acta pathol. microbiol. scand.*, 1954, 35, 54-66. [Statens Seruminst., Copenhagen.]

619

OFF, K. Umsatz von radioaktiven Serum-eiweissfraktionen. 3. Versuche an normalen Kaninchen. [Turnover of radio-active serum protein fractions. 3. Experiments on normal rabbits.] *Ztschr. ges. exp. Med.*, 1954, 123, 434-441. [Med. Klin., Freie Univ., Berlin.] For parts 1 and 2 see Abst. 4627, Vol. 24.

The turnover of blood protein fractions in normal rabbits was studied by means of ^{131}I -labelled serum. In all fractions the fall in activity took place in 2 phases, a relatively quick fall followed by a regular, slow decline. Mixing of intra- and extra-vascular protein took place more quickly with albumin and γ -globulin than with β - and α -globulin. The distribution space of α - and β -globulin was greater than that of the albumin and γ -globulin. The turnover was quickest for α_2 -globulin, followed by α_1 -, β - and γ -globulins, and finally albumin. The amount of protein renewed daily amounted to 1/7 of the albumin and about 1/4 of the globulins in the body.

M. B. Richards.

620

KRÜSKEMPER, H. L. and SCHULZE, G. Stoffwechseluntersuchungen bei langdauernder Cholesterinfütterung am Kaninchen. 1. Über das Verhalten von Eiweissfraktionen, Lipiden und Fermenten im Serum. [Metabolism studies with rabbits given cholesterol for a long time. 1. Behaviour of protein fractions, lipids and enzymes in serum.] *Arch. exp. Pathol. Pharmacol.*, 1954, 222, 562-574. [Med. Klin., Univ. Göttingen.]

Administration of cholesterol to 13 rabbits for 26 to 89 days caused a mean increase of 23 per cent. in total serum protein. This was due mainly to a rise of about 370 per cent. in β -globulin and a smaller rise in γ -globulin; serum albumin fell by about 18 per cent. The changes were apparent after 6 weeks, and showed no tendency to increase or go back with more prolonged feeding. The total lipid content of the serum increased, with an increase in all the fractions studied. Blood cholesterol increased sixfold from the normal value of 120.1 mg. per cent.; from the sixth week the values ranged between 350 and 1280. The cholesterol: phosphatide ratio increased, as did the neutral fats and "unknown substances". Cholesterol estimations made on serum gave higher values than those made on an alcohol-ether extract, the differences being significantly correlated with the β -globulin content of the serum. Serum lipase increased significantly in activity; acid and alkaline phosphatase showed no measurable change. Cholinesterase activity remained unchanged for 10 weeks, then increased.

It is suggested that the findings are probably the expression of a deep-seated disturbance of fat metabolism, combined with physico-chemical changes in the structure of the serum-protein-lipid complex.—M. B. Richards.

621

DE WAELE, J. and TEUNISSEN, G. H. B. Onderzoek van bloedsrum van normale en zieke honden met behulp van papierelectrophorese.

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[Blood serum of the normal and sick dog studied by electrophoresis on paper.] *Tijdschr. Diergeneesk.*, 1954, **79**, 447-454. [Lab. Med. Vet. Chem., Rijks Univ., Utrecht.] English, French and German summaries.

622

CHOPARD, P. Bestimmung der Eiweissfraktionen des Blutserums bei den Haustieren mit der Papierelektrophorese, unter Berücksichtigung verschiedener Faktoren. [Estimation of protein fractions in the blood serum of farm animals by electrophoresis on paper, with consideration of several modifying circumstances.] *Ztschr. Tierzücht. Züchtungsbiol.*, 1954, **63**, 21-52. [Inst. Tierzücht. Hyg., Univ. Berne.] French summary.

The history of techniques for estimating blood proteins and of electrophoretic separation in particular is briefly reviewed. For the present study blood was taken from the jugular vein of horses, cattle and goats, and during bleeding at slaughter of pigs, sheep and fowls. Rabbit blood was taken from the ear vein. Serum was separated in the centrifuge from clotted blood, except horse blood, which required no spinning. Total protein was estimated with a Zeiss immersion refractometer: separate proteins by the technique of Grassmann and Hannig (Abst. 1240, Vol. 23).

The results are reported in detail for 9 stallions, 8 mares and 4 geldings, 20 pigs, 22 white hill sheep, 14 Saanen goats, 16 Leghorn hens, 6 dogs and 4 cats. A special study was made of 1 adult and 4 young rabbits in Berne and at the high alpine station on the Jungfrauoch. In the young, β - and γ -globulins increased at high altitude; in the mature rabbit the globulins decreased and albumin increased.

Mean values are given for 11 Simmenthal cows. In an experiment on 5, there was an apparent increase in total protein after feeding which, with the method used, might be caused by either fat or sugar in blood and was not confirmed by Kjeldahl estimation. Milking had no significant effect on the same 5 cows. They were studied also during the transition from hay to grass. Four showed a significant increase in total protein and all a significant reduction of albumin 4 days after the transition to grass alone. On mountain pasture there was no change in total protein or its fractions.

For 3 calves at birth and soon after, values were low and rose steeply. In 7 out of 19 preparations no γ -globulin was found; α -globulin fell in the first few days and the rise was accounted for by albumin.

Mean normal values are summarised as follows, total protein in g. per 100 g. serum and fractions as percent. of total in the order albumin, α -, β - and γ -globulin:

Horse	. 7-00	40-9	18-5	19-1	21-5
Pig .	. —	39-2	21-9	15-6	23-3
Sheep .	. —	49-3	6-4	16-8	27-5
Goat .	. 7-53	44-3	10-8	14-3	30-6
Fowl .	. 5-50	33-2	18-5	12-0	36-3
Dog .	. 6-71	51-1	11-3	17-7	19-9
Cat .	. 6-70	49-0	24-7	8-9	17-4
Rabbit	. 5-64	62-5	10-7	14-8	12-0
Cattle	. 6-98	52-4	12-5	12-5	22-6

I. Leitch.

623

WEHMEYER, P. Concentration of plasma proteins in the ox. 1. Individual differences. *Nord. Vet.-Med.*, 1954, **6**, 717-736. [Statens Seruminst., Copenhagen.] German and Danish summaries.

Blood samples from 206 cattle showed that breed, sex and age did not influence serum protein values, which were also independent of cell volume and sedimentation rate. In one group a high serum protein value was accompanied by a high γ -globulin value, but in another there was no relation between albumin and globulin values. Globulin was slightly higher and albumin slightly lower in the oldest cows.

The logarithm of the formol-gelatination time was roughly proportional to both γ -globulin and globulin value. Fibrinogen value was not related to globulin value.—A. Hepburn.

624

WEHMEYER, P. Variation in the composition of the blood in cows during thirst, after intake of water, and on hunger. *Acta pathol. microbiol. scand.*, 1954, **34**, 518-520. [Statens Seruminst., Copenhagen.]

Five healthy cows and 5 culled cows were fed on hay and deprived of water for 2 days. In all there were increased serum albumin and protein concentrations. Cell volume increased only in the healthy cows.

Water was supplied and after 30 min. or 2 hr. serum albumin fell markedly, serum protein and cell volume less. Globulin concentration rose in the healthy cows.

The blood composition returned to normal in the 5 culled cows after grazing for 3 days. When water alone was supplied for 2 days no significant difference was seen in plasma protein concentrations or cell volume.—A. Hepburn.

625

HEIM, W. G. and SCHECHTMAN, A. M. Electrophoretic analysis of the serum of the chicken during development. *J. Biol. Chem.*, 1954, **209**, 241-247. [Dept. Zool., Univ. California, Los Angeles.]

Serum was obtained from chicken embryos of 10 to 21 days incubation age, from chickens up to

3 months old and from adult cocks and laying hens. The average mobilities of the component proteins and the percentage composition are presented in tables and diagrams.

Pre-albumin components, probably not identical, occurred in sera from embryos and laying hens, but not in males or immature females. Albumin represented about 30 per cent. of the total protein at all stages. α -Globulin decreased and β -globulin increased during embryonic life and γ -globulin increased for some days before and after hatching.

D. Duncan.

626

MÜTTER, D. and WORTMANN, V. Zum Aminosäureaufbau der Serum- und Gewebeeisweißkörper gesunder Menschen und Tiere. [Amino-acid composition of serum and tissue proteins of healthy men and animals.] *Biochem. Ztschr.*, 1954, 325, 448-458. [Forschungsinstitut, Diabetes, Karlsburg, Krs. Greifswald.]

Nineteen amino-acids were estimated quantitatively by chemical methods or by paper chromatography in the electrophoretically separated serum proteins of man, and also in the proteins of organs of man, pig, dog, rabbit and rat. The results for human serum agreed well with those of other authors, except that the methionine content of albumin, 3.1 per cent., differed from that given by some others, 1.3 per cent. Serum albumin had a considerably higher content of cystine, methionine, arginine, glutamic acid and phenylalanine than γ -globulin, but the latter was richer in tyrosine, tryptophan, glycine, serine and threonine; α - and β -globulin, when compared with other proteins, also had a characteristic amino-acid composition.

In man the composition of tissues closely resembled that of the serum proteins both qualitatively and quantitatively, except for the presence of hydroxyproline in a few organs: pancreas, heart, skeletal muscle and thyroid. Lung, pancreas and skeletal muscle contained nearly twice as much arginine as the other tissues. The thyroid was rich in cystine, the liver in methionine and threonine, and the pancreas in glycine. Human and animal tissue proteins also differed little in their amino-acid composition. In the pig, as in man, liver and heart were rich in methionine. In the dog the highest cystine values were found in the brain and the pituitary. The dog differed from man in that hydroxyproline was found in all organs except the liver, and almost always also in the urine. The adrenals of dog and rat contained about twice as much arginine as most of the other tissues. There was no reason to suspect the presence of unknown amino-acids.—M. B. Richards.

627

JIMÉNEZ DÍAZ, C., AGUIRRE, M. and ARJONA, E. La glucosamina del plasma y sus modifica-

ciones patológicas. [Plasma glucosamine and its pathological modifications.] *Rev. clín. española*, 1954, 52, 374-381. [Inst. Invest. Med., Madrid.] English, German and French summaries.

For 10 normal subjects plasma glucosamine ranged from 75 to 124 mg. per 100 ml. In diseases with increased destruction of tissues (infections and neoplasms) there were higher levels of plasma glucosamine, and also in collagen diseases, especially rheumatic disease, rheumatoid arthritis and chronic infectious asthma. For 52 patients with clinically active cardio-articular rheumatism values ranged from 153 to 445 mg. per 100 ml., and in 54 patients with rheumatoid arthritis, classified according to its intensity, there was clear parallelism between the activity of the disease and the increase in plasma glucosamine. When treatment with salicylate, ACTH, cortisone or N mustards was effective, as it usually was, there was a fall in serum glucosamine. The estimation of glucosamine is of great clinical importance as a guide in the treatment of cardio-articular rheumatism with these drugs.—M. B. Richards.

628

MUNKVAD, I. and VESTERDAL, J. Plasma glutamine and glutamic acid in children with brain diseases as compared with normal children. *Acta paediat.* 1954, 43, 320-326. [Univ. Clin. Paediat., Rigshosp., Copenhagen.] French, German and Spanish summaries.

Glutamine and glutamic acid were estimated by the method of Krebs (Abst. 3940, Vol. 18) in the plasma of 25 children with brain disorders and 12 without. Glutamine was significantly lower in the blood of those with brain disorder; in glutamic acid there was no difference, and both varied so greatly in the same individual at different times that the method is of no diagnostic value.

W. M. Deans.

629

IANNACONE, A. and KORNERUP, T. Plasma lipids and diabetic retinopathy. *Acta med. scand.*, 1954, 148, 411-416. [Dept. Metabol. Res., Wenner-Gren's Inst., Stockholm.]

630

IANNACONE, A. and MÖLLERSTRÖM, J. Plasma lipids and diabetic atherosclerosis. *Acta med. scand.*, 1954, 148, 417-424. [Dept. Metabol. Res., Wenner-Gren's Inst., Stockholm.]

631

SENAPATI, J. M., SUBRAHMANYAM, K. and BANERJI, S. M. Plasma cholesterol and its fractions in apparently healthy individuals. *J. Indian Med. Assoc.*, 1954, 23, 386-387. [Dept. Physiol., Sriram Chandra Bhandj Med. Coll., Cuttack.]

In 30 Indian males, aged 20 to 30 years, mean plasma total cholesterol was 171.8 mg. per cent., range 155.2 to 190.2, mean free cholesterol 54.03 mg. per cent., range 47.1 to 65.2, and mean (calculated) esterified cholesterol 117.8 mg. per cent., range 99.0 to 143.0.—J. S. Thomson.

632

GORECZYK, L. Über den Fettsäuregehalt des Depotblutes der Milz. [Fatty acid content of stored blood in the spleen.] *Biochem. Ztschr.*, 1954, **325**, 477-481. [Krankenhaus Staatsbahnen, Budapest 6.]

Stored blood from the spleen of dogs gave a fatty acid content ranging from 234 to 454 mg. per cent. for 7 samples, with a mean value of 385. In peripheral blood from the femoral vein the fatty acid content ranged from 195 to 334, with a mean value of 296 mg. per cent. The average difference in fatty acid content between stored blood and peripheral blood was 29 per cent. After circulating blood was allowed to flow through the spleen the spleen serum gave the same fatty acid content as peripheral serum. This increase in the fatty acid content of the stored blood probably plays a part in the esterification of cholesterol in the spleen.—M. B. Richards.

633

VAN SOEST, P. J. and BLOSSER, T. H. A detailed study of levels of certain blood constituents in normally calving dairy cows and in dairy cows with parturient paresis. *J. Dairy Sci.*, 1954, **37**, 185-194. [Dept. Dairy Sci., State Coll. Washington, Pullman.]

Blood glucose and pyruvic acid, serum Ca, plasma P and haematocrit were estimated before and after parturition in 4 normal cows and 4 cows, one at 2 parturitions, which had a history of milk fever.

In all parturient cows blood glucose and pyruvate rose and 3 cows showed increases with the development of milk fever. Pyruvate was higher during milk fever than at parturition. Plasma P and serum Ca declined erratically in the cows with signs of milk fever, but only slightly in normal cows. The haematocrit increased at parturition in all, and gradually declined to a minimum, generally 15 to 30 days *post partum*.

For 48 hr. after parturition there was a positive correlation between glucose and pyruvate in all and a negative correlation between plasma P and both blood glucose and pyruvate in the cows with milk fever.—A. Hepburn.

634

STRENGERS, T., MAAS, J. W., ROTTINGHUIS, H. and FEHMERS, G. A. Plasma electrolytes in the neonatal period. *Acta paediat.*, 1954, Vol. 25, No. 1

43, 342-346. [Clin. Chem. Lab., Onze Lieve Vrouwe Gasthuis, Amsterdam.] French, German and Spanish summaries.

Data are presented for Na, K, Cl and CO₂ in samples of blood plasma from 30 premature and 32 full-term infants and from 25 adults. Those for the infants are for 1, 2, 3, 5 and 7 days of age, but samples were not obtained from all on each of these days. In both groups of infants there was, on the first day, slight acidosis attributable to anaerobic metabolism *in utero* or during birth. In the full-term infants it disappeared rapidly and adult levels were reached by the 7th day. In the premature group the acidosis persisted, largely because of continuing high levels of Cl which, in turn, are thought to be related to incomplete development of the kidneys.—D. Harvey.

635

GUNDERSEN, K., BRADLEY, R. F. and MARBLE, A. Serum phosphorus and potassium levels after intravenous administration of glucose. Their use as diagnostic acids in diabetic and non-diabetic subjects with and without liver disease. *New Engl. J. Med.*, 1954, **250**, 547-554. [Baker Clin. Res. Lab., New England Deaconess Hosp., Boston, Mass.]

Eleven normal subjects and 41 patients, in all 38 men and 14 women, were given intravenous glucose tolerance tests. Glucose tolerance was considered normal when the fasting level was 100 mg. per 100 ml. or less and this was regained within 120 min. after glucose infusion. These criteria were met by 24 subjects and were not met by 24, and 4 were borderline.

Serum P fell in normal subjects by from 4 to 35 per cent., average 19 per cent., and in diabetics by 5 to 32, average 18 per cent. Serum K showed slight variations in either direction, without significant difference between groups.

Liver function was judged to be normal in 26 subjects, of whom 7 were diabetic and 2 borderline; liver disease was unquestioned in 5, of whom 4 were diabetic; the other 21 had only suggestive evidence of impaired liver function. The changes in serum P or K could not be used diagnostically. D. Duncan.

636

WIDDAS, W. F. Difference of cation concentrations in foetal and adult sheep erythrocytes. *J. Physiol.*, 1954, **125**, 18P-19P. *Proc.* [Dept. Physiol., St. Mary's Hosp. Med. Sch., London, W.2.]

637

LEUFOLD, F., FRANK, H. and BÜTTNER, H. Über proteingebundenes Acetalphosphatid im Blut.

[Protein-bound acetal phosphatide in blood.]
Hoppe-Seyler's Ztschr., 1954, 296, 55-62. [Med.
Univ. Kiel.]

See also Absts. 184, 354, 475, 510, 531, 563, 692, 758,
792, 830, 895, 1080, 1179, 1180.

LYMPH, CEREBROSPINAL FLUID, ETC.

638

THAYSEN, J. H. and THORN, N. A. Excretion of urea, sodium, potassium and chloride in human tears. *Amer. J. Physiol.*, 1954, 178, 160-164. [Hosp. Rockefeller Inst. Med. Res., New York.]

639

THAYSEN, J. H., THORN, N. A. and SCHWARTZ, I. L. Excretion of sodium, potassium chloride and carbon dioxide in human parotid saliva. *Amer. J. Physiol.*, 1954, 178, 155-159. [Hosp. Rockefeller Inst. Med. Res., New York.]

640

GRAD, B. Diurnal, age, and sex changes in the sodium and potassium concentration of human saliva. *J. Gerontol.*, 1954, 9, 276-286. [Gerontol. Unit, Allan Mem. Inst. Psychiat., McGill Univ., Montreal.]

The Na and K content of mixed, unstimulated saliva from 52 males and 58 females aged from 5 to 99 years was estimated by direct intensity flame photometry. Samples of 4 ml. were taken from each subject before each meal and on retiring at night. The mean content of all the samples from 101 subjects who provided all 4 specimens was 11.62 ± 0.42 m. equiv. Na and 24.98 ± 0.46 m. equiv. K per litre; the mean Na:K ratio was 0.46 ± 0.02 . A diurnal variation occurred, mostly in Na content; the highest values for Na:K occurred before breakfast and the lowest values before lunch or before supper with a tendency to rise before retiring at night. The Na content of saliva from men aged from 40 to 92 years was significantly higher than that of men under 40; no significant difference occurred among women in 2 similar age groups. The K content of saliva was significantly higher in both men and women aged 40 or over than in subjects of the same sex younger than 40. There was no significant difference in the salivary Na:K ratio between subjects over and those under 40. Men aged 40 and over had significantly higher salivary Na contents and Na:K ratios than had women over 40; there was no such difference due to sex in the younger subjects or in the salivary K content between sexes at any age.

Since it is known that the salivary Na:K ratio is inversely proportional to the degree of activation of the adrenal cortex, it is suggested that women in later life have a higher level of adrenal cortical function than men of the same age.

G. F. Garton.

641

WUNDERLY, C. and CAGIANUT, B. Free amino acids in the human aqueous humour. *Brit. J. Ophthalmol.*, 1954, 38, 357-363. [Ophthalmol. Clin., Univ. Zürich.]

642

WHEATLEY, V. R. Studies of sebum. 5. The composition of some sebum-like materials of human origin. *Biochem. J.*, 1954, 58, 167-172. [Dept. Biochem., Med. Coll. St. Bartholomew's Hosp., London, E.C.1.]

TISSUES

643

KRAYBILL, H. F., HANKINS, O. G. and FARNWORTH, V. M. Adaptation of anthropometric and roentgenological measurements for appraisal of the percentage of bone in cattle. *J. Appl. Physiol.*, 1954, 7, 13-18. [Animal and Poultry Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

Measurements were made before and after slaughter on 75 cattle of different breeds and conformation, from 136 to 1870 lb. in weight and from 52 to 4543 days in age. Lateral X-ray photographs were made of the lower leg area, the large metacarpal (cannon) bone and its surrounding tissues, with a standardised technique. The width and lateral area of the bone and the lateral area of the soft tissue were estimated from the X-ray photographs, and the density of the bone was estimated hydrostatically after death. Measurements were made of the bone, and the circumference of the leg was also measured in life. The bone content of the whole animal was calculated from analysis of ribs.

Correlations between all the measurements are presented. It is concluded that for practical purposes the density, width of bone and circumference of the metacarpal bone were the most significant indicators of the total bone content of the body. The regression equation form these 3 variables is:

Percentage of bone = $83.12 - 1.24(\text{Width of bone}) - 33.84(\text{Density of bone}) - 0.28(\text{Circumference of bone})$.

The estimated standard error is ± 3.79 . Density was the most significant factor, and although less accurate than the triple measurement it appeared to be useful for practical purposes.—D. Duncan.

644

WALSER, M. and BODENLOS, L. J. Composition of skin as compared with muscle. *Amer. J. Physiol.*, 1954, 178, 91-96. [Naval Med. Res. Inst., Bethesda, Md.]

Half-inch strips of skin from round the trunk of 13 normal female rats were extracted with ether

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and in the residue Cl was estimated with thio-cyanate and Na and K by flame photometer. The results are tabulated along with values for Na, K and Cl in the serum of the same rats and values for sodium space, chloride space and non-extracellular chloride of skin calculated therefrom.

Na, Cl and water contents were almost constant; these and K were lower than in dog skin (Abst. 3165, Vol. 13) or human skin (Abst. 459, Vol. 15).

Fat, water, collagen by the method of Lowry *et al.* (Title 817, Vol. 11) and K were estimated in skin from other rats and in muscle from 3 of these. Non-collagen solids were calculated by difference. Relative to these, the K content of skin was much less variable than when expressed in terms of fat-free dry tissue; it ranged from 35.5 to 54.8 mM per 100 g. fat-free non-collagenous dry tissue, mean 47.4 [given as 42 in Table 4, p. 95]. The corresponding mean value for muscle was 38.4, and for the whole body, from analyses of 3 carcasses and on the assumption that collagen forms 5 per cent. of the body by weight, 36. It is suggested that fat-free non-collagenous dry tissue is proportional to the mass of parenchymal cells and that intracellular constituents should be related to it. The distribution of body chloride also is discussed in the light of the findings.

W. M. Deans.

645

HRACHOVEC, J. Sur la variation de composition du muscle et du foie au cours du développement du lapin. [Variation in the composition of muscle and liver during development in the rabbit.] *C.R. Acad. Sci.*, 1954, 239, 306-308.

Liver and hindlimb muscle from rabbits of different ages from the 21st day of foetal life to adults were analysed.

The hindlimb muscles formed an increasing percentage of the bodyweight, from 1.8 in the embryo to 7.5 in the adult, but the liver reached its maximum relative weight of 9.5 to 10 per cent. about the 24th day of foetal life and thereafter declined until it represented 2.1 to 2.3 per cent. of the adult bodyweight.

The contents of lipid P and of free cholesterol, expressed in mg. per 100 g. fresh tissue, increased in both tissues until about one or two weeks after birth; their levels then fell in muscle but continued to rise in the liver so that in the adult the values for liver were 5 times as high as those for muscle. However, the ratios of lipid P : deoxyribonucleic acid and free cholesterol : deoxyribonucleic acid rose in both tissues in a similar way. The fall in lipid constituents in muscle is due mainly to the increase in protein content.

D. Duncan.

646

HRŮŽA, Z. Ztráty hmoty některých parenchymatousích orgánů hladověním v průběhu onto-

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genesis. [The loss of substance in some parenchymatous organs due to fasting during growth.] *Čsl. fysiolog.*, 1954, 3, 235-242. [Res. Inst. Human Nutrit., Prague.]

Rats were fasted until they lost 30 per cent. of their initial bodyweight. The greatest loss of bodyweight was observed in rats 38 days old. With newborn rats the loss of substance of the brain, liver, stomach and kidney was proportional to the loss of the whole body. In rats some days after birth the loss of substance of brain and kidneys was slower and that of liver and stomach faster than the loss of other tissues. During development the water content of most organs, except the stomach, decreases. The water content of the organs is increased by fasting, especially in early life.—M. Prokšová (Czechoslovakia).

647

FRANÇOIS, J., RABAËY, M., WIEME, R. J. and NEETENS, A. Étude des protéines cristalliniennes hydrosolubles par l'électrophorèse dans la cataracte expérimentale. [Electrophoretic study of water-soluble lens proteins in experimental cataract.] *Ann. Oculist.*, 1954, 187, 593-610. [Clin. Ophthalmol., Univ. Ghent.] English summary.

The changes in the lens proteins of rats at different stages of galactose-induced cataract were studied by paper electrophoresis. The tables and electrophoretograms show that the cataract lens is about 50 per cent. heavier than the normal lens of a rat of the same weight. In the normal lens the mean percentage of water-soluble proteins is 64, in lenses with slight opacity it is 46, and in those with marked opacity 30.6. This diminution takes place at the expense of all fractions, so that the relative concentration of the different fractions in the cataract lens is nearly the same as in the normal lens. In nuclear cataract, where the lens nucleus is much more opaque than the cortex, the diminution of fraction III is proportionately greater, since this fraction is relatively higher in the nucleus than in the cortex. In the electrophoretograms of cataract lenses the curves tend to become flattened, and when the cataract is complete there is a more or less homogeneous zone in which it is difficult to distinguish separate fractions.—M. B. Richards.

648

NOBLE, N. L., BOUCEK, R. J. and LEWIS, G. T. A relationship of tissue lipids to sex and body weight in the albino rat. *Circulation Res.*, 2, 1953, 311-314. [Miami Heart Inst., Fla.] Male and virgin female rats weighing from 40 to 625 g. and fed on stock diet were used, 27 rats in all.

There was no significant difference in the mean

phospholipin, total or residual (total minus phospholipin) fatty acid contents in the liver or phospholipin in the heart between females and males of the same weight, but when 5 large males weighing 400 to 625 were included the females had a significantly greater concentration of total liver fatty acids. The concentrations of liver phospholipin in the male, heart phospholipin in the older male and in the female, and total liver fatty acids in the young male decreased significantly with increase in bodyweight.

Female rats and older males had more ketone bodies in urine and liver than the younger males, and females had more in the heart than males.

D. Duncan.

649

DAVIDSON, J. N. The chemical architecture of the liver cell. *Proc. Nutrition Soc.*, 1954, 13, 112-115. *Proc.* [Dept. Biochem., Univ. Glasgow.]

650

BUCK, R. C., PATERSON, J. C. and ROSSITER, R. J. Chemical composition of cerebral arteries. The concentration of lipids and minerals compared with those in the internal carotid. *Canad. J. Biochem. Physiol.*, 1954, 32, 539-547. [Dept. Biochem., Univ. W. Ontario, London.]

651

MASSARI, F. and MARSICO, G. Rilievi sperimentali e critici sulla dimostrazione istochimica dei mucopolisaccaridi nel nevrasso di Mammiferi. [Experimental and critical study of the histochemical demonstration of mucopolysaccharide in the central nervous system of mammals.] *Arch. Sci. biol., Bologna*, 1954, 38, 319-337. [Ist. Anat. Umarna, Univ. Bari.]

Several histochemical methods using stains and an enzymic method are critically discussed. It is concluded that the presence of true mucopolysaccharides can be demonstrated in the central nervous system. The species studied were the cow, horse, sheep, rabbit, cat, dog, guinea pig and mouse.—D. Duncan.

652

STAMMLER, A. U. U. and DEBUCH, H. Die quantitative Verteilung des Plasmalogens im Gehirn. [Quantitative distribution of plasmalogen in the brain.] *Hoppe-Seyler's Ztschr.*, 1954, 296, 80-87. [Nervenklin., Univ. Cologne.]

653

CHEEK, D. B. Observations on total body chloride in children. *Pediatrics*, 1954, 14, 5-10. [Dept. Paediat., Univ. Toronto.] Spanish summary. Total chloride was estimated from bromide distribution in 50 children aged from 2 weeks to 16 years. In early infancy levels were of the order

of 50 m. equiv. chloride per kg. bodyweight. In the first year of life there was a rapid decline towards adult values. A linear relation was found between total chloride in m. equiv. per kg. and bodyweight in kg.

Data relating to 3 patients with tuberculous meningitis are appended, which suggest that in this disease total chloride is normal or increased.

F. C. Aitken.

654

FORBES, R. M., COOPER, A. R. and MITCHELL, H. H. On the occurrence of beryllium, boron, cobalt, and mercury in human tissues. *J. Biol. Chem.*, 1954, 209, 857-865. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

The concentration of Be, B, Co and Hg were estimated in tissues from a normal man. Be was present in lung, kidney and liver in concentrations of 0.002 to 0.0004 p.p.m. fresh tissue, but was absent from skeletal muscle. The skeleton contained most Be, 0.90 p.p.m., and next came the kidneys, 0.248 p.p.m. Liver and skin contained 0.056 and 0.050 p.p.m. Co. Most Hg was found in the nervous system, 0.047, and in the heart, 0.052 p.p.m. All tissues analysed contained B, Co and Hg.—A. Hepburn.

655

OLSON, K. B., HEGGEN, G., EDWARDS, C. F. and GORHAM, L. W. Trace element content of cancerous and noncancerous human liver tissue. *Science*, 1954, 119, 772-773. [Dept. Med., Subdiv. Oncol., Albany Med. Coll., N.Y.]

Liver tissue from 6 patients who had died from cancer of the gastrointestinal tract, of whom 4 had liver metastases and the other 2 portal cirrhosis, 1 child dead from acute lymphatic leukaemia with hepatic infiltration, and 6 dead from diseases other than cancer were analysed for trace elements by a method already described (Abst. 87, Vol. 24).

In agreement with other studies, Zn was low in cancerous tissue, mean 18 p.p.m., compared with non-cancerous liver, mean 38 p.p.m. or the unaffected portions of liver with metastases, mean 80 p.p.m. Cu was very high in liver from the patients who had portal cirrhosis but not liver metastases. Fe, Zn, Cr and Co were high in liver from the patient with leukaemia.—W. M. Deans.

656

MCLENDON, J. F. and FOSTER, W. C. Protein bound iodine in extra thyroidal human tissues. *Arch. internat. Pharmacodyn.*, 1953-54, 96, 287-290. [J. Gershon-Cohen Found., Albert Einstein Med. Centre, Northern Div., Philadelphia, Pa.]

Samples of tissue from 40 subjects postmortem were analysed for protein-bound iodine. The tissue was frozen in liquid nitrogen, pulverised and

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extracted with methanol. The methanol was decanted off the precipitated protein and replaced by acetone. This protein suspension was poured into 12 cm. of 3/8 in. cellophane tubing stoppered with a piece of grapevine. The acetone escaped through the grapevine while the protein was collected in the cellophane tube and dried. It was then burnt in a platinum tube in oxygen and analysed for I by the method of McClendon and Bratton (Abst. 1505, Vol. 8). The average value for the protein-bound I content of skeletal muscle was 5.85 μ g. per 100 g. tissue, for heart muscle 6.095, for liver 8.425 and for kidney 8.0.

B. W. Simpson.

657

NAKAMURA, S. [On the Al-content of the animal tissues.] *Osaka Daigaku Igaku Zasshi*, 1954, 6, 207-209. [Dept. Hyg., Med. Sch., Univ. Osaka.] In Japanese: English summary.

The Al content, in mg. per 100 g., of different tissues of the cow was: heart 10.3, skeletal muscle 4.0, liver 0.48, medulla oblongata 0.93, cerebrum 0.21, cerebellum 0.25, spleen 0.30 and kidney 0.28. (From summary.)—J. S. Thomson.

658

HART, P. C. Onderzoek naar het cobaltgehalte van runderlevers. [Cobalt content of cattle liver.] *Tijdschr. Diergeneesk.*, 1954, 79, 517-528. [Inst. Veeteelt. Onderzoek, T.N.O., Utrecht.] English, French and German summaries.

In continuation of the series of studies (see also Abst. 3231, Vol. 24) of trace elements in liver of cattle given thiouracil the following values were found for Co: in 28 given thiourea 0.19 to 0.61, mean 0.34 μ g. per g., and 0.54 to 1.85, mean 0.89 mg. total; in 31 controls 0.22 to 0.45, mean 0.37 μ g. per g. and 0.54 to 1.07, mean 0.83 mg. total. The differences between the groups were not significant.

I. Leitch.

659

WEITZEL, G., STRECKER, F. J., ROESTER, U., BUDDECKE, E. and FRETZDORFF, A.M. Zink im Tapetum lucidum. [Zinc in the tapetum lucidum.] *Hoppe-Seyler's Ztschr.*, 1954, 296, 19-30. [Biochem. Abt., Med. Forschungsanst., Max-Planck-Gesellsch., Göttingen.]

It had already been reported (Title 861, Vol. 24) that the zinc content of the several parts of the eye, with the exception of the choroid, was not high, but that the choroid had a very high zinc content. It is now shown that this is true of carnivores, but not of ruminants, and that, in contrast to the findings of Bowness *et al.* (Title 548, Vol. 23), albino rabbits have just as much Zn in the choroid as pigmented rabbits.

The choroid was further dissected and the Zn

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was found to be concentrated in the iridescent layer (*tapetum lucidum*) with values up to 8.5 (average 7.2) per cent. of dry matter in the dog and up to 13.8 (average 11.6) per cent. in the fox. The cat had less.

Injection of 100 mg. dithizone per kg. body-weight intravenously into dogs produced a bright red colour in the tapetum followed by dissolution, separation of the retina and blindness. 8-Hydroxyquinoline had much less effect and dithizone had less effect on cats than on dogs. Those treated with dithizone had only a small fraction of the normal Zn content in the whole choroid.—I. Leitch.

660

MACDONALD, I. Chemical analysis of human foetal skull bones. *Biochem. J.*, 1954, 57, 437-439. [Dept. Physiol., Guy's Hosp., London.]

Ca, P, carbonate and collagen were estimated in the parietal and frontal bones of the crania of 21 foetuses aged 28 to 43 weeks. The Ca and carbonate contents increased with increasing foetal age; the mean proportional weekly increase on dry weight of bone was 0.04 per cent. for Ca and 0.05 per cent. for carbonate. No such increase occurred in P and collagen content. It is suggested that the increased hardness of the head associated with foetal maturity is due to an increase in the proportion of calcium carbonate in the skull bones.—G. F. Garton.

661

EASTOE, J. E. and EASTOE, B. The organic constituents of mammalian compact bone. *Biochem. J.*, 1954, 57, 453-459. [British Gelatine and Glue Res. Assoc., London, N.7.]

In a sample of compact bone 99 per cent. of the weight was accounted for by inorganic matter, collagen, a mucopolysaccharide-protein complex, and a protein fraction resistant to solution in hot water. Samples of the 3 fractions of organic matter were prepared for detailed analysis. No difference was found between bone collagen and collagen from other tissues. The protein fraction of the mucopolysaccharide-protein complex did not resemble collagen in amino-acid composition, but was similar to serum proteins. The protein resistant to solution in hot water was heterogeneous.—R. Hill.

662

LOBENB, R. R. and BURNETT, G. W. Studies of the composition of teeth. 1. Chemical analysis for the principal inorganic constituents of the enamel and dentin from Syrian hamsters. *J. Dent. Res.*, 1954, 33, 487-496. [Dept. Dent. Res., Dent. Div., Army Med. Serv. Grad. Sch., Washington, D.C.]

663

TSYBAKOVA, E. T. Soderzhanie pirovinogradnoi kisloty v zdorovykh "normal'nykh" i karioznykh zubakh cheloveka. [Pyroracemic acid in healthy, "normal" and carious human teeth.] *Stomatologiya*, 1954, No. 2, 15-19. [Dept. Biochem., Stomatol. Inst., Moscow.]

Carious teeth had a pyroracemic acid content 3 to 5 times greater than healthy teeth. The so-called "normal" teeth, i.e. teeth without any obvious sign of caries, but from carious subjects, were intermediate between healthy and carious teeth in respect of their pyroracemic acid content. The average content was for healthy molars 0.25 mg., for premolars 0.19 mg., for incisors 0.23 mg. and for canines 0.22 mg. per cent.

For the purpose of this experiment teeth were considered to be healthy when there was a complete set in the mouth without a single carious tooth.

H. Scherbatoff.

664

WYSOCKI, A. P., MANN, G. V. and STARR, F. J. The cystine and methionine content of the hair of malnourished children. *Amer. J. Clin. Nutr.*, 1954, 2, 243-245. [Dept. Nutr., Harvard Sch. Pub. Health, Boston, Mass.] Spanish summary.

In samples of hair from 40 children from 8 to

48 months old no difference was found in cystine and methionine content between 7 normal subjects and 33 with kwashiorkor.—A. Hepburn.

665

CHARLET, P. V., FRANÇOIS, A. C. and LEROY, A. M. Recherches sur la composition chimique des toisons de brebis. [Chemical composition of the fleece of sheep.] *Ann. Zootech.*, 1953, 2, No. 1, 11-32. [Lab. Zootech., Inst. Nat. Agronom., Paris.]

The chemical composition of fleeces from normal and "wet" (*mouilleux*) sheep was studied. The "wet" fleeces were not more hygroscopic, but they contained 41.6 per cent. water and normal fleeces only 27.1 per cent. Substances extractable with ether, ethanol or water were all present in greater quantities in the normal fleece. The ratio of water-soluble minerals to ether-soluble material was 0.555 in normal and 0.942 in "wet" fleeces, suggesting an increased secretion of the sweat glands in the latter sheep; this idea was supported by the greater alkalinity of the aqueous extract and also by the greater water content of the fleece. Sebaceous secretion was below normal.

A. Hepburn.

See also Absts. 270, 530, 626, 877, 943.

DUCTLESS GLANDS AND HORMONES

666

LEE, N. D. The permissive role of adrenal steroids in protein anabolism. *J. Clin. Endocrinol.*, 1954, 14, 824. *Proc. [Veterans Admin. Med. Teaching Group Hosp., Memphis, Tenn.]*

667

OVERZIER, C. Die Wirkung der Steroidhormone auf den Stoffwechsel und den Wasser- und Mineralhaushalt. [Effect of steroid hormones on metabolism and exchanges of water and minerals.] *Deutsch. med. Wochenschr.*, 1954, 79, 1142. [Med. Klin., Univ. Mainz.]

A short review.

668

CANADELL, J. M. Antagonismo entre la hormona del crecimiento y cortisona. [Antagonism between growth hormone and cortisone.] *Rev. española Fisiol.*, 1953, 9, 287-292. [Dept. Endocrinol., Fac. Med., Barcelona.] English summary.

669

FINERTY, J. C. and PANOS, T. C. Effect of hyper- and hypoadrenocortical function on young fat-deficient male rats. *J. Clin. Endocrinol.*,

1954, 14, 823. *Proc. [Univ. Texas Med. Branch, Galveston.]*

670

FRAILE, A. Influencia de la corteza suprarrenal sobre el metabolismo de la rata en ayunas. [Effect of the adrenal cortex on the metabolism of the fasting rat.] *Rev. española Fisiol.*, 1953, 9, 267-276. [Lab. Fisiol. Animal, Barcelona.] English summary.

For 15 male rats of different ages and weights subjected to complete fast, survival was 6 to 9 days, and the average loss of weight 36 per cent. For 15 similar adrenalectomised rats survival was 4 to 7 days and the average weight loss 20 per cent. Administration of cortisone to the adrenalectomised fasting rats increased their survival time and weight loss to the averages for the normal animals, but deoxycorticosterone acetate (DOCA) and NaCl had no such effect.

The effect of fasting on the weights of heart, liver, spleen, kidney, testicles and thymus is recorded for both normal and adrenalectomised animals. In normal and cortisone-treated adrenalectomised animals fat deposits almost disappeared, but in the untreated adrenalectomised rats there was abundant perirenal and interscapular fat.

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Diminution of liver fat was approximately the same for both normal and operated animals. The fact that adrenalectomized fasting animals lose less weight than normal animals is due not only to their shorter survival, but to the disturbance of fat and protein metabolism. Since neither DOCA nor NaCl prolongs their survival, death does not, as is frequently assumed, appear to be caused by changes in water or salt metabolism.

M. B. Richards.

671

ROSENMAN, R. H., FREED, S. C. and FRIEDMAN, M. (with SMITH, M. K.) **Effect of deoxycorticosterone acetate upon the blood pressure of rats fed varied dietary intakes of potassium and sodium.** *J. Clin. Endocrinol.*, 1954, **14**, 661-665. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

Rats which failed to develop high blood pressure after removal of one kidney and the placing of a figure-of-eight ligature about the other were given injections of deoxycorticosterone acetate (DOCA), and diets differing in their content of Na and K. When the diet had a high Na : K ratio, DOCA failed to raise the blood pressure persistently; in fact, excess Na caused a depressor response, augmented when the K content of the diet was simultaneously decreased. An adequate intake of K, without excess Na, was essential for the development and persistence of high blood pressure after DOCA, but further increase of K intake did not appear to augment the effect. It is concluded that the K ion has a specific relation to production of high blood pressure by deoxycorticosterone.—M. B. Richards.

See also Absts. 444, 461, 462, 535, 539-41, 836.

672

EGER, W. **Die Stellung der Epithelkörperchen im innersekretorischen System.** [The position of the parathyroid glands in the endocrine system.] *Deutsch. med. Wochenschr.*, 1954, **79**, 1425-1426. [Pathol. Inst., Univ. Göttingen.]

A review.

673

GROLLMAN, A. **The role of the kidney in the parathyroid control of the blood calcium as determined by studies on the nephrectomized dog.** *Endocrinology*, 1954, **55**, 166-172. [Dept. Exp. Med., Southwestern Med. Sch. Univ. Texas, Dallas.]

After removal of both kidneys dogs were maintained on an electrolyte-free carbohydrate and fat diet and given peritoneal lavage. The thyroids and parathyroids were previously removed from some of the dogs, which then received dried thyroid daily.

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After removal of thyroids and parathyroids tetany was relieved and serum Ca restored to normal by intraperitoneal injection of a "blood electrolyte" solution enriched with Ca. The high P level was not corrected. When the kidneys were removed from these dogs and lavage was stopped the serum Ca fell again and tetany recurred, showing that these changes do not depend on abnormal excretion of Ca and P.

In dogs with kidneys alone removed, injection of parathyroid raised serum Ca at first, but this effect declined by the sixth day; when peritoneal lavage was begun the capacity to react to parathyroid hormone was restored.

It was concluded that the parathyroid hormone acts directly on body Ca reserves and that this is independent of its action on the kidney.

The proportions of Ca, Mg and inorganic P in the blood and peritoneal fluid are compared, and indicate the proportions of these ions which are bound in the blood.—D. Duncan.

674

ROCHE, J. and MICHEL, R. **Thyroid hormones and iodine metabolism.** *Annu. Rev. Biochem.*, 1954, **23**, 481-500. [Coll. France, Paris.]

675

RAWSON, R. W. **Present concepts of thyroid physiology as revealed with modern tools of study.** *Federation Proc.*, 1954, **13**, 663-671. [Mem. Centre Cancer, New York.]

676

RALL, J. E., ROBBINS, J., WEST, C. D., PEARSON, O. H. and RAWSON, R. W. **Metabolic effects of thyroid hormone.** *J. Clin. Endocrinol.*, 1954, **14**, 769. [Mem. Centre Cancer, New York.]

677

MCCLENDON, J. F., FOSTER, W. C. and BOSSHARDT, D. K. **Conditions of formation of the thyroid hormone outside the thyroid gland.** *Arch. internat. Pharmacodyn.*, 1953-54, **96**, 304-308. [Hahnemann Med. Coll., Philadelphia, Pa.]

A sample of pure thyroglobulin containing only 0.028 per cent. thyroxine I and 0.1 per cent. diiodotyrosine I was iodinated at the pH and ionic strength of blood plasma, coagulated by heat, washed and dried. It was then found to contain 0.33 to 0.34 per cent. thyroxine I and 1.4 to 3.2 per cent. diiodotyrosine I. In each of 8 rats 500 mg. of this material increased the B.M.R. by 80 to 90 per cent. whereas 500 mg. desiccated thyroid increased the rate by 95 and 3.5 mg. *l*-thyroxine increased it by 50 per cent.

Since casein contains twice the amount of tyrosine present in thyroglobulin, it was

considered of interest to test iodinated casein. Of 3 samples iodinated, only one had a thyroxine I content double that of thyroglobulin. The metabolic activity of this sample was twice as great as that of desiccated thyroid. When it was hydrolysed and lyophilised the composition of this product remained constant indefinitely. It dissolved instantly in water and when it was administered subcutaneously was 6 times more effective metabolically than when it was given by mouth.—B. W. Simpson.

678

WILKINS, L., CLAYTON, G. W. and BERTHRONG, M. Development of goiters in cretins without iodine deficiency: hypothyroidism due to apparent inability of the thyroid gland to synthesize hormone. *Pediatrics*, 1954, 13, 235-246. [Dept. Paediat., Sch. Med., Johns Hopkins Hosp., Baltimore, Md.] Spanish summary.

Case histories are given of 4 children with congenital cretinism in whom the thyroid glands were present and capable of concentrating ^{131}I . These patients lived in areas where I was not deficient and where diets were not excessively high in goitrogens. The 2 older children developed goitre. This type of hypothyroidism tended to run in families and was probably the result of an inborn defect in the ability of the thyroid to convert inorganic I to thyroid hormone. The goitre which developed was probably caused by excessive secretion of pituitary thyrotropin. Neither malignant change nor exophthalmos was seen. The importance of adequate and continuous thyroid treatment is stressed. A gland from a patient of this type showed multiple nodules, some with colloid and some with epithelial hyperplasia.

B. W. Simpson.

679

RUIZ MARTÍN, M., ORTIZ DE LANDÁZURI, E., DE LA FIGUERA, J., MORA, R. J., NÚÑEZ CARRIL, M. and MORATA GARCÍA, F. Aportaciones al estudio etiopatogénico y anatomoclínico en el bocio endémico. (Revisión de 100 tiroides.) [Contributions to the etiopathogenic and anatomoclinical study of endemic goitre. (Review of 100 thyroids).] *Rev. clín. española*, 1954, 53, 89-105. [Clín. Méd., Univ. Granada.] English, German and French summaries.

Different causes and types of thyroid enlargement are discussed. A histological study was made of glands obtained after death or after surgical extirpation. The findings are fully tabulated. The mean thyroid weight and vesicular size were greater in persons from the endemic goitre zone than in others. Abnormal glands tended to have greater variations in the size of nuclei.—D. Duncan.

680

ORTIZ DE LANDÁZURI, E., NÚÑEZ CARRIL, M., ESCOBAR DEL REY, F. and MORATA GARCÍA, F. Observaciones sobre el tiroides de perros precedentes de zona de endemia bociosa. [Observations on the thyroids of dogs from the endemic goitre area.] *Rev. clín. española*, 1954, 53, 24-28. [Clín. Méd., Univ. Granada.] English German and French summaries.

The thyroids of dogs from the endemic goitre area of Güejar Sierra were larger in proportion to bodyweight than those of dogs from the goitre-free city of Granada. Histological examination revealed small, pyknotic nuclei and enlarged vesicles in the former. The size of vesicles was more variable in the goitre zone and the curve of distribution on the basis of diameter might serve as an indication of the activity of the gland.

D. Duncan.

681

KRISS, J. P. and GREENSPAN, F. S. Urinary excretion of thyrotropic hormone by normal humans and by subjects with altered thyroid function. *J. Clin. Endocrinol.*, 1954, 14, 770. *Proc.* [Dept. Med., Stanford Univ. Sch. Med., San Francisco, Calif.]

682

MAQSOOD, M. Influence of the thyroid on body temperature of rabbits and rams. *Vet. Rec.*, 1954, 66, 306-309. [Animal Res. Stat., Univ. Cambridge.]

In rabbits iodinated casein mixed with the food in small quantities did not affect the body temperature, but at or above 0.064 per cent. of the ration the temperature rose significantly, especially in summer. In Suffolk rams moderate doses of thyroprotein did not affect body temperature.

Continuous administration of thiouracil or thyroid removal decreased the body temperature of both rabbits and rams, but the decrease was prevented by thyroxine. It is suggested that the fall in temperature resulted from a lower metabolic rate.—W. A. Greig.

683

ROWINSKI, P. and MANUNTA, G. La termoregolazione verso il caldo nella cavia ipotiroidea per trattamento con metiltiouracile. [Thermoregulation against cold in the guinea pig rendered hypothyroid by treatment with methylthiouracil.] *Arch. Sci. biol., Bologna*, 1954, 38, 206-220. [Ist. Fisiol., Fac. Med. Vet., Univ. Sassari.]

Of 4 pairs of guinea pigs 2 of each sex served as control and the other 2 received methylthiouracil; after 63 days of treatment with methylthiouracil the 2 females had their thyroids removed. Basal

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metabolism at different environmental temperatures was estimated by Haldane's method with open circuit.

Adaptation to cold was not impaired by methylthiouracil, though basal metabolic rate was somewhat less than in controls, especially in the males. Water loss at temperatures between 30° and 40° C. was decreased in males and increased in females by methylthiouracil.

Adaptation to cold was abolished by removal of the thyroid.—D. Duncan.

684

KENSHALO, D. R. Maternal hypo- and hyperthyroidism in albino rats as influencing growth, metabolism and endocrine gland weights of the offspring. *Growth*, 1954, 18, 13-26. [Florida State Univ.]

Female rats, 90 to 120 days old, were divided into 3 groups; 31 were rendered hypothyroid by total or subtotal thyroid removal and 22 received thyroxine daily by injection. The smallest dose given was 2.1 times the amount normally secreted by the thyroid of a pregnant rat and the largest dose was 13.4 times that amount. The injections were stopped 2 days before parturition. The controls were untreated. All the females were mated with males of the same age. After birth the litters were reduced to 6 young in each litter; they were weaned at 4 weeks. The standard diet was Purina Laboratory Chow. Food consumption and basal metabolism were recorded. At 33 weeks the offspring were killed and pituitary, thyroid and adrenal glands, gonads and seminal vesicles were weighed.

No difference was found in growth, food consumption or oxygen consumption in the offspring of these rats, but at 33 weeks the adrenals of daughters of hyperthyroid dams and the adrenals and ovaries of daughters of hypothyroid dams were significantly heavier than those of controls.

B. W. Simpson.

685

PANOS, T. C. and FINERTY, J. C. Effect of hyperthyroidism and hypothyroidism on young fat-deficient male rats. *J. Clin. Endocrinol.*, 1954, 14, 802-803. *Proc.* [Univ. Texas Med. Branch, Galveston.]

686

HARKNESS, M. L. R., HARKNESS, R. D. and SANTLER, J. E. Changes in the collagen content of the thyroid in rats treated with thiouracil. *J. Physiol.*, 1954, 125, 51-55. [Dept. Physiol., University Coll., London.]

Thiouracil was administered to rats in the drinking water at 0.05 per cent, w/v. The 4 rats in each group were killed 3, 6, 12, 24 or 50 days after thiouracil treatment began. The average

thyroid gland weight increased from 18.0 mg. \pm 2.5 in the controls to 58.4 mg. \pm 4.5 at 50 days. The total collagen in the thyroids increased from 0.369 mg. \pm 0.068 to 0.886 mg. \pm 0.075 in the same time. After the thiouracil treatment ceased, collagen decreased and the weight of the thyroids fell. The disappearance of collagen was fairly rapid during the first 30 days but after the 37th day it was much slower.—B. W. Simpson.

687

MELLEN, W. J. and HILL, F. W. Basal metabolism and thyroid size in chickens fed thiouracil and a thiouracil-thyroprotein combination. *Poultry Sci.*, 1954, 33, 872-874. [Dept. Poultry Husb., Cornell Univ., Ithaca, N.Y.]

Groups of 40-day-old male chickens were given an adequate basal starting ration with supplements of 0.2 per cent. thiouracil with or without 1 g. thyroprotein per 100 lb. feed. Mean live-weights at 3 to 3½ weeks were 139 g. and 180 g., respectively. Measurements of basal oxygen consumption during the period 3 to 3½ weeks of age indicated that there was no difference between the groups when the values were adjusted for live-weight. The weight of the thyroids of birds from groups 1 and 2 were 290 g. and 346 g., respectively, after adjustment for liveweight.—M. J. Head.

688

LIBBY, D. A. and MEITES, J. Negative effects of antibiotics on thyroid gland. *Science*, 1954, 120, 354. [Dept. Physiol., Michigan State Coll., East Lansing.]

Immature male rats in 3 groups of 10 were fed for 21 days on a basal diet alone or with 50 mg. potassium penicillin G or 50 mg. aureomycin per kg. diet. On the 21st day, 16 hr. before being killed, each rat was injected intraperitoneally with 1.0 μ C. ¹³¹I. Neither penicillin nor aureomycin altered the size of the thyroids or their uptake of ¹³¹I.

White Leghorn cockerels aged 20 days were divided into 3 groups of 10 each and fed on a diet alone or with 90 g. arsenic acid or 2 g. penicillin per ton. After 5 weeks the chicks were killed and the thyroids were weighed. Neither substance influenced the weight of the thyroid. These findings are not in agreement with those of Calesnick *et al.* (Abst. 3241, Vol. 24).—B. W. Simpson.

689

BONATI, B., SALVI, A. and RANCATI, G. B. Sulla tiroide del vecchio. Comportamento della jodoproteidemia e colesterolemia in soggetti in età presenile trattati con ormone tireotropo. [The thyroid in old age. Protein-bound iodine and cholesterol in blood in elderly presenile subjects treated with thyrotropic hormone.]

Acta gerontol., 1954, 4, 9-14. [Ist. Clin. Med. Gen., Univ. Modena.] French and English summaries.

690

SOLIMAN, F. A. and REINEKE, E. P. **Changes in uptake of radioactive iodine by the thyroid of the rat during the estrous cycle.** *Amer. J. Physiol.*, 1954, 178, 89-90. [Physiol. Dept., Fac. Vet. Med., Univ. Cairo.]

The oestrus pattern of each of 35 mature female rats was studied for 5 days. Each animal was then injected intraperitoneally with 1 μ C. of ^{131}I and killed exactly 6 hr. later. The thyroids and other organs were weighed and radio-activity counts were made to estimate the uptake by the thyroids during pro-oestrus, oestrus, metoestrus and dioestrus. Iodine concentration by the thyroid was at its maximum during oestrus, decreased at metoestrus and reached the lowest levels at dioestrus and pro-oestrus. In a second test, where I intake was rigidly controlled, 43 rats were treated in the same way, with the same result.

In further experiments oestrogens in small doses consistently increased thyroid I; progesterone had the opposite effect. It is suggested that the rhythmic alteration in the thyroid during the oestrus cycle is probably controlled by changes in the levels and proportions of oestrogen and progesterone secreted by the ovary.—B. W. Simpson.

691

ASCHKENASY, A. **Action de la testostérone, de la thyroxine et de la cortisone sur l'ingestion alimentaire, la chute de poids et l'état des organes chez le rat carencé en protéines. [Effect of testosterone, thyroxine and cortisone on food consumption, weight loss and the state of the organs in the rat on protein-deficient diet.]** *Ann. Endocrinol.*, 1953, 14, 353-365.

Five control rats received a diet containing 18 per cent. casein and 5 experimental groups of from 4 to 10 rats received a similar but protein-free diet. Rats of different groups received testosterone propionate or thyroxine or cortisone or all 3 hormones. After 35 days all were killed for study of the carcasses.

The progressive decrease in appetite seen in the rats on protein-free diet was enhanced by the hormones. The loss of weight was greatest in rats receiving cortisone or all 3 hormones. In protein-starved rats not all organs lost the same proportion of their weight; the loss of parietal fat and the muscular atrophy led to increased relative weights of liver, kidneys, testicles, adrenals and thyroid. The spleen, thymus and accessory sex glands became greatly reduced in relative weight. Testosterone increased the loss of weight of the carcass, liver, spleen, lymphatic tissue and

thymus, but the kidneys, adrenals, testicles and thyroid were relatively large and the seminal vesicles and preputial glands very large. Thyroxine did not greatly affect the loss of carcass weight or of liver or kidney tissue, but it sometimes protected the spleen, thymus and preputial glands, while the testicles became very small. Cortisone increased the loss of liver tissue, but partly masked this by an increase in its water content. There was no effect on the kidneys or accessory sex glands, but the thyroid was larger than in any other group. All 3 hormones together had much the same effect as testosterone alone, except that the liver lost less weight. The histological changes are described.—D. Duncan.

See also Absts. 322, 369, 446, 508, 827, 1027, 1048.

692

GRIFFIN, A. C., LUCK, J. M., KULAKOFF, V. and MILLS, M. **Further observations on the endocrine regulation of blood amino acids.** *J. Biol. Chem.*, 1954, 209, 387-393. [Dept. Chem., Stanford Univ., Calif.]

When intact rats were injected with adrenaline, pituitary growth hormone, insulin or pituitary thyrotropin, but not after *l*-noradrenaline bitartrate, blood amino-N fell to about 90 per cent. of the pre-injection value 1 hr. after administration and to 88 per cent. after 2 hr., with recovery to 92 per cent. after 4 hr. The blood amino-N of hypophysectomised rats was reduced by all 5 hormones; recovery was slower. With adrenalectomised rats, low blood amino-N was found after injection of adrenaline and to a slight extent after growth hormone, insulin and thyrotropin. No effect was found with *nor*adrenaline or with adrenocortical steroids and sex hormones. It is concluded that adrenaline is one of the final effector substances in producing low blood amino-acid values, and that thyroid function may also be involved.

C. Warner.

693

ASSALI, N. S. and SUYEMOTO, R. **Studies on toxemia of pregnancy. Effects of corticotrop hormone (ACTH) on the hemodynamics and the excretion of electrolytes of normal pregnant women.** *Metabolism*, 1954, 3, 303-312. [Obstet. Res. Lab., Univ. Cincinnati.]

Three pregnant women without hypertension or other abnormality of pregnancy were given ACTH intramuscularly in doses of 120 to 140 mg. daily for 4 to 6 days. Observation extended from 3 days before treatment until 3 days after completion of treatment. ACTH had no effect on blood pressure, or on the response of blood pressure to ganglionic blockade with tetraethylammonium chloride, and there was no evidence of water retention. Na excretion tended to fall and plasma Na to rise, K excretion to rise and plasma K to fall.

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It was concluded that pregnancy toxæmia cannot be attributed to hyperactivity of the adrenals.

A. M. Thomson.

694

COMSA, J. Nouvelles recherches sur l'interaction thymus-thyroïde-gonades chez le cobaye. [New researches on the interaction of thymus, thyroid and gonads in the guinea pig.] *J. Physiol., Paris*, 1954, **46**, 577-583.

The gonads and thymus were removed from male guinea pigs weighing about 180 g. and experiments were made 70 days later. Some of the animals received injections of thymus extract and others testosterone propionate.

The removal of gonads and thymus resulted in hyperactivity of the thyroid, as suggested by histological examination of the thyroid, high thyrotropic activity in the urine, low blood cholesterol and high urinary creatine. All these signs were reduced or abolished by 4 daily injections of thymus extract or testosterone.—D. Duncan.

695

KALANT, N. Metabolic effects of the pancreatic hyperglycemic factor. *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 617-619. [McGill Univ. Clin., Royal Victoria Hosp., Montreal.]

696

CAVALLERO, C. Études sur le facteur hyperglycémiant du pancréas (Glucagon). [The hyperglycæmic factor in the pancreas (glucagon).] *Rev. canad. Biol.*, 1953, **12**, 509-529. [Inst. Pathol. Anat., Univ. Milan.] English summary.

697

APPEL, W. and HANSEN, K. J. Über den Abfall der veresterten Fettsäuren und der Aminosäuren des Blutes nach Insulin. [Decrease of esterified fatty acids and of amino-acids in the blood after insulin.] *Hoppe-Seyler's Ztschr.*, 1954, **297**, 49-60. [Med. Klin., Univ. Kiel.]

The first effect of insulin on the blood was a decrease in the blood fats, followed by the effect on the blood sugar, and by a fall in the amino-N with further increase of the dose. Whether given subcutaneously or intravenously, insulin caused a reduction in the esterified fatty acids of the serum, in a dose which was still without definite effect on the blood sugar. The decrease was mainly in the neutral fats; the amounts of lipid P and cholesterol ester showed no appreciable change. Simultaneous administration of insulin and dextrose showed that the decrease of the esterified fatty acids and amino-N of the serum bore no relation to the blood sugar content, but depended on the dose of insulin. This indicates that the decrease was not caused by changes in the carbohydrate metabolism, but was a direct effect of the insulin, which might be due to acceleration of the active transport

of these substances into the cell through the cell membrane. It is assumed from these results that insulin promotes the formation of protein and fat not only indirectly through its effect on carbohydrate metabolism, but also directly by increasing the amounts of the necessary components in the tissues.—M. B. Richards.

698

PERLOFF, W. H., LASCHÉ, E. M., NODINE, J. H., SCHNEEBERG, N. G. and VIEILLARD, C. B. The starvation state and functional hypopituitarism. *J. Amer. Med. Assoc.*, 1954, **155**, 1307-1313. [Endocrine Clin., Philadelphia Gen. Hosp., Pa.]

Studies of endocrine function were made in 5 undernourished patients, 3 women with *anorexia nervosa* and 2 men with diagnoses of non-tropical sprue and of emotional depression with anorexia, respectively.

All the women had amenorrhoea with low urinary oestrogen output and no measurable gonadotropins, indicating ovarian failure secondary to lack of pituitary stimulation. All patients had low excretions of 17-ketosteroids and one man had also a low gonadotropin output, but the patient with sprue had a high gonadotropin output. Two patients had normal uptakes of ¹³¹I by the thyroid, but in 2 the uptake was borderline and in the man with sprue it was very low even when the isotope was given intravenously.

The B.M.R. was low in 3 patients and the blood cholesterol level was also low in 3; the latter constitutes an important difference from hypopituitarism. Low 17-ketosteroid excretion, low serum chloride level, impaired eosinophil responses after administration of insulin, adrenaline or corticotropin, and low blood sugar levels in several patients were suggestive of impaired adrenocortical function.

It is suggested that all the changes described were due to pituitary insufficiency, though the one woman who died had a pituitary of normal size and structure. In the other patients re-feeding restored all the functions to more normal levels. The difficulty of differentiating the condition from hypopituitary cachexia is discussed. The ultimate diagnosis probably depends on the response of the malnourished patient to re-feeding; the hypopituitary patient usually requires endocrine therapy.—D. Duncan.

See also Absts. 393, 430, 542.

699

IKKOS, D., LUFT, R. and SÖRGREN, B. Body water and sodium in patients with acromegaly. *J. Clin. Invest.*, 1954, **33**, 989-994. [Div. Endocrinol., Dept. Int. Med., Serafimerlasarettet, Stockholm.]

700

- GAEßLER, O. H. Effects of growth hormone preparations on protein metabolism. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 8, 1954, 38-54.* [Edsel B. Ford Inst. Med. Res., Henry Ford Hosp., Detroit, Mich.]

701

- NICKERSON, K., BONSNES, R. W., DOUGLAS, R. G., CONDLIFFE, P. and DU VIGNEAUD, V. Oxytocin and milk ejection. *Amer. J. Obstet. Gynecol.*, 1954, **67**, 1028-1034. [Dept. Obstet. Gynaecol., Cornell Univ. Med. Coll., New York.]

Women 4 to 8 days *post partum* received by injection, immediately before a nursing, either naturally occurring oxytocin, highly purified and containing no detectable vasopressin, or a synthetic octapeptide amide which is, as far as has been tested, identical with the natural substance. Milk ejection occurred consistently after the intravenous injection of 0.5 unit or the intramuscular injection of 2 units. The milk flow generally lasted for less than a minute. The only side effect noted was painful uterine contractions in one woman.

That synthetic oxytocin was indistinguishable from the naturally occurring substance is taken as proof that both oxytocic and milk-ejection activities are inherent in the molecular structure.

There is a historical review of the literature.

F. E. Hytten.

702

- LATIMER, H. B. The prenatal growth of the thymus in the dog. *Growth*, 1954, **18**, 71-77. [Dept. Anat., Univ. Kansas.]

703

- RODRÍGUEZ, R. R. Alloxan diabetes in the rat: recovery following estrogen treatment. *Endocrinology*, 1954, **55**, 1-9. [Inst. Biol. Med. Exp., Costa Rica 4185, Buenos Aires.]

In rats made diabetic with alloxan and forcibly fed, prolonged treatment with oestradiol benzoate, alone or with insulin, was curative. In the 6 months of observation 26 per cent. of the untreated rats died and the rest remained diabetic. Administration of insulin in amounts sufficient to prevent glycosuria reduced the mortality to 3 per cent. but did not cure the diabetes, the insulin requirement remaining unchanged throughout at 7.3 units on the average. Treatment with oestradiol alone, 15 µg. daily, cured 47 per cent. of the rats, after initial exacerbation of the diabetes, when several animals died. Combined treatment with insulin and oestradiol cured 69 per cent. of the rats, the regression of the diabetes being accompanied by a decrease in the insulin requirement from 7 units to none in 3 to 4 months. The curative action was confirmed by histological examination of the pancreas.—M. B. Richards.

See also Abst. 464.

ENERGY EXCHANGE AND SPECIFIC DYNAMIC ACTION

704

- WORRALL, R. L. A physiological constant and its nutritional significance. *Proc. Nutrition Soc.*, 1954, **13**, xiii-xiv. [31 Braeside Ave., Sevenoaks, Kent.]

705

- OTIS, A. B. The work of breathing. *Physiol. Rev.*, 1954, **34**, 449-458. [Dept. Surg., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

706

- LAMB, M. W. and MICHIE, J. M. Basal metabolism of nineteen children from two to ten years old. *J. Nutrition*, 1954, **53**, 93-104. [Dept. Foods Nutrit., Texas Technol. Coll., Lubbock.]

The subjects were 9 girls and 10 boys aged from 2 to 10 years, healthy and of normal growth. Oxygen consumption was studied with a Collins Benedict Roth apparatus; the children were lying quietly awake, 12 to 14 hr. after their last meal. Results of 86 experiments are given.

The B.M.R. was more closely related to growth in height than to that in weight or in surface area.

Calories per kg. bodyweight were inversely proportional to age, but calories per cm. height were independent of age. Results were more uniform for girls than for boys. The results are compared with predictions from 5 standards; Benedict height, Dreyer, Talbot height, Talbot weight and Lewis. The best correlation was obtained with the Lewis standards; of the 86 results only 4 deviated from the Lewis prediction by 10 per cent. or more. For girls the average was slightly below and for boys slightly above the Lewis standard. Agreement with Talbot's standards was also good, the results being about 9 per cent. above these standards.—D. Duncan.

707

- NARANJO VARGAS, P., CORNEJO, F. and BERMEO, J. El metabolismo basal en la embarazada y el feto. [Basal metabolism in pregnancy and in the foetus.] *Rev. española Fisiol.*, 1953, **9**, 221-241. [Fac. Med., Univ. Central Ecuador, Quito.] English summary.

In 40 clinically healthy non-pregnant women in Ecuador, aged from 17 to 40 years, the mean

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B.M.R. as estimated with the MacKesson apparatus was $+0.42$ per cent. on the DuBois standard, standard error ± 6.71 . There was no change with age.

In 200 pregnant women within the same age limits there was a linear increase in B.M.R. as pregnancy progressed; the mean value rose from $+5.5$ per cent. ± 8.6 at 8 weeks to $+48.6 \pm 12.6$ at 36 weeks of pregnancy, and this was also independent of age. In 32 observations during the puerperium the B.M.R. fell to $+0$ in 8 or 9 days after parturition.

From the results a table of standard B.M.R. values during pregnancy and the puerperium is presented. The mechanism of the changes is discussed in the light of the observations that arterial blood pressure, pulse and respiratory rates were unchanged. The surface area and corresponding energy requirement of the foetus are calculated from existing data and it is estimated that of the "standard" increase in B.M.R. of 41.2 per cent. at the end of pregnancy, about 12.7 per cent. corresponds to the needs of the foetus and 28.5 per cent. to those of maternal and placental tissues.

D. Duncan.

708

MAHADEVA, K. The energy expenditure at rest of Southern Asiatics in Britain. *Indian J. Med. Res.*, 1954, 42, 181-190. [Dept. Physiol., Univ. Edinburgh.]

Energy exchange was measured in 20 healthy South Asiatic men aged between 20 and 41 years after residence in Scotland for periods of from 1 month to 4 years. The same number of healthy Europeans served as controls. Measurements were made with a Benedict Roth spirometer and with the subjects resting about 1 hr. after a light morning meal. Deviations from basal rates by the Robertson and Reid standard (Abst. 2278, Vol. 22) were calculated. The mean values for the groups, the South Asiatic given first, were, age 30.7 , 29.0 years; weight 63.4 , 68.4 kg.; height 168.5 , 175.2 cm.; surface area 1.72 , 1.83 sq. m.; energy expenditure 40.1 , 40.6 Cal. per sq. m. per hr.; deviation from predicted basal rate $+9.9$, $+10.6$ per cent. The energy expenditure by the 2 groups did not differ significantly.

The influence of climate on resting metabolism is discussed.—D. Harvey.

709

DE LANGEN, C. D. Lage grondstofwisseling en moeheid. [Low basal metabolic rate and fatigue.] *Nederl. Tijdschr. Geneesk.*, 1954, 98, 1818-1824. [Utrecht.]

A clinical lecture.

710

VINOGRADOV, M. I. Sovremennoe sostoyanie i ocherednye zadachi fiziologii truda. [Contemporary state and future problems of the physiology of work.] *Gigiena Sanit.*, 1954, No. 3, 3-9.

temporary state and future problems of the physiology of work.] *Gigiena Sanit.*, 1954, No. 3, 3-9.

711

DURNIN, J. V. G. A. and WEIR, J. B. DeV. Variations in the metabolic cost of standard activities. *J. Physiol.*, 1954, 125, 60P-61P. [Inst. Physiol., Univ. Glasgow.]

712

BALKE, B. Optimale körperliche Leistungsfähigkeit, ihre Messung und Veränderung infolge Arbeitsermüdung. [Optimum bodily performance, its measurement and modification as the result of fatigue.] *Arbeitsphysiologie*, 1954, 15, 311-323. [Sch. Aviation Med., Randolph Field, Tex.]

The view is now held by physiologists that neither strength nor speed nor endurance determines work capacity but "the total work load that gives functionally optimal or maximal output". This may be estimated by finding the limits of performance at 3 loads and extrapolating, or by increasing the load at regular intervals until recognisable criteria of fatigue appear. The latter technique was used with an electrically braked bicycle ergometer or a moving plane the incline of which could be increased by a known amount at short intervals. Recorded were blood pressure, pulse rate, rate of respiration, respiratory volume, alveolar oxygen and carbon dioxide tensions, oxygen consumption and carbon dioxide production. Oxygen in expired air was recorded at 15-sec. intervals from a Pauling oxygen meter and carbon dioxide was continuously recorded by an infrared apparatus on a photokymograph, calibrated by analysis in a Haldane apparatus of samples collected at intervals in a Douglas bag. The load was increased until pulse rate reached 184 to 188 beats per min. or a fall of systolic pressure indicated failure of the circulation to achieve further adaptation.

When the oxygen used per pulse beat begins to decline while work continues, the optimum has been passed; also when carbon dioxide production exceeds oxygen consumption. At these critical points hyperventilation appears; alveolar oxygen tension rises and carbon dioxide falls. These criteria point to maximum sustained output at a pulse rate of 180 per min.

With work of medium to heavy intensity, even one hour produces fatigue and after a rest the same level of output is not attained. All the criteria of performance are affected by fatigue.—I. Leitch.

713

HATTORI, B. [Studies on feeding standard of the National Safety Force. 3. On basal metabolism, relative metabolic rate for various workloads

and energy consumption for the engineer personnel at Camp Katsuta. 4. On basal metabolism, relative metabolic rate for various workloads and energy consumption for the infantry personnel at Camp Nerima.] *Japanese Safety Forces Med. J.*, 1954, 1, No. 4, 8-16; No. 5, 7-17. [Med. Sch., Camp Kurihama.] In Japanese: English summary.

3. The average B.M.R. of 37 engineer personnel [details not given in summary] was 41.5 Cal. per sq. metre per hr. The average energy consumption was 3200 Cal. daily.

4. In 20 infantry personnel [again no details] the mean B.M.R. was 42.5 Cal. per sq. metre per hr. and energy consumption from 3200 to 3600 Cal. daily.

From all 4 reports the mean B.M.R. for 89 personnel in different service categories was 41.9 Cal. per sq. metre per hr. The recommended food intake is 3300 Cal. per head daily. [From summaries.]—D. Duncan.

714

BARGETON, D. and KRUMM-HELLER, C. (with DE FOMBELLE and MASSON) Antithyroïdiens et métabolisme basal chez le rat. 1° étude en fonction du temps, 2° étude en fonction de la dose, 3° comparaison d'activité d'un mercapto-imidazol et de thiouraciles substitués. [Antithyroid substances and basal metabolism in the rat. 1. The effect of time. 2. The effect of dose. 3. Comparison of the activity of a mercapto-imidazole and some substituted thiouracils.] *Arch. internat. Pharmacodyn.*, 1953-54, 96, 257-286. [Serv. Recherches, Société Théraplix, 98 Rue de Sèvres, Paris 7.] English and German summaries.

715

MĚLKA, J. Hodnota specifického dynamického účinku bílkovin v letním a zimním období. [Evaluation of the specific dynamic action of proteins in summer and winter.] *Čas. Lék. čes.*, 1954, 93, 463-467. [Physiol. Inst. VLA, Hradci Králové.] Russian summary.

716

PAGÉ, É. and CHÉNIER, L. P. Effects of diets and cold environment on the respiratory quotient of the white rat. *Rev. canad. Biol.*, 1953, 12, 530-541. [Dept. Physiol. Nutrit., Fac. Med., Laval Univ., Quebec.] French summary.

The respiratory quotient was measured at 5° and 29° C. in male Wistar rats after 3 weeks on a complete diet high in fat, which in a total of 128.6 parts included casein 24, sucrose 17, and fat 50, or after a shorter time on a diet low in fat which included, per cent., casein 15, sucrose 78 and fat 1. Some of the rats were adapted to cold for 3 weeks at a temperature of from 8° to 10° C.

Measurements were made fasting or after a dose of 1 ml. maize oil or 1 ml. 33 per cent. maltose solution per 100 g. bodyweight.

Exposure to cold depressed the R.Q. whatever the previous experience of diet or temperature. Administration of maltose caused the R.Q. to increase in all circumstances of temperature, but oil had no effect. In rats not adapted to cold the R.Q. was lower in those on the high-fat diet; the effect was the same, but less, in rats adapted to cold. In rats kept at 29° C. and fed on a low-fat diet, adaptation to cold led to a lower R.Q. than in rats not so adapted. With a high-fat diet, adaptation made no difference.

The oxygen consumption of the same rats was about doubled by exposure to cold, and adaptation to cold also increased it at 29° C. but not at 5° C. Diet had little effect except that administration of maltose or oil to non-adapted rats given the low-fat diet depressed oxygen consumption.

Fasting rats were more active than rats given oil or maltose.

It is suggested that rats exposed to cold burn fat preferentially and that adaptation to cold is characterised by preferential utilisation of fat and accelerated conversion of sugar to fat.

E. M. Hume.

717

CHÉNIER, L. P. Effet du froid et des régimes alimentaires sur les échanges respiratoires du rat blanc. [Effect of cold and diet on respiratory exchange in the white rat.] *Laval méd.*, 1954, 19, 241-267 (to be continued). [Dept. Physiol. Nutrit., Inst. Physiol., Laval Univ., Quebec.]

The thesis includes a general review of the subject.

Male Wistar rats were maintained on a diet high in fat or on one high in carbohydrate; the diets were not identical in every other particular. Oxygen consumption and rectal temperature were measured in the rats fasting after 1 hr. at 0° C. and after 1 and 2 hr. at -20° C. Some of the rats were previously exposed for 2 weeks to a temperature of from 1° to 2° C. In the rats not previously adapted to cold, oxygen consumption rose with declining temperature in the same way in both dietary groups, but rectal temperature was better maintained with the high-fat diet. In the rats adapted to cold for 2 weeks previously and then exposed for 2 hr. at -20° C., the oxygen consumption of those having the high-fat diet was significantly the greater; the rectal temperature was the same for both diets. The rats on the high-fat diet had throughout less tendency to lose weight.—E. M. Hume.

718

SELLERS, E. A., YOU, R. W. and MOFFAT, N. M. Regulation of food consumption by caloric

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value of the ration in rats exposed to cold. *Amer. J. Physiol.*, 1954, **177**, 367-371. [Dept. Physiol., Univ. Toronto.]

In 2 sets of experiments the effects of keeping rats in individual cages at $1.5 \pm 1^\circ \text{C}$. were studied. In the first 6 experiments diets and treatments varied; at different times 6 diets were given, in all of which protein content was 20.5 g. but fat ranged from 5.5 to 44.5 g., carbohydrate from 42.5 to 67.5 g. and energy from 412 to 615 Cal. per 100 g. The average daily intake by survivors varied widely from 13.8 to 23.9 g., the amount ingested being less with the high than with the low fat content, but the energy intake was remarkably constant, mostly between 80 and 90 Cal. There was no difference in survival for the groups which could be attributed to the fat content of the diets.

The findings in 2 more experiments confirmed the results of the first. When the diet was high in fat the amount of food and consequently of protein consumed was less than when a diet low in fat was taken; the urinary output of N varied in the same way.—D. Harvey.

719

MELLEN, W. J., HILL, F. W. and DUKES, H. H. Studies of the energy requirements of chickens. 2. Effect of dietary energy level on the basal metabolism of growing chickens. *Poultry Sci.*, 1954, **33**, 791-798. [Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

The 3 basal rations contained all known dietary constituents, and the energy values were varied to 975, 623 or 505 Cal. per lb. by altering the proportions of ground grain and ground oak husk.

In experiment 1, groups of 32 male day-old Rhode Island Red \times Barred Plymouth Rock chickens were given the high- and low-energy feeds. At 4 weeks of age both groups weighed the same, although the energy intake of the low-energy group was two-thirds that of the other. At $4\frac{1}{2}$ weeks of age, the oxygen consumed by the high-energy birds was 0.575 litre per bird per hr., which was significantly higher than the value of 0.465 recorded for the low-energy group.

In experiment 2, separate male and female groups of 20 Barred Plymouth Rock \times Rhode Island Red day-old chickens were given the high- and medium-energy rations. B.M.R. measurements were made on males at 5 to 6 and 14 to 17 weeks of age and on females at 9 to 10 and 19 to 22 weeks. The slightly higher oxygen consumption of birds on the high-energy ration was consistent, but not statistically significant. The experiment was repeated using the high- and low-energy rations and B.M.R. measurements were made at 4 to 6 weeks of age. Both males and females receiving the high-energy feed were heavier at the time of B.M.R. measurement. There was no

statistically significant difference in B.M.R. due to treatment, sex or sex-treatment interaction. Separate analysis of data for each sex indicated that for males only there was a significantly greater oxygen consumption by the birds receiving the high-energy ration.

Statistical analysis indicated that females had larger thyroid glands relative to bodyweight than males.—M. J. Head.

720

ELLIS, F. P., FERRES, H. M., LIND, A. R. and NEWLING, P. S. B. The upper tolerable levels of warmth for acclimatized European men working in the tropics. *J. Physiol.*, 1954, **125**, 55P-56P. [Med. Res. Coun. Royal Naval Trop. Res. Unit, Singapore.]

721

HASAN, J. and NIEMI, M. Metabolic responses of human subjects to severe acute thermal stress. *Acta physiol. scand.*, 1954, **31**, 137-146. [Inst. Occupational Health, Helsinki.]

Observations were made of oxygen consumption, rectal and skin temperatures and pulse rate in 16 human subjects during and after exposure to extremely high environmental temperatures in a Sauna bath. Most of the subjects showed a rise in the metabolic rate during thermal stress, with a subsequent fall, but no decrease in the metabolic rate below the pre-heating level could be found during the first hour, at 10 hr. or at 18 hr. after the thermal stress. The atypical reactions observed in 3 subjects might possibly be explained on an emotional basis. Positive correlations were observed between the metabolic rate and rectal temperature, skin temperature and pulse rate.

M. B. Richards.

722

HASAN, J., LAAMANEN, A. and NIEMI, M. Effect of thermal stress and muscular exercise, with and without insulin hypoglycaemia, on the body temperature, perspiration rate, and electrolyte and lactate content of sweat. *Acta physiol. scand.*, 1954, **31**, 131-136. [Inst. Occupational Health, Helsinki.]

The effect of low blood sugar, induced by insulin injections, on the rise in body temperature, perspiration rate, and electrolyte and lactate content of sweat, produced by thermal stress in a Finnish Sauna bath or by exercise on a treadmill, was studied on 10 soldiers and 9 students of physical education. Low blood sugar caused no significant difference in the perspiration rate or in the electrolyte content of sweat, but the lactate content showed some tendency to increase with decreased blood sugar concentrations. The rise in body temperature was significantly smaller than in

experiments without insulin injections. The Na content of sweat was significantly higher in the students than in the soldiers; this may indicate that the former were in a state of adrenocortical insufficiency caused by overtraining.

M. B. Richards.

723

BROWN, G. M., BIRD, G. S., BOAG, T. J., BOAG, L. M., DELAHAYE, J. D., GREEN, J. E., HATCHER, J. D. and PAGE, J. The circulation in cold acclimatization. *Circulation*, 1954, 9, 813-822. [Dept. Med., Fac. Med., Queen's Univ., Kingston, Ont.] Spanish summary.

Studies of 59 healthy, purebred Eskimo men living the traditional life of hunting, trapping and fishing showed that, in comparison with a control group of Canadian medical students, the Eskimos, when exposed to cold, had a higher blood flow through the hand and forearm, a greater rise of blood pressure and a rise of 30 per cent. in B.M.R.

I. Leitch.

724

JOLIET, J. F. and CASTILLON DU PERRON, M. Sur l'élimination de l'eau par les voies respiratoires. [Elimination of water by the respiratory tract.] *C.R. Acad. Sci.*, 1954, 239, 620-622.

By means of a simple apparatus the amount of moisture in the expired air of healthy subjects was weighed, and related to the intake of oxygen. For 1 ml. oxygen consumed, elimination of water was almost constant. The figures for 8 subjects ranged from 0.59 to 0.68 mg. water, 2 to 5 estimations being made on each subject. By this method it is possible, under normal conditions, without correction for temperature or pressure, to measure the quantity of oxygen absorbed with a precision at least equal to that of the usual apparatus for measuring metabolism.—M. B. Richards.

725

LEBLANC, J. Subcutaneous fat and skin temperature. *Canad. J. Biochem. Physiol.*, 1954, 32, 354-358. [Defence Res. Med. Labs., Toronto, Ont.]

Skin temperatures were taken at 20 places on the trunk of 6 young men after exposure for 20, 40 and 60 min. to air temperatures of 50°, 60° and 70° F.

The rate of fall of skin temperature was greatest in the first 20 min. and was also affected by the environmental temperature [the text says that the fall was faster at 70° than at 50°, but this does not agree with the figures in Table 2]. No subject shivered at 70°, and at this temperature there was no apparent effect of subcutaneous fat thickness. At 60° and at 50° the mean fall in skin temperature and the onset of shivering were related to the

thickness of subcutaneous fat. Regional variations in fat thickness in the same subject were also related to differences in skin temperature over the body.—D. Duncan.

726

PATCHELL, M. R. Direct effects of climate on cattle. 1. Some observations on the skin temperature, body temperature, respiration rate and pulse rate of dairy stock under normal temperature conditions. 2. Measurements of skin temperature in cattle. *N.Z. J. Sci. Technol.* [A], 1954, 36, 1-9; 10-14. [Dairy Res. Inst. (N.Z.), Palmerston North.]

1. The body and skin temperatures, respiration rate and pulse rate of 6 pairs of 2-year-old identical twin Jersey heifers were recorded at air temperatures of from 36° to 67° F. Records were made 4 times daily on 3 days in every fortnight for 3 months.

Statistical analysis of the results showed that respiration rate and skin temperature increased when air temperature rose. Differences between animals in body temperature and pulse rate were believed to be due to the effect of pregnancy. Twin pairs tended to have similar respiration and pulse rates.

2. Four types of thermocouple for taking skin temperatures in cattle are described and their advantages and disadvantages are discussed. With this type of instrument more accurate readings were obtained when the hair was left on than when it was shaved. Skin temperatures were lower on the extremities than on the trunk.—J. N. Aitken.

727

KNAPP, B. J. and ROBINSON, K. W. The role of water for heat dissipation by a Jersey cow and a Corriedale ewe. *Austral. J. Agric. Res.*, 1954, 5, 568-577. [Sir William Macgregor Sch. Physiol., Univ. Queensland, Brisbane.]

The animals were exposed 12 times to controlled environmental conditions in a psychrometric room. Each exposure lasted 7 hr. Six exposures were made with varying dry bulb temperature in steps of 4.5° through a range of 86° to 108.5° F. at a fixed humidity of 30 mm. Hg vapour pressure. The other exposures were made with varying humidity in 5-mm. steps over the range 15 to 40 mm. Hg vapour pressure at a constant temperature of 104° F. Air movement was constant.

Rectal temperature and respiratory rate and volume of both animals increased during exposure to heat. The sheep was more severely affected than the cow when both temperature and humidity were high.

Water loss through the skin of the Jersey cow

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was of the same order as loss through human skin. Respiratory water was only a fifth to a ninth of the total water lost. In the sheep transectaneous water loss was only a third of that through human skin. Respiratory water losses accounted for a third of the total.

It was concluded that the more efficient heat-regulating mechanism of the Jersey cow would enable it to withstand extreme environmental conditions better than the Corriedale ewe. An apparatus for measurement of respiratory volume and vapour pressure of expired air is described.

J. N. Aitken.

728

KAYSER, C., RIETSCH, M. L. and LUCOT, M. A. Les échanges respiratoires et la fréquence cardiaque des hibernants au cours du réveil de leur sommeil hivernal. Recherches physiologiques sur l'incrément thermique critique. [Respiratory exchange and cardiac frequency in hibernating animals during waking from winter sleep. Physiological research on critical heat increment.] *Arch. Sci. physiol.*, 1954, 8, 155-193. [Inst. Physiol., Fac. Méd., Strasbourg.]

See also Absts. 683, 1388.

CARBOHYDRATES

729

WHISTLER, R. L. and MCGILVRAY, D. I. Chemistry of the carbohydrates. *Annu. Rev. Biochem.*, 1954, 23, 79-98. [Dept. Biochem., Purdue Univ., Lafayette, Ind.]

730

VILLEE, C. A. Intermediary metabolism. *New Engl. J. Med.*, 1954, 251, 21-27; 64-70. [Res. Labs., Boston Lying-in Hosp., Mass.]
A review with 124 references.

731

WEINHOUSE, S. Carbohydrate metabolism. Some aspects of the intermediary metabolism of carbohydrates and lipids. *Annu. Rev. Biochem.*, 1954, 23, 125-176. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

732

CALCAGNO, P. L. and RUBIN, M. I. (with KELLEHER, M. K. and STUBBINS, M. M.) Effect of added carbohydrate on growth, nitrogen retention and renal water excretion in premature infants. *Pediatrics*, 1954, 13, 193-202. [Statler Res. Labs., Child. Hosp., Buffalo, N.Y.] Spanish summary.

The effect of adding carbohydrate to a diet of evaporated milk and water was tested in a group of 4 infants for whom the diets with and without added carbohydrate were isocaloric and in a group of 5 infants for whom the diets with and without added carbohydrate were of equal N content. Balance studies were made in 4- to 6-day periods with foreperiods of 5 to 7 days before each diet.

In both groups the average daily weight gain was greater when carbohydrate was added to the diet. In the isocaloric diet group average N, Na and K retentions were greater on the diet which contained higher levels of these nutrients. With constant N intake the average N, Na and K retentions were greater and blood urea N and daily

urea excretion were lower when energy intake was increased by addition of carbohydrate to the diet. In both groups average total electrolyte excretion was lower with added carbohydrate. With constant energy intake urine volume was greater and with constant N intake it was less when extra carbohydrate was given.—F. C. Aitken.

733

RODRÍGUEZ MIÑÓN, J. L., JIMÉNEZ DÍAZ, J. and DE GÓRGOLAS, R. Changes in the carbohydrate tolerance in patients with renal disease. *Bull. Inst. Med. Res., Univ. Madrid*, 1953, 6, 97-104. [Med. Clin.]

In double blood sugar tolerance tests 10 out of 14 patients with nephritis showed curves of diabetic type when given glucose by mouth. In another 8 patients glucose given by vein produced higher blood sugar values and longer disappearance curves than were seen in 3 normal subjects. The disturbance in utilisation of glucose suggests participation of the kidney in carbohydrate metabolism.—D. Duncan.

734

ESPEJO G. DE AVELLANEDA, M. Sobre la hipoglucemia relativa. [Relative hypoglycaemia.] *Rev. clín. española*, 1954, 52, 42-45. [Serv. Nutric., Hosp. Cruz Roja, Seville.]

A review with case histories.

735

HJORT, P. On the glucose tolerance test in sprue. *Acta med. scand.*, 1954, 149, 119-126. [Med. Dept. A., Rikshosp., Oslo.]

The effect of the amount of carbohydrate in the diet on the flat curve produced by oral glucose tolerance tests in sprue was studied in 3 subjects. Reduction of the carbohydrate content of the diet had the effect of raising and broadening the tolerance curve in 2 subjects; in the other the curve was flat even on a low-carbohydrate diet. The

high broad curve of a diabetic with sprue is shown also. Intravenous glucose tolerance tests in 2 of the patients with sprue showed on normal diet high curves which became higher and broader after a low-carbohydrate diet.

The findings are thought to be consistent with the theory that reduced glucose absorption causes the flat curves.—F. C. Aitken.

736

KÖNIG, A. Beitrag zur Frage der Blutzuckerregulation nach intravenösen Dextrosebelastung. [Blood sugar regulation after intravenous dextrose.] *Ztschr. ges. exp. Med.*, 1954, 124, 93-105. [Inst. Physiol., Univ. Greifswald.]

Blood sugar estimations hourly for 10 hr. on normal rabbits gave curves which differed widely in different animals and were of 3 types: hyper-regulatory, with variations of more than 30 mg. per cent. in the course of the day; average, with variations from 15 to 30 mg. per cent.; and hypo-regulatory, with variations below 15 mg. per cent. Within a few seconds after intravenous injection of glucose, glucose in the blood fell, after 1 min. to 48 to 73 per cent. of the initial value. Two explanations are discussed, immediate diffusion of the sugar into the interstitial tissues, or combination of the sugar with serum colloids. The height of the peak was independent of the original blood sugar value, and showed no direct proportionality to the dose injected. Immediately after injection of glucose there was dilution of the blood which was followed by diuresis. After loading with different amounts of glucose, the curves differed only in the magnitude of the variations. The curves were individually characteristic for different animals.—M. B. Richards.

737

FRANÇOIS, R. and RUTON-UGLIENGO. Acidose et utilisation des hydrates de carbone. Application au traitement des états de déshydratation. [Acidosis and carbohydrate utilisation. Application to the treatment of states of dehydration.] *Presse méd.*, 1954, 62, 867-869. [Lyons.]

In dogs with acidosis induced by intravenous perfusion with NH_4Cl the injection of insulin was followed by a much smaller fall in blood sugar and in plasma K and inorganic P levels than in the same dogs in their normal state. Acidotic dogs also showed a diabetic response to a glucose tolerance test. Utilisation of plasma glucose *in vitro* by red blood cells was inhibited by acidification, and was less in blood taken from acidotic dogs than in normal blood. Further experiments confirmed that acidosis interferes with the action of insulin.

In an infant of 11 months, severely dehydrated as a result of digestive disturbance, infusion of isotonic glucose in serum was ineffective in restoring the plasma electrolyte balance; it is concluded that the acidosis prevented the uptake of glucose by the red cells and that the glucose increased the osmotic pressure of the plasma, forced diuresis and in fact made the situation worse. The infant died. In a second infant with similar intense dehydration the first infusion given was of 300 ml. serum with 1.2 per cent. bicarbonate to correct the acidosis, after which physiological serum and isotonic glucose quickly brought about complete recovery. The importance of correcting acidosis before administration of isotonic serum glucose solutions is stressed.—D. Duncan.

738

BAZHANOV, B. G. K voprosu o vliyaniy fizicheskikh upravleniia na uglevodnyi obmen bol'nykh sakharnym diabetom. [Effect of physical exercise on carbohydrate metabolism in diabetes mellitus.] *Klin. Med., Mosk.*, 1953, 31, No. 10, 80-82. [Saratov. Med. Inst.]

Changes in the level of reducing substances in the blood of diabetics were studied after injection of 5 units of insulin and again after insulin followed by exercise for 10 min. Similar estimations were made after a double load of sugar and after sugar preceded by exercise.

Except in severe diabetes, physical stress reduced the level of reducing substances in blood and in combination with insulin caused a greater fall than did insulin alone. Conversely, sugar plus physical stress resulted in a smaller rise than sugar only. Physical stress lowered reducing substances and sugar in both arterial and venous blood and increased the arterio-venous difference, changes which were relatively greater in terms of sugar than of reducing substances.—D. W. Taylor.

739

WYNN, V. Electrolyte disturbances associated with failure to metabolise glucose during hypothermia. *Lancet*, 1954, 267, 575-578. [Dept. Surg., St. Mary's Hosp. Med. Sch., London.]

Administration of glucose in induced hypothermia in 2 human subjects and 5 dogs resulted in hyperglycaemia and a fall in plasma Na and total protein. Dilution of extracellular fluid by water owing to the osmotic effect of glucose is postulated.—F. C. Aitken.

740

RUNYAN, J. W. and KANTOR, N. Metabolic observations in insulin-resistant diabetics given intravenous fructose. *J. Lab. Clin. Med.*, 1954, 43, 615-619. [Thorndike Mem. Lab., Boston City Hosp., Mass.]

741

HILL, R., BAKER, N. and CHAIKOFF, I. L. **Altered metabolic patterns induced in the normal rat by feeding an adequate diet containing fructose as sole carbohydrate.** *J. Biol. Chem.*, 1954, **209**, 705-716. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Glucose tolerance tests were made on 3 groups of rats fasted for 96 hr. or fed for 3 days on an adequate diet containing 58 per cent. glucose or fructose as the sole carbohydrate. The level of plasma glucose did not exceed 130 mg. per 100 ml. in the rats fed on glucose, but in fasted rats and those fed on fructose over 250 mg. per 100 ml. was present after 5 hr.

Liver slices from rats fed on glucose or fructose were incubated with glucose, fructose or acetate labelled with ^{14}C , and the incorporation of ^{14}C into fatty acids, CO_2 and glycogen was studied. Diet made no significant difference to the production of fatty acid and CO_2 from fructose and acetate. The incorporation of ^{14}C from glucose was much less after the high-fructose than after the high-glucose diet. A similar effect was found on glycogen production from ^{14}C -glucose. Insulin injection for 3 days before rats fed on fructose were killed failed to correct the impaired oxidation of glucose.

The oxidation of ^{14}C -glucose to $^{14}\text{CO}_2$ by brain and kidney slices and the uptake of glucose from excised diaphragm of animals fed previously on glucose and on fructose were similar.

The activity of liver glucokinase was thought to be impaired by the prolonged feeding of fructose. The total concentration of hexoses in the plasma of the portal vein was about the same in rats fed on either glucose or fructose, but in rats fed on fructose the level of glucose was only slightly higher in the portal blood than in the arterial blood, while in rats fed on glucose the portal blood had twice the glucose concentration of the arterial blood. It is suggested that the glucokinase system in liver becomes adapted to dietary glucose.

A. Hepburn.

742

STEELE, R. (with Kiyono, K. M.) **The excretion and retention of the carbon of ingested sucrose by the mouse.** *J. Biol. Chem.*, 1954, **209**, 91-103. [Dept. Biol., Brookhaven Nat. Lab., Upton, N.Y.]

Sucrose labelled with ^{14}C in both the glucose and the fructose moiety was prepared photo-synthetically.

Young adult mice were starved for 15 to 18 hr., given a priming dose of unlabelled sucrose and amino-acid solution, and 3 hr. later a similar solution with ^{14}C -sucrose. The mice were killed between $3\frac{1}{2}$ hr. and 36 days after the test dose and in the interval were fed on stock diet and kept in

metabolism chambers for collection of CO_2 , urine and faeces.

In one mouse kept for 36 days 92.1 per cent. of the ^{14}C ingested was excreted as CO_2 , 3.1 per cent. in urine and 3.2 per cent. in faeces. It was considered that when the cumulative error was allowed for the total excretion was probably more than 99 per cent. Most of the ^{14}C found in different tissues in mice killed $3\frac{1}{2}$ and $3\frac{3}{4}$ hr. after the test dose was lost rapidly, but it was concluded that the demonstration of components with rapid turnover in almost every tissue does not eliminate the possibility that a large proportion of tissue C is present in components with slow turnover.

D. Duncan.

743

COX, P. J. N. and PUGH, R. J. P. **Galactosaemia.** *Brit. Med. J.*, 1954, ii, 613-618. [Hosp. Sick Child., Great Ormond St., London.]

A general discussion illustrated with reports of cases.

744

PATTERSON, J. W. **Hyperglycemia and galactose cataracts.** *Amer. J. Physiol.*, 1954, **177**, 541-543. [Dept. Anat., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

Groups of rats weighing 94 to 117 g. received ground dog chow pellets alone or mixed with 20, 35, 50 or 65 per cent. galactose. Blood sugar was estimated weekly and development of cataracts was studied. A 5-day balance test was made on each rat.

The total blood sugar increased with galactose intake, and with it urinary galactose excretion, urine volume, water and food consumption. In spite of increased appetite rats consuming galactose ate less dog chow than controls, and weight gain decreased in proportion to dog chow consumption.

The minimum time for production of cataracts was about 14 days and the minimum blood sugar about 150 mg. per 100 ml., or an increment of 30 mg. per 100 ml. above the normal. Galactose was thus 4 or 5 times as effective as glucose in producing cataracts (Patterson, *Amer. J. Physiol.*, 1953, **172**, 77). In 4 rats given 35 per cent. galactose in the diet and injected with phloridzin twice daily to keep down the blood sugar, cataract formation was significantly slower than in pair-fed rats not receiving phloridzin.—D. Duncan.

745

FOURNIER, P. **Différence d'activité physiologique entre des formes isomériques du galactose. [Difference in physiological activity between isomeric forms of galactose.]** *C.R. Acad. Sci.*, 1954, **239**, 304-306.

For preceding papers see Absts. 3490-3492, Vol. 24.

The basal diet resembled those used before. Experimental diets contained 12 per cent. lactose or 6 or 20 per cent. galactose, replacing part of the starch. Each group contained 6 rats of about 50 g. bodyweight, and Ca balances and galactose excretion were studied on the third day. With lactose 57 per cent. of the Ca intake was retained, compared with 38.7 per cent. on control diet, and hardly any galactose was excreted in the urine. With 6 per cent. galactose Ca utilisation was not significantly above the control level, and half the galactose appeared in the urine. With 20 per cent. galactose Ca utilisation was 62 per cent. and again about half the galactose was excreted unchanged.

It is concluded that the favourable effect of lactose on Ca metabolism is due to the β -galactose moiety, which is well utilised. In commercial galactose there are 3 or 4 isomers, and it is supposed that only the β -galactose is effective, while the others are poorly utilised and are excreted.

D. Duncan.

746

ALSLEV, J. and MÖCKEL, W. Über das Verhalten der Citronensäure im Blut nach Glucose, Galaktose und Fructosebelastungen. [Behaviour of citric acid in blood after a test dose of glucose, galactose, or fructose.] *Ztschr. ges. exp. Med.*, 1954, 124, 44-51. [Med. Klin., Univ. Kiel.]

After glucose, galactose or fructose, 1 g. per kg. bodyweight, was taken in 300 ml. coffee, there followed an increase of pyruvic and lactic acid in the blood, the increase being considerably greater after galactose or fructose than after glucose, but with little difference between the 2 former. After glucose and galactose blood citric acid fell in most,

with a small increase in a few subjects. After fructose there was a regular increase in blood citric acid, although the increase was much smaller than that of pyruvic and lactic acids. The results are discussed in relation to clinical and biochemical findings reported in the literature.—M. B. Richards.

747

KREBS, H. A. Considerations concerning the pathways of syntheses in living matter. Synthesis of glycogen from non-carbohydrate precursors. *Bull. Johns Hopkins Hosp.*, 1954, 95, 19-33. [Med. Res. Coun. Unit Res. Cell. Metabol., Univ. Sheffield.]

Report of Herter Lecture 1.

748

LAKSHMINARAYAN RAO, M. V. and BHATIA, I. S. Biological utilization of the polyfructosans of *Agave Vera Cruz* Mill. *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, 3, 110-111.

The stem of *Agave Vera Cruz* is used as a famine food and has the percentage composition crude protein 2.9, ether extract 0.9, fibre 21, ash 2.3 and carbohydrate 72.8. The bulk of the carbohydrate consists of 2 polyfructosans, one of which was used in balance experiments with rats, growth experiments being impossible because of severe diarrhoea. From 50 to 85 per cent. of the polyfructosan was retained. The polyfructosan has a great affinity for water and the diarrhoea was attributed to absorption of water from the intestinal tissue.

J. S. Thomson.

See also Absts. 366, 380, 428, 455, 532, 537, 913, 922-24, 985, 991, 1045, 1185, 1189, 1321.

PROTEINS AND PROTEIN DERIVATIVES

749

HUGHES, W. L. and SINEX, F. M. Chemistry of the proteins, peptides, and amino acids. *Annu. Rev. Biochem.*, 1954, 23, 177-214. [McCollum-Pratt Inst., Johns Hopkins Univ., Baltimore, Md.]

750

GÖRGY, P. On some aspects of protein nutrition. *Amer. J. Clin. Nutr.*, 1954, 2, 231-242. [Dept. Paediat., Hosp. Univ. Pennsylvania, Philadelphia.] Spanish summary.

A review.

751

BENDER, A. E. Recent work on proteins, with special reference to peptide biosynthesis and nutritive value. *J. Sci. Food Agric.*, 1954, 5, 305-318. [Bovril, Ltd.]

752

PECHAR, J., DIVÍŠ, E., PLACER, Z., HÁTEL, J. and KOZLOVSKÁ, E. Vylučování dusíku stolicí. [The excretion of nitrogen in the faeces.] *Sborn. pathofysiol. tráv.*, 1954, 8, 37-43. [Inst. Nat. Nutrit., Prague.]

Nitrogen in the food, urine and faeces of more than 700 sick and healthy persons were studied. Most patients received in their diet daily 14 g. N, a few 25 g. daily. In these 2 diet groups no significant difference was found in the fresh or dry weight of faeces or in the quantity of faecal N. There was no relation between the quantities of N excreted in urine and in faeces. Faecal excretion of N was not constant even on standard diet and did not depend on the amount of N in the food.

M. Prokšová (Czechoslovakia).

N.A. and R., January 1955

753

FORSYTH, B. T. The effect of testosterone propionate at various protein and calorie intakes in malnutrition after trauma. *J. Lab. Clin. Med.*, 1954, 43, 732-740. [Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

The effect of testosterone propionate on N retention was investigated in 4 patients suffering from malnutrition after severe trauma. Although the patients were in positive N balance when treatment was begun, all retained significantly more N with testosterone, though the degree of response was not clearly related to the degree of loss of lean bodyweight. The amounts of N retained on the same amount of testosterone differed in different patients, but in any one patient the additional N retention produced by testosterone was the same at different N and energy intakes, if these were adequate.—M. B. Richards.

754

POUGH, I. C., FORSYTH, B. T. and SBOV, V. M. Nitrogen balance in acute hepatitis. *Amer. J. Med.*, 1954, 16, 907-908. *Proc.* [Army Med. Serv. Grad. Med. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

755

TUI, C., KUO, N. H. and SCHMIDT, L. (with JONES, J.) The protein status in pulmonary tuberculosis. *Amer. J. Clin. Nutr.*, 1954, 2, 252-264. [Creedmoor Inst. Psychobiol. Studies, Creedmoor State Hosp., Queens Village 27, N.Y.] Spanish summary.

Nitrogen balance studies of 11 patients with advanced progressive pulmonary tuberculosis showed significantly positive balances in 4 at intakes of 40 to 60 Cal. per kg. bodyweight and 10.76 to 15.19 g. N. Two subjects were in slightly positive balance at energy intakes of 35 to 36 Cal. per kg. and N intakes of 5.43 to 6.25 g. The remaining subjects were in frankly negative balance at lower energy intakes and N intakes of 6.75 to 9.76 g. Studies of blood constituents and fluid compartments in these 11 and another patient showed presumptive evidence of low serum protein levels in 7.

The effect of a high protein intake, 50 to 60 Cal. and 0.5 to 0.72 g. N per kg., was studied in 9 of the subjects. Large positive N balances were obtained and after an initial weight loss in all except 1 subject, all gained weight. Changes in fluid compartments and blood constituents are tabulated.

The question "which is more harmful—hypoproteinaemia, which jeopardises healing because of shortage of healing material, or rapid protein replacement, which favours healing but stimulates

respiratory activity?" awaits controlled investigation.—P. C. Aitken.

756

OLESEN, K., HEILSKOV, N. C. S. and SCHØNHEYDER, F. The excretion of ^{15}N in urine after administration of ^{15}N -glycine. *Biochim. biophys. Acta*, 1954, 15, 95-107. [Biochem. Inst., Univ. Aarhus, Denmark.] French and German summaries.

The excretion of ^{15}N in the urine from 3 normal men in N balance was followed for 15 days after they were given ^{15}N -glycine. A curve given by the sum of 3 exponential terms closely fitted the experimental points in a graph of ^{15}N content of the urine against time. From the mathematical analysis of these curves it was deduced that at least four N pools, or groups of substances subject to continuous exchange of N, existed in the body, and one of these contained such a large amount of N that the amount of incorporated ^{15}N leaving it during the experiment could be neglected. Two model pool systems, simplified according to biological considerations, were mathematically solved from the data and the sizes of the pools were estimated.—C. Warner.

757

BARTLETT, P. D. and STEVENSON, A. Effects of protein anabolic hormones on rates of protein degradation and protein loss in the fasting dog. *Endocrinology*, 1954, 55, 200-204. [Edsel B. Ford Inst. Med. Res., Detroit, Mich.]

Glycine labelled with ^{15}N was given by vein to adult bitches on the second day of a fast started when the animals were in nitrogen balance. The urinary excretion of ^{15}N was studied for 5 days, during which growth hormone or testosterone propionate was given daily. Either hormone reduced the amount of ^{15}N excreted and slightly reduced the rate of protein degradation. Their effects were synergistic.—C. Warner.

758

STEINBOCK, H. L. and TARVER, H. Plasma protein. 5. The effect of the protein content of the diet on turnover. *J. Biol. Chem.*, 1954, 209, 127-132. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

Rats were fed on diets containing no protein or 25 or 65 per cent. protein for 3 weeks. ^{35}S -labelled plasma protein was injected intravenously and the specific activity of the plasma was followed for 7 days. The animals receiving 25 per cent. protein had a greater average protein pool, a shorter plasma protein half-life and a greater protein replacement rate than those on the protein-free diet. This was thought to be due to quicker initial plasma protein formation. The animals on

the 65 per cent. protein diet had a slightly smaller pool, a further decrease in half-life and a slight further increase in the replacement rate compared with those on the 25 per cent. protein diet; these results were interpreted as indicating an initial increase in the rate of protein degradation.

C. Warner.

759

FRANDSEN, A. M., NELSON, M. M., SULON, E., BECKS, H. and EVANS, H. M. **The effects of various levels of dietary protein on skeletal growth and endochondral ossification in young rats.** *Anat. Rec.*, 1954, **119**, 247-265. [Div. Dent. Med., Coll. Dent., Univ. California.]

Groups of 6 rats received from weaning diets containing no protein or 3 or 6 per cent. casein; 12 controls received a similar diet with 24 per cent. casein to appetite, and other groups of 6 received this diet but were pair-fed with littermates on the low-protein diets. The basal diet contained, per cent., alcohol-extracted casein 24, sucrose 63.5, hydrogenated vegetable oil 8, salt mixture 4 and liver eluate powder 0.5, with added vitamins. Sucrose replaced casein when this was reduced. The rats were killed at 63 to 67 days of age and skeletal growth was measured on X-ray photographs. Sections of the tibia were studied.

Skeletal growth was retarded in all the restricted groups, but always more severely in those on low-protein diets than in their pair-fed littermates. In the rats which received no casein (they received about 5 mg. N daily from the liver eluate) ossification in the tibia had ceased and "sealing-off" bone was found in the epiphysis. The marrow contained greatly distended sinusoids but no fat cells. The epiphyseal disc was narrow. The head of the tibia was small, the lamina compacta of the epiphysis was thin and the trabeculae were delicate. Similar, but less pronounced, abnormalities were present in the tibiae of all the deprived rats.

D. Duncan.

760

LA GRUTTA, G. and CILENTO, A. **Sostanze azotate e contenuto idrico nei ratti in crescita durante il decorso della ipoalimentazione e della successiva rialimentazione. [Nitrogenous substances and water content of growing rats during underfeeding and subsequent re-feeding.]** *Arch. Sci. biol., Bologna*, 1954, **38**, 366-376. [Ist. Fisiol. Umana, Univ. Palermo.]

Groups of young rats weighing initially 43 ± 1.2 g. were housed individually and received a synthetic diet providing, per cent., carbohydrate 75, protein 10, lipids 10 and salt mixture 5, with a multivitamin preparation. A group of 8 rats received sufficient of this diet to cover their needs for normal growth, another 8 had their intake restricted; 4 of the latter were killed when they weighed two-thirds as much as the controls, and

the other 4 were then well fed until they caught up with the controls, when all were killed.

The water content of the tissues did not differ significantly between the groups. The absolute N content of the muscles of underfed rats was maintained so that relatively to other components it increased by 9.55 per cent. ($P < 0.2$). The re-fed rats showed a mean increase of 20 per cent. ($P < 0.02$) in total N of the muscles and 50 per cent. ($P < 0.01$) in coagulable N when compared with the normal controls of the same bodyweight. The re-fed rats also showed an increase of 10 per cent. in the incoagulable N of the liver.

It is concluded that the re-fed rat can store in the muscles and liver large quantities of organic N compounds or compounds with a high proportion of N.—D. Duncan.

761

ARNOLD, A. and SCHAD, J. S. **Nitrogen balance studies with dogs on casein or methionine-supplemented casein.** *J. Nutrition*, 1954, **53**, 265-273. [Sterling-Winthrop Res. Inst., Rensselaer, N.Y.]

Dogs depleted of protein reserves were maintained in N equilibrium by about 139 mg. casein N, 102 mg. 1 per cent. methionine-supplemented casein N or 72 mg. 3 per cent. methionine-supplemented casein N per kg. daily.—C. Warner.

762

FORBES, R. M. (with YORR, M.) **Studies on the influence of antibiotics and methionine on nitrogen utilization and basal metabolism of the growing male albino rat.** *J. Nutrition*, 1954, **53**, 275-287. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

The effects of adding methionine and a mixture of streptomycin and chloromycetin to a semi-purified diet with soya bean oilmeal as the sole source of protein were studied in rats by a 2×2 factorial experiment. No significant interaction was observed. Methionine caused marked increases in the biological value of the dietary protein, N retention and bodyweight, body water and body N gains. The antibiotics caused a marked decrease in endogenous N excretion and slight increases in N retention and the digestibility of the protein.

C. Warner.

763

LAWRENCE, R. T. B., SALTER, J. M. and BEST, C. H. **The effect of insulin on nitrogen retention in the hypophysectomized rat.** *Brit. Med. J.*, 1954, **ii**, 437-439. [Dept. Physiol., Univ. Toronto.]

764

THOMPSON, R. C. and BALLOU, J. E. **Studies of metabolic turnover with tritium as a tracer.**

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4. Metabolically inert lipide and protein fractions from the rat. *J. Biol. Chem.*, 1954, 203, 883-888. [Biol. Sect., Radiol. Sci. Dept., General Electric Co., Richland, Wash.]

Female rats were fed to appetite on Purina dog chow; there were 20 in the control group and 20 each received a total of 100 mC. tritium oxide intraperitoneally in 5 equal weekly injections. The rats were killed in 2 groups, at 138 and 258 days after the first injection. Samples of liver, brain, skin, fat, hind leg muscle and residual carcass were separated into protein and lipid components and the concentration of bound tritium was estimated. The biological half-life of the labelled fractions was estimated from the difference in tritium content between the groups killed early and late.

Collagen fractions showed half-lives of 300 days or longer; lipid fractions were also found with half-lives as long as 300 days. The highest concentration of bound tritium, 4 months after tritium oxide was given, was found in the lipids of brain.—G. A. Garton.

765

CANNON, P. R., FRAZIER, L. E. and HUGHES, R. H. Factors influencing amino acid utilization in tissue protein synthesis. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 8*, 1954, 75-90. [Dept. Pathol., Univ. Chicago, Ill.]

Protein-depleted rats fed on diets of different energy content and given amino-acids by mouth or subcutaneously utilised the amino-acids for gain in weight, even when the energy intake was very low, though utilisation was best with an adequate energy intake. Riboflavin, and to some extent Ca pantothenate, pyridoxine and vitamin B₁, but not nicotinic acid or choline, was needed for good weight gain when protein-depleted rats were fed on rations adequate in energy and amino-acids.—C. Warner.

766

KRITZMAN [KRITSMAN], M. G. and BAVINA, M. V. Issledovanie pri pomoshchi mechenykh aminokislot intensivnosti obrazovaniya belkov organov i tkanei v norme i pri eksperimental'nom ateroskleroze. [An investigation into the rate of formation of proteins, using labelled amino-acids, in organs and tissues under standard conditions and during experimental atherosclerosis.] *Dokl. Akad. Nauk S.S.S.R.*, 1954, 94, 721-724. [Inst. Terap., Akad. Med. Nauk SSSR.]

The rate of incorporation of amino-acids into tissues of normal and atherosclerotic rabbits was studied with methionine-³⁵S, glycine-¹⁴C and tyrosine-¹⁴C. The animals were killed 8, 12, 18

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and 20 hr. after intramuscular injection of the tracer and organs and tissues were analysed.

In atherosclerotic animals incorporation of methionine was much less than normal, the difference varying from 30 to 60 per cent. in the aorta to almost nil in skeletal muscle. Similar results were obtained for the other two tracers. It is considered that in atherosclerosis abnormal cholesterol metabolism should not be studied without consideration of possible abnormalities of protein synthesis.—D. W. Taylor.

767

NIKLAS, A., MAURER, W. and KRAUSE, H. Messung der biologischen Halbwertszeiten einzelner Serum-Eiweiss-Fractionen beim Kaninchen. (Vergleichende Messungen bei peroraler Gabe von S³⁵-Methionin und Infusion von S³⁵-markiertem Serum-Eiweiss.) [Measurement of the biological half-life of some serum protein fractions in the rabbit. Comparative measurements after giving ³⁵S-methionine by mouth or infusing serum protein labelled with ³⁵S.] *Biochem. Ztschr.*, 1954, 325, 464-476. [Med. Klin., Univ. Cologne.]

When ³⁵S-methionine was given to rabbits by mouth, the fall in the amount of ³⁵S-labelled serum protein was slower than after infusion of ³⁵S-labelled rabbit serum. The flattening of the curves after oral intake of ³⁵S-methionine was due to continuous new formation of ³⁵S-labelled serum protein, arising from the liberation in the breakdown of the labelled protein of ³⁵S-amino-acids, which were then incorporated anew into the protein. The flattening of the curves observed after ³⁵S-methionine intake can be accounted for quantitatively in this way. There was an exponential decrease in labelled albumins with a biological half-life of 10 days. The separate globulin fractions did not decrease exponentially, but more and more slowly with time, each fraction being composed of other fractions with different half-lives. The average half-life of the globulin fractions was between 2 and 5 days. In the rabbit the new formation of albumin amounted to 0.6 g. daily, and of globulins to 1.3 g.—M. B. Richards.

768

KOLFF, W. J. and PAGE, I. H. Influence of protein and other factors on postnephrectomy hypertension in rats sustained with an improved method of peritoneal lavage. *Amer. J. Physiol.*, 1954, 178, 69-74. [Res. Div., Cleveland Clin. Found., Ohio.]

Rats were prepared for peritoneal lavage by insertion of an indwelling stainless steel cannula. Peritoneal lavage had no ill effect on 2 normal rats.

After removal of both kidneys lavage was repeated 2 or 3 times daily. The rats were excessively thirsty and the water content of their tissues increased with the time of survival. Of 16 rats on mixed diets or on high-protein chow, 11 developed high blood pressure, but only 5 developed it of 21 on a low-protein, low-Na diet of rice pabulum. The blood pressure was not related to body water content, to serum Na or to the Na content of the fluid used for lavage.—D. Duncan.

769

DENT, C. E. and WALSH, J. M. **Amino-acid metabolism.** *Brit. Med. Bull.*, 1954, **10**, 247-250. [University Coll. Hosp. Med. Sch., London.]

770

MÜTING, D. Der Aminosäuregehalt des menschlichen Urins. [**Amino-acid content of human urine.**] *Hoppe-Seyler's Ztschr.*, 1954, **297**, 61-67. [Forschungsinstit. Diabetes, Karlsburg.]

Free and peptide-bound amino-acids were estimated quantitatively by paper chromatography on 24-hr. samples of urine of 40 healthy subjects. In general the values for 20 amino-acids agreed with those in the literature, but those for valine, serine and methionine were higher. No important difference was found between the urinary amino-acids of men and of non-pregnant women. The analyses seem to include the greatest part of the amino-acid content of human urine, since the sum of the amounts of α -amino-N reckoned from the separate acids studied was only about 10 per cent. less than the total content of α -amino-N found by Moore and Stein (Abst. 3939, Vol. 18).

M. B. Richards.

771

MILLER, S., RUTTINGER, V. and MACY, I. G. **Urinary excretion of ten amino acids by women during the reproductive cycle.** *J. Biol. Chem.*, 1954, **209**, 795-801. [Res. Lab., Child. Fund Michigan, Detroit.]

Fifteen women aged from 20 to 36 years supplied 44 twenty-four-hour urine samples. Fourteen were collected during non-pregnancy, 25 during the second to ninth months of pregnancy, and 5 during lactation, 34 to 221 days *post partum*. The amino-acids were estimated microbiologically.

The quantities of amino-acids excreted fluctuated throughout gestation, but the median value for each was greater than in non-pregnancy. Threonine had the greatest percentage increase and arginine the least. During lactation each amino-acid was excreted in smaller quantities than in non-pregnancy, ranging from 49 per cent. for tryptophan to 69 per cent. for valine. The change in the excretion of amino-acids from pregnancy to lactation was most marked and threonine, lysine, histi-

dine and tryptophan fell to 7, 9, 12 and 21 per cent. of the amounts excreted during the ninth month of gestation.—A. Hepburn.

772

RUTTINGER, V., MILLER, S., ANDRECOVICH, M. E. and PERDUE, G. M. **Urinary free amino acid excretions during successive pregnancies.** *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 108-112. [Res. Lab., Child. Fund Michigan, Detroit.]

One woman, initially aged 23, was examined before, during and after each of her first 2 pregnancies and during part of her third, for the excretion of essential amino-acids. There was an initial increase of excretion of all these amino-acids with pregnancy, greatest for threonine, histidine, lysine and tryptophan, least for methionine. The excretion of threonine increased progressively, reaching 10 or more times the non-pregnant value, but excretion of the other amino-acids remained roughly constant after the fourth month. Lowest figures were obtained during lactation.—C. Warner.

773

NARDI, G. L. **Urinary loss of amino-acids after surgery.** *Surgery*, 1954, **35**, 378-381. [Dept. Surg., Harvard Med. Sch., Boston, Mass.]

In 5 patients the excretion of essential and non-essential amino-acids increased after surgical operation and the magnitude of the increase was proportional to the degree of trauma.—D. Duncan.

774

NARDI, G. L. **"Essential" and "nonessential" amino acids in the urine of severely burned patients.** *J. Clin. Invest.*, 1954, **33**, 847-854. [Dept. Surg., Harvard Med. Sch., Massachusetts Gen. Hosp., Boston.]

775

HARRIS, H., MITTWOCH, U., ROBSON, E. B. and WARREN, F. L. **Excretion of amino acids in cystinurics.** *Biochem. J.*, 1954, **57**, xxxiii. [Galton Lab., University Coll., London.]

776

FRAZIER, E. I. (with STUTES, A. L.) **The urinary excretion of tryptophan by human subjects on controlled diets varying in levels and sources of protein.** *J. Nutrition*, 1954, **53**, 115-127. [Dept. Home Econ., Agric. Exp. Stat., Alabama Polytech. Inst., Auburn.]

Twelve women aged 19 to 24 given a diet containing 9.8 g. N and 885 mg. tryptophan daily excreted about 30 mg. tryptophan daily in the urine, about 10 mg. being "free". With diets low in nicotinic acid, with 7.1 to 8.4 g. N and 521 to 616 mg. tryptophan, the amount of tryptophan

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excreted was slightly less, though "free" tryptophan excretion was unchanged. There was no apparent relation between the amount of tryptophan excreted and the source or amount of dietary N, bodyweight, surface area, basal energy intake or urine volume. It is concluded that there was selective re-absorption of tryptophan from the glomerular filtrate by the tubules.—C. Warner.

777

GARTLER, S. and DOBZHANSKY, T. Excretion in human urine of an unknown amino-acid derived from dates. *Nature*, 1954, 174, 553. [Inst. Study Human Variation, Columbia Univ., New York.]

A ninhydrin-reacting substance, occurring apparently as a free amino-acid in dates, was excreted, possibly quantitatively, in the urine after ingestion. C. Warner.

778

LANG, K. Über Phenylpyruvische Oligophrenie. [Phenylpyruvic oligophrenia.] *Ztschr. Kinderheilk.*, 1954, 75, 132-139. [Kinderklin., Univ. Bonn.]

Two sisters with phenylpyruvic oligophrenia are described in detail. Their intelligence quotients (Binet) were at 11 years, 3 and at 7 years, 62. This metabolic abnormality behaves as a Mendelian recessive. It is characterised by an enzyme block which prevents the conversion of *l*-phenylalanine from food to *l*-tyrosine, so that *l*-tyrosine becomes an essential amino-acid. Phenylalanine accumulates in the blood, reaches an abnormally high level in cerebrospinal fluid and is deaminated in the kidney and excreted as phenylpyruvic acid. It is not known whether some other toxic product, such as phenylacetic acid, or lack of tyrosine is responsible for the mental deterioration and finally, idiocy. The lack of tyrosine causes abnormally fair skin and light hair. Administration of tyrosine, about half the daily requirement, *i.e.*, 1.0 to 1.5 g., improved the younger but not the older child. Glutamic acid has been reported helpful. No benefit from ascorbic acid or vitamin B₁ was seen.—I. Leitch.

779

LIGNAC, G. O. E. Cystinosis. [Cystinosis.] *Nederland Tijdschr. Geneesk.*, 1954, 98, 1674-1681. [Leyden.]

A review.

780

HIMWICH, W. A. Absorption of *l*-glutamic acid. *Science*, 1954, 120, 351-352. [Thudichum Psychiat. Res. Lab., Galesburg State Res. Hosp., Ill.]

Glutamic acid hydrochloride and *l*-glutamic acid were very poorly absorbed by human subjects. Sodium glutamate was well absorbed.—D. Duncan.

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781

NASSET, E. S. and GATEWOOD, V. H. Nitrogen balance and hemoglobin of adult rats fed amino acid diets low in *L*- and *D*-histidine. *J. Nutrition*, 1954, 53, 163-176. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

Adult rats were fed for 2 weeks on a diet containing 9.6 per cent. whole egg protein and then received successively by stomach tube an N-free diet for 1 week, an amino-acid diet containing about half the total N required for maintenance for 1 week, and a complete amino-acid diet with twice this amount of N for 1 week. This 5-week cycle of feeding was repeated for 25 weeks. N balance and Hb were studied with different proportions of histidine in the amino-acid diet.

Reduction of histidine adversely affected the N balance. A positive N balance was obtained with one-fifth of the histidine present in the complete amino-acid mixture, but Hb values were reduced at that level and by as much as 20 per cent. at lower levels. Substitution of *D*- for *L*-histidine exerted no obvious effect on N balance or Hb concentration.—A. Hepburn.

782

EGGERT, R. G., WILLIAMS, H. H., SHEFFY, B. E., SPRAGUE, E. G., LOOSLI, J. K. and MAYNARD, L. A. The quantitative leucine requirement of the suckling pig. *J. Nutrition*, 1954, 53, 177-185. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

Groups of 2-day-old suckling pigs were fed on a simulated milk diet lacking leucine but containing N as ammonium citrate, casein and amino-acids equivalent to 25 per cent. protein on an air-dry basis. Growth and feed efficiency were studied with *L*-leucine added at different levels in one experiment; in another carcass storage of protein, fat and ash was also estimated.

The *L*-leucine requirement was estimated to be between 1.00 and 1.25 per cent. of the diet, or not more than 5 per cent. of the dietary protein.

A. Hepburn.

783

HARPER, A. E., BENTON, D. A., WINJE, M. E. and ELVEHJEM, C. A. Leucine-isoleucine antagonism in the rat. *Arch. Biochem. Biophys.*, 1954, 51, 523-524. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Rats fed on diets containing 9 per cent. casein supplemented with *L*-leucine grew less well than those without leucine. The inhibition of growth produced by 1 per cent. *L*-leucine in the diet was completely prevented by adding 0.5 per cent. *D*-isoleucine, but not by any other amino-acid tested. The inhibition due to 3 per cent. leucine was almost

prevented by 1.7 per cent. isoleucine, but that concentration of isoleucine was itself slightly inhibitory.

C. Warner.

784

GRAU, C. R. and STEELE, R. Phenylalanine and tyrosine utilization in normal and phenylalanine-deficient young mice. *J. Nutrition*, 1954, 53, 59-71. [Dept. Biol., Brookhaven Nat. Lab., Upton, N.Y.]

Mice were fed on amino-acid diets containing 0.7 per cent. L-tyrosine and either 0.1 or 0.7 per cent. L-phenylalanine for 5 to 14 days. Tyrosine or phenylalanine uniformly labelled with ^{14}C was then added to the diet and expired CO_2 was collected at intervals for 30 min., after which the animals were killed and the activity of the tyrosine and the phenylalanine of the liver proteins was estimated.

Animals fed on the phenylalanine-deficient diet absorbed less phenylalanine and oxidised less of that absorbed to liver protein tyrosine and to CO_2 than did normal animals; the deficient animals also absorbed less tyrosine and oxidised less of that absorbed to CO_2 , though incorporation into liver protein tyrosine was unimpaired; none was incorporated into liver phenylalanine.—C. Warner.

785

MAKINO, H. [Histochemical investigations on the metabolism of arginine and its derivatives.] *Osaka Daigaku Igaku Zasshi*, 1954, 6, 233-241. [Dept. Biochem., Med. Sch., Univ. Osaka.] In Japanese: English summary.

Spermatogenesis was impaired in rats on a diet deficient in arginine, and was restored nearly to normal by a supplement of ornithine. Neither arginine nor ornithine could be replaced by arginic acid, from which it is concluded that the conversion of arginic acid to arginine *via* its α -keto-acid does not take place *in vivo*. (From English summary.)

D. Harvey.

786

BAYETTA, L. A., BERNICK, S., GEIGER, E. and BERGREN, W. The effect of tryptophane deficiency on the jaws of rats. *J. Dent. Res.*, 1954, 33, 309-315. [Dept. Biochem., Sch. Dent., Univ. S. California, Los Angeles.]

Forty 21-day-old weanling rats were maintained on a standard ration for 1 week, and were then divided into 3 groups. The controls received a complete diet for 7 weeks, a second group received a tryptophan-deficient diet for 7 weeks, and a third group received the tryptophan-deficient diet for 3 weeks and the complete diet for 4 weeks. Representatives from each group were killed at 3 and at 7 weeks. The tryptophan-deficient diet contained an acid hydrolysate of casein as its source of N, and for the control diet 0.75 per cent. tryptophan was added.

The control rats made normal weight gains, but the tryptophan-deficient group lost weight; the repleted group made up this loss, but did not attain the weight of the control group by 7 weeks. The deficient rats developed alopecia and cataracts. Endochondral and periosteal bone formation was inhibited. At 3 weeks the femurs and alveolar processes of the alveolar teeth were affected; at 7 weeks, the dentine of the incisor teeth was imperfectly calcified, and the femurs showed marked osteoporosis. Such lesions were reversible on repletion with tryptophan.—W. A. Greig.

787

HARPER, A. E., BENTON, D. A., WINJE, M. E. and ELVEHJEM, C. A. "Antilipotropic" effect of methionine in rats fed threonine-deficient diets containing choline. *J. Biol. Chem.*, 1954, 209, 159-163. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Rats were fed to appetite on diets containing 9 per cent. casein, sucrose, fats, salts and vitamins, including choline, and the effects of adding combinations of methionine, tryptophan and threonine on the growth rate and liver fat content were studied for 2 weeks.

Tryptophan slightly increased growth rate, but had no effect on liver fat. Methionine alone or with tryptophan increased growth rate and considerably increased liver fat; little difference was noted between the effects of 0.1 and 0.6 per cent. methionine. Threonine gave an increased growth rate, especially in the presence of both methionine and tryptophan, and a decrease in liver fat content, slight in the absence of methionine, pronounced in its presence, always bringing the fat content below 16 per cent. of the dry weight.

It is suggested that when the primary deficiency of the diet in S-containing amino-acids is remedied, the secondary deficiencies of first threonine and then tryptophan become evident; the addition of methionine to the diet precipitates a threonine deficiency which causes liver fat to accumulate. When paired feeding was used, the food intake of animals fed on the basal diet supplemented with methionine and tryptophan being limited to that of those on the diet supplemented with tryptophan alone, no increase in liver fat was noted, presumably because the threonine did not become sufficiently low.—C. Warner.

788

EDWARDS, L. J. The absorption of methionine by the skin of the guinea pig. *Biochem. J.*, 1954, 57, 542-547. [Dept. Phys., Beecham Research Laboratories, Ltd., Brockham Park, Betchworth, Surrey.]

DL- ^{35}S -methionine was rubbed into the skin of guinea-pigs during 4 weeks, and the incorporation

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of the ^{35}S into the protein of the growing hair was studied. With doses of 34 to 441 μg . methionine, about 1 per cent. of the ^{35}S was incorporated into the hair, mainly as cystine. When similar amounts of methionine were given in food about 2.5 times as much ^{35}S was incorporated in the hair, but since a large amount of the topically applied methionine was not absorbed and was washed off the subsequent hair clippings, and since the relative radio-activities of the liver, spleen and heart were similar in both groups, it appeared that the mechanism of utilisation of methionine was similar whether the amino-acid was eaten or absorbed through the skin. Intramuscular injection of methionine gave higher incorporation, about 5 per cent. of the ^{35}S being recovered from the hair after low doses, though higher doses gave relatively lower recoveries.—C. Warner.

789

DEVIK, F. Protective effects of combined hypoxia and cysteine treatment on whole-body irradiation of mice. *Brit. J. Radiol.*, 1954, 27, 463-466. [Inst. Gen. Pathol., Univ. Oslo.]

790

BENSON, W. R. and YOUNG, J. M. The effects of repeated small doses of ethionine on the pancreas, the growth, and the serum level of methionine of rats. *Amer. J. Pathol.*, 1954, 30, 618-619. *Proc.* [Dept. Pathol., Sch. Med., Duke Univ., Durham, N.C.]

791

FITZGERALD, P. J., HELLMAN, L., WEINSTEIN, J. and SCHIMMEL, R. The concentration, distribution, and excretion of radio-ethionine (S^{35}) in the rat on stock and protein-depleted diets—determined by radioactivity counting and radio-autography. *Amer. J. Pathol.*, 1954, 30, 619-620. *Proc.* [Dept. Pathol., Coll. Med., State Univ. New York.]

792

FEINBERG, H., RUBIN, L., HILL, R., ENTENMAN, C. and CHAIKOFF, I. L. Reduction of serum lipides and lipoproteins by ethionine feeding in the dog. *Science*, 1954, 120, 317-318. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Administration of ethionine caused marked reduction in the fatty acid, phospholipin, cholesterol and lipoprotein contents of the serum, which were rapidly restored to normal on removal of the ethionine from the diet.—C. Warner.

793

GAUDRY, R. and MARTEL, F. Note sur le métabolisme de quelques homologues supérieurs

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d'acides aminés naturels chez le rat. [Note on the metabolism of some higher homologues of natural amino-acids in the rat.] *C.R. Soc. Biol.*, 1954, 148, 472-473. [Laval Univ., Quebec.]

Two homologues of serine, DL- α -amino- ϵ -hydroxyacaproic acid and DL- α -amino-5-hydroxyvaleric acid, one of cystine, DL- ϵ -dithio-bis- α -aminocaproic acid, and one of methionine, DL- α -amino- ϵ -methyl-mercaptocaproic acid, were excreted in the urine of rats as ammonia, urea and α -keto acids which interfered with the Jaffe estimation of creatinine. When "hexahomoserine" was given, α -keto- ϵ -hydroxyacaproic acid, α -ketoglutaric acid and pyruvic acid were found in the urine.

C. Warner.

794

DAVIES, D. F., WOLFE, K. M. and PERRY, H. M. (Jr.) Studies on primary amines. 2. Their natural occurrence in urine of normotensive and hypertensive subjects. *J. Lab. Clin. Med.*, 1954, 43, 620-632. [Dept. Int. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

Methods were described in Abst. 55, Vol. 24.

Samples of urine were from 36 subjects, 12 normal, 20 with arterial hypertension and 4 with other disorders. As many as 8 amine spots were separated on paper chromatograms of single 24-hr. specimens of urine. The amines grouped themselves around 10 R_f peaks. There was no evidence that the number of amines excreted by patients with hypertension differed from the number excreted by normal subjects; many more data would be required for a study of the difference in frequency of occurrence of particular amines.

D. Harvey.

795

STEIN, W. H., PALADINI, A. C., HIRS, C. H. W. and MOORE, S. Phenylacetylglutamine as a constituent of normal human urine. *J. Amer. Chem. Soc.*, 1954, 76, 2848-2849. [Rockefeller Inst. Med. Res., New York 21.]

796

BARRY, J. M. Use of glutamine by the mammary gland for the synthesis of casein. *Nature*, 1954, 174, 315-316. [Dept. Agric., Univ. Oxford.]

1- ^{14}C -DL-glutamine was injected intravenously into a lactating goat and samples of blood and milk were taken at intervals up to 12 hr. Free glutamine in plasma had a specific activity many times that of free and plasma protein glutamic acid. After 3 hr. the specific activity of free glutamine in plasma decreased; free and combined glutamic acid remained about the same.

The acid hydrolysate of milk casein contained glutamic acid and the enzymic hydrolysate from the action of pancreas suspension contained in

addition glutamine. The specific activity of casein glutamine after 3 hr. was slightly higher than that of the free glutamine in plasma but that of casein glutamic acid was much lower. This suggested that free plasma glutamine was the main source of the glutamine residues in casein, which was confirmed by the injection of (1^{14}C :amide- 15N) DL-glutamine, when the ratio μC . per m. mol. carbon:atoms per cent. excess 15N in the glutamine of casein from milk after 1.5 hr. was approximately the same as in that injected. Glutamine did not lose its amide N and so apparently did not form intermediate γ -glutamyl peptides in the synthesis of casein.—A. Hepburn.

797

TANK, G. W. and HERRIN, R. C. **Effect of protein and amino acids upon renal function in the dog.** *Amer. J. Physiol.*, 1954, 178, 165-167. [Dept. Physiol., Med. Sch., Univ. Wisconsin, Madison.]

The post-absorptive creatinine clearances of 3 dogs were 85 to 90 ml. when the diet consisted of pork heart alone, but 56 to 72 ml. when the diet consisted of maize, salts and vitamins with 5 to 70 per cent. casein. No protein was found in the urine of any of the animals. Other dogs tested did not show these differences.

Intravenous infusion of alanine and, in 2 and sometimes a third of 5 dogs, of valine, increased the clearance of creatinine and of p -aminohippurate. Alanine usually decreased and valine usually increased the filtration fraction.—C. Warner.

798

SCHMIDT-NIELSEN, B. **Excretion of endogenous and exogenous creatinine and of mannitol in the kangaroo rat.** *Amer. J. Physiol.*, 1954, 178, 177-181. [Kettering Lab., Univ. Cincinnati, Ohio.]

Kangaroo rats, *Dipodomys merriami*, received a high-protein diet of soya bean meal and lettuce or a low-protein diet of barley, carrots and lettuce. Clearances of creatinine, mannitol and inulin were

studied by methods to be described (Schmidt-Nielsen, *Amer. J. Physiol.*, in the press).

The ratio of endogenous creatinine clearance: inulin clearance lay between 0.84 and 1.46, with only one figure below unity, and is thus comparable to the ratio reported in man (Hare *et al.*, *Federation Proc.*, 1949, 8, 67). After infusion of creatinine the creatinine: inulin clearance ratios indicated active secretion of creatinine by the renal tubules. The mean mannitol: inulin clearance ratio was 0.91, closely agreeing with figures for man and dog.

It is considered that endogenous as well as exogenous creatinine is secreted by the tubules in this species, but that secretion at low plasma concentrations becomes significant only when the filtration rate is low, so that at normal filtration rates the endogenous creatinine clearance is a measure of the glomerular filtration rate.—D. Daneman.

799

WILSON, D., BEYER, A., BISHOP, C. and TALBOTT, J. H. **Urinary uric acid excretion after the ingestion of isotopic yeast nucleic acid in the normal and gouty human.** *J. Biol. Chem.*, 1954, 209, 227-232. [Chronic Dis. Res. Inst., Univ. Buffalo, N.Y.]

About 1 g. yeast nucleic acid labelled with 15N was swallowed in gelatine capsules by 2 normal young men and a man of 65 with non-tophaceous gout. The rates of excretion of 15N in uric acid were similar in all; 47 to 73 per cent. of the ingested purine N was excreted as uric acid, but pyrimidine N was almost completely excreted as urea and ammonia, if conversion of purine to these products was neglected.

It is concluded that the purines of nucleic acid were rapidly converted to uric acid, or possibly to some precursor whose turnover rate was similar to that of uric acid, and that normal and gouty subjects did not differ significantly in their ability to do this.—C. Warner.

See also Absts. 434-37, 447-451, 454, 495, 498, 533, 555, 580, 668, 691, 700, 715, 753, 757, 805, 818-20, 863, 876, 947, 1174, 1431, 1542-44.

FATS AND OTHER LIPIDS

800

Biochemical problems of lipids. International Colloquium, Brussels, June 1953, pp. 309 (with discussion 309-310). Price 60s.

801

GURIN, S. **Lipogenesis.** *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 6*, 1953, 1-10 (with discussion 10-12). [Sch. Med., Univ. Pennsylvania, Philadelphia.]

802

KINSELL, L. W. **Effects of high-fat diets on serum lipids. Animal vs. vegetable fats.** *J. Amer. Dietetic Assoc.*, 1954, 30, 685-688. [Inst. Metabol. Res., Highland Alameda County Hosp., Oakland.]

Hospital patients with diverse diseases were given diets containing considerable amounts of vegetable fat. Such diets brought about a marked fall in the cholesterol and phospholipin contents

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of the plasma. When fat of animal origin was substituted for the vegetable fat, the plasma values for cholesterol and phospholipins increased; the reverse exchange again occasioned a fall in the plasma concentration of these classes of lipids.

G. A. Garton.

803

JOHNSON, W. A., FREEMAN, S. and MEYER, K. A. **The disappearance of intravenously injected emulsified fat from the circulation of patients and animals.** *J. Lab. Clin. Med.*, 1952, **39**, 414-419. [Dept. Exp. Med., Northwestern Univ. Med. Sch., Chicago, Ill.]

A preparation containing 10 per cent. olive oil in 5 per cent. glucose solution emulsified with 1 per cent. of a lecithin fraction was administered parenterally to human subjects at 1 g. fat per kg. bodyweight and to dogs at 0.5 g. fat per kg. bodyweight. The human subjects included patients with minor complaints to be treated by operation and others suffering from hyperthyroidism, liver cirrhosis and renal insufficiency; dogs were studied after bilateral ligation of the ureter or Eck fistula formation and in diabetes produced by alloxan. The emulsion was injected into the human subjects over 1 or 2 hr. and into dogs over 1 hr. Serum samples were analysed for total fatty acids, cholesterol and lipid P before, during and at intervals after injection of the fat emulsion.

In the human subjects 75 per cent. of the injected fat was removed from the blood by the end of the injection; a further 8 hr. was required to remove the remainder. Patients with glomerular nephritis and dogs with bilateral ureteral ligations removed the fat more slowly from the circulation than did normal groups. Cirrhotic patients and dogs with Eck fistulae showed less elevated blood fat values than corresponding controls. Removal of injected fat was slower in dogs with uncontrolled diabetes than in similar animals treated with insulin.—G. A. Garton.

804

LEWIS, G. T. and PARTIN, H. C. **Fecal fat on an essentially fat-free diet.** *J. Lab. Clin. Med.*, 1954, **44**, 91-93. [Med. Res. Found. Dade County, Miami, Fla.]

Three patients in hospital were given a diet containing daily not more than 25 mg. fatty acids. Faeces were collected daily (from one patient for 2 months) and analysed for total N and total ether-soluble material.

The average daily excretion of ether-soluble lipid was about 2 g. The faecal fat excreted bore no relation to the amount of N excreted. It is considered that the lipid is of endogenous origin, representing excretion by the intestinal mucosa.

G. A. Garton.

805

MAGEE, D. F. **Nature of the decrease in fecal fat resulting from the feeding of protein.** *Amer. J. Physiol.*, 1954, **177**, 285-286. [Dept. Pharmacol., Sch. Med., Univ. Washington, Seattle.]

Groups of rats and dogs were fed on diets rich in protein (gelatine or casein) or on high-carbohydrate diets of similar energy value. Faecal fat was estimated. After 21 days the rats were killed and the lipase activity of dried pancreas was estimated by the method of Archibald (Abst. 3854, Vol. 16).

Faecal fat excretion was less on the high-protein than on the high-carbohydrate diets. The different diets did not produce any great difference in the pancreatic lipase activity of the rats.

G. A. Garton.

806

AAES-JØRGENSEN, E. and DAM, H. **The role of fat in the diet of rats.** 1. Influence of lard, hydrogenated peanut oil and absence of dietary fat on growth, food and fluid consumption and urine production. 2. Influence of dietary fats on growth. 3. Influence of kind and quantity of fat on food and fluid consumption and urine production. 4. Influence of supplementation with raw skim milk, linoleic acid or both on growth. 5. Influence of supplementation with raw skim milk, linoleic acid or both on food and fluid consumption and urine production. *Brit. J. Nutrition*, 1954, **8**, 281-285; 285-289; 290-296; 296-301; 302-306. [Dept. Biochem., Polytech. Inst., Copenhagen.]

1. Weanling male rats were fed to appetite for 14 weeks on diets containing 7 per cent. lard or hydrogenated peanut oil or on a fat-free diet of the same basal composition. They drank water, raw skimmed milk or whey. Food and liquid intakes and urine production were measured and the animals were weighed weekly.

The rats grew significantly better on the diet containing 7 per cent. lard than on hydrogenated peanut oil, irrespective of what they drank. Growth was better, whichever fat was given, when the rats drank raw skimmed milk instead of water. Animals on the fat-free diet grew at the same rate as those on the diet containing hydrogenated peanut oil. Water consumption and urine production were greater when the diet with peanut oil or the fat-free diet was given in place of that with lard.

2. Groups of female weanling rats were given to appetite diets containing 7 per cent. of lard, peanut oil, coconut oil, hydrogenated peanut oil or hydrogenated whale oil. In some experiments the amount of fat in the diet was greater. The animals were weighed weekly for 16 weeks.

Rats grew equally fast on diets containing 7 per cent. lard, peanut oil or coconut oil; growth on hydrogenated fats was considerably slower.

Growth was little affected when the lard content of the diet was increased to 14 or 28 per cent., though similar increases in the dietary content of hydrogenated peanut oil reduced growth considerably. The growth of animals given 28 per cent. hydrogenated peanut oil and 20 per cent. casein was inferior to that of rats on a fat-free diet containing the same amount of casein.

3. This paper reports the food and fluid consumption and the urine output, during the last 13 weeks, of the animals described in the preceding abstract. Water intake was greater and urine output was less on diets containing hydrogenated fat and on fat-free diets than on diets containing lard, peanut oil or coconut oil. Animals fed on the hydrogenated fat or the fat-free diet had the greatest daily energy intake per unit of surface area; they had classical signs of essential fatty acid deficiency, including scaly tails and dry and scaly skin.

4. Weanling female rats, in 24 groups each of 6 animals, were reared for 18 weeks on diets containing 7 or 28 per cent. of lard, peanut oil or hydrogenated peanut oil, with or without linoleic acid, 150 mg. per animal weekly, and raw skimmed milk to drink.

Growth was faster when the lard or peanut oil was raised from 7 to 28 per cent., but slower when the higher level of hydrogenated peanut oil was given. Raw skimmed milk caused significantly faster growth than water in animals given the diets containing 7 or 28 per cent. hydrogenated peanut oil. When these diets were supplemented with linoleic acid growth was faster than that of animals which received the unsupplemented diet with water to drink. The growth-depressing effect of hydrogenated peanut oil was overcome to about the same extent by skimmed milk as by linoleic acid; the effect was most pronounced with 7 per cent. dietary fat. No explanation is offered.

5. The rats and diets used were those described in the preceding abstract; food and fluid intake and urine output were measured during 18 weeks. The ratio of total energy intake (less energy for water evaporation) to average daily weight gain was very high in rats given hydrogenated peanut oil; it was less when raw skimmed milk was given in place of water or when linoleic acid was added to the diet. The faster growth of animals given peanut oil or lard was not due to greater energy intake.—G. A. Garton.

807

SIEDLER, A. J. and SCHWEIGERT, B. S. **Effect of the level of animal fat in the diet on the maintenance, reproduction and lactation performance of dogs.** *J. Nutrition*, 1954, **53**, 187-194. [Div. Biochem. Nutrit., American Meat Inst. Found., Chicago, Ill.]

Groups of Cocker Spaniel bitches were fed on a basal diet "of ingredients commonly used in dry meals" with or without the addition of 4 or 8 per cent. rendered pork fat containing anti-oxidant or 18 per cent. of sucrose, at the expense of the basal ration. The animals in each group were bred to one of 2 dogs for the first litter and to the other dog for the second litter. The food intakes and weight gains of the bitches and their litters, the number of pups born, the number alive 24 hr. after birth and the number weaned were recorded.

Before breeding, the addition of 4 or 8 per cent. fat or 18 per cent. sucrose increased the efficiency of the diet for maintenance. The reproductive performance of the bitches given the diet containing 4 per cent. fat was better than that of the bitches fed on the basal diet. The reproductive capacity of those receiving 8 per cent. fat or 18 per cent. sucrose was poor. The average weight gain of pups from the bitches which had received 4 per cent. fat was greater than that of any other group.

G. A. Garton.

808

MEAD, J. F. and FILLERUP, D. L. **Plasma lipids in fat deficiency.** *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 449-451. [Atomic Energy Project, Sch. Med., Univ. California, Los Angeles.]

Plasma was obtained from 26 male rats fed on a normal diet and from 16 male rats fed for 22 weeks on a fat-deficient diet; 18 of the animals fed on the normal diet were fasted for 12 to 20 hr. before sampling. Plasma lipids were extracted and the components were estimated by chromatography.

Total plasma lipids in fat-deficient rats were considerably less than in rats fed on the adequate diet, whether or not the latter had been starved. In fat deficiency the several classes of plasma lipids, triglycerides, sterols and sterol esters, expressed as percentages of the total, were reduced to about the same extent; the phospholipid fraction showed a relative increase.—G. A. Garton.

809

FRIEDMAN, M., ROSENMAN, R. H. and BYERS, S. O. **The role of exogenous lipids in the hyperlipemia and hypercholesteremia of nephrotic rats.** *J. Clin. Invest.*, 1954, **33**, 1103-1105. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

Nephrosis was induced in rats by intravenous injection of 0.5 ml. rabbit anti-rat kidney serum on each of 2 successive days. Groups of these animals were then fed on a normal diet, a diet devoid of fats and sterols or the normal diet supplemented with 2 per cent. cholesterol and 1 per cent. cholic acid. Blood was obtained 4 and 6 days after the last injection of immune serum for estimation of total plasma cholesterol and total plasma lipids.

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The increased values for total lipids and cholesterol found in the nephrotic rats on normal diet were found also in animals on the fat-free ration; it is suggested that this is due to a diminished rate of elimination from the plasma of lipids of endogenous origin. A greater retention of cholesterol in the plasma was observed in the nephrotic rats on the diet supplemented with cholesterol and cholate.—G. A. Garton.

810

ASADA, S. **Histochemical studies on the intravenously infused fat emulsion.** *Acta Scholae med. Univ. Kioto*, 1954, **31**, 171-192. [2. Surg. Div., Fac. Med., Univ. Kyoto.]

A stable fat emulsion containing 10 to 30 per cent. of cod liver oil and with a lipid ratio of neutral fat 85.5, fatty acid 7.9, lecithin 6.4 and other lipids 0.2 per cent. was administered intravenously to cats, mice and rabbits at 0.5 g. fat (3.3 ml. emulsion) per kg. bodyweight. Animals were killed at intervals after infusion and sections of lung, liver, spleen and kidney were examined for lipids with appropriate stains.

Fat embolism was not seen in any of the species; the fat globules were removed from the bloodstream about 30 min. after infusion. The fat globules in the lung were ingested by phagocytes, in the liver by Kupffer cells and in the spleen by reticulo-endothelial cells. No fat globule was seen in kidney or bile duct epithelium. Several hours after infusion there was extensive leucocytosis; the leucocytes ingested the infused fat globules.

When large quantities of the fat emulsion were administered by mouth or when the emulsion was administered to starved animals the fat in the phagocytes of the organs studied was histologically similar to that observed when standard amounts were administered intravenously. In the cat the infused fat was removed from the circulation more quickly than in the mouse and in the rabbit. When the fat emulsion was infused into rabbits daily for several weeks there was no abnormality except for a small deposit of fat in the reticulo-endothelial cells of the liver and spleen; when methionine was injected into rabbits simultaneously with the fat emulsion there was no accumulation of fat in these reticulo-endothelial cells.

It is concluded that the emulsion is suitable for human clinical use. In a supplement to the paper it is stated that when the emulsion was infused into human subjects before lobectomy or laparotomy no abnormality occurred and fat disposal was similar to that in the animals studied.

G. F. Garton.

811

BECKER, G. H. and GROSSMAN, M. I. (with SMITH, J. R., TAYLOR, R. D., HOLLERMAN, W. A. and DECREASE, W. M.) **Studies on the thermo-**

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genic response to intravenous fat emulsions. *J. Lab. Clin. Med.*, 1954, **43**, 752-758. [U.S. Army Med. Nutrit. Lab., Denver, Colo.]

Fat emulsions were tested by the Standard U.S.P. XIII pyrogen test with rabbits, but their effect was estimated from the highest rise above the control temperature in the 3 hr. after administration.

Reduction of the free fatty acid content of emulsions by treating the maize oil with alumina, ageing them or adding heparin did not affect the response. Autoclaving the emulsion resulted in a higher mean response, though the difference was not statistically significant. Peroxide after autoclaving was almost absent and is thus eliminated as a cause of the fever reaction. With emulsions containing large particles as a result of prolonged shaking there was some fat trapping and several rabbits died with signs of pulmonary embolism, but particle size could not be clearly correlated with fever response. The cause of the response remains obscure.—D. Duncan.

812

BEAUFALLET, M. and MAY, P. **Recherches concernant le rôle physiologique des acides gras polyéniques. 1. Teneur en ces constituants des phosphatides des divers parenchymes chez le jeune rat soumis à un régime normal ou lipidoprive. [Physiological role of polyene fatty acids. 1. Content of these substances in the phosphatides of the different parenchymatous tissues of the young rat normally fed or deprived of fat.]** *Rev. canad. Biol.*, 1953, **12**, 6-18. [Lab. Physiol. Gén., Sorbonne.] English summary.

Rats, the progeny of mothers fed on a complete or a fat-free diet, were maintained on the fat-free diet, consisting of, per cent., fat-free casein 18, glucose 78, and salts 4, with adequate vitamins. The offspring of the mothers deprived of fat had at 3 weeks old only about half the bodyweight of the offspring of the mothers not deprived, and their survival time was inversely related to the number of young in the litter, but never exceeded 60 days. Young rats thus reared on the fat-free diet for 50 days were then killed, and the brain, liver, kidneys, heart and carcass were extracted with alcohol and light petroleum. Phosphoaminolipids were separated by precipitation with acetone and subjected to saponification and isomerisation, which brought about conjugation of the double bonds. They were examined spectrophotometrically, since the dienes, trienes, tetraenes, pentaenes and hexaenes, which are contained in the phosphoaminolipids of the normal young rat, have characteristic maxima of absorption.

In the normal rats all the polyene acids investigated were present in the tissues examined, the

amount of hexaene acid being particularly high in the brain.

In the rats having the fat-free diet, the content of polyenes in the brain was little changed except for the hexaene, of which the amount was about halved. In the heart the amount of triene tended to be increased, of tetraene to be unchanged, and of the remainder to be much decreased. In the other tissues the amount of triene was unchanged and of the remainder was greatly reduced.

E. M. Hume.

813

SCRIBANTE, P. and FAVARGER, P. Étude de la digestibilité de l'acide stearique et de ses esters glycériques chez le rat. [Digestibility of stearic acid and its glyceryl esters by the rat.] *Helv. physiol. pharm. Acta*, 1954, 12, 74-89. [Inst. Chim. Physiol., Univ. Geneva.]

The true and apparent digestibilities of the saturated triglycerides tristearin, tripalmitin, trimyristin and trilaurin and of stearic acid and some of its glyceryl esters were studied with rats. The digestibility of stearic acid depended on the chemical form in which it was ingested; the most readily digestible form found was the monostearate. The excretion of endogenous fat was not constant and increased with a decrease in the coefficient of digestibility of the food fat.—G. A. Garton.

814

RAPPAPORT, A. M., BOROWY, Z. J., LOUGHEED, W. M. and LOTTO, W. N. Subdivision of hexagonal liver lobules into a structural and functional unit. Role in hepatic physiology and pathology. *Anat. Rec.*, 1954, 119, 11-33. [Dept. Physiol., Univ. Toronto.]

A new concept of the smallest structural and functional unit of the liver is described. The unit is not the hexagonal field which is seen histologically, but occupies adjacent fields and extends from one central vein to the next. Difficulties in correlating the distribution of hepatic lesions with the arrangement of hexagonal fields may be explained by reference to this concept of the circulatory pattern.—D. Duncan.

815

HARTROFT, W. S. The trabecular anatomy of late stages of experimental dietary cirrhosis. Its pathogenesis in terms of Rappaport's structural unit. *Anat. Rec.*, 1954, 119, 71-93. [Banting and Best Dept. Med. Res., Univ. Toronto.]

The livers of over 350 rats on several diets low in lipotropic substances were examined. Representative animals were perfused through the left ventricle with Indian ink to show up the circulatory pattern. It was shown that the distribution of fibrous tissue in both early and late cirrhosis is non-portal in a functional sense although geographically

periportal. It can be best comprehended by reference to Rappaport's concept (see preceding Abst.) of the functional structural unit of the liver.

D. Duncan.

816

CLÉMENT, G., CLÉMENT, J. and LE BRETON, E. Recherches sur les déséquilibres entre les constituants lipidiques des structures cellulaires au cours de l'installation de l'hépatome expérimental du rat. 2. Étude du foie de rat ayant ingéré un régime équilibré additionné de cholestérol. [Disequilibrium in the lipid constituents of cell structures during the establishment of experimental hepatoma in the rat. 2. Study of the liver of the rat on a balanced diet with additional cholesterol.] *Arch. Sci. physiol.*, 1954, 8, 259-277. [Dept. Physiol., Inst. Recherches Cancer Gustave Roussy, C.N.R.S., Univ. Paris.]

Male rats were fed for from 15 to 24 months on an adequate diet containing 5 per cent. amorphous cholesterol. Their livers were examined histologically at the end of the experiment and also analysed for total fat. The microsomes, mitochondria and other cell fractions were separated in 30 per cent. sucrose solution and analysed for glycerides, cholesterol esters, phospholipins and unsaponifiable matter.

The fatty livers contained "free" lipid which consisted mainly of cholesterol esters, glycerides and a fraction of the unsaponifiable matter. An increase of hepatic parenchyma occurred.

G. A. Garton.

817

RAULIN, J. Rôle de la nature des lipides alimentaires dans l'action des surcharges de cholestérol sur divers organes et notamment sur le foie et les réserves grasses abdominales du rat blanc. [The effect of the nature of food lipids on the action of excess cholesterol on various organs, notably on the liver and abdominal fat reserves in the white rat.] *Arch. Sci. physiol.*, 1954, 8, 195-225. [Lab. Biochim. Nutrit., C.N.R.S., Bellevue, Seine-et-Oise.]

Fatty livers induced in rats by diets containing cholesterol and free unsaturated fatty acids were characterised by their high content of cholesteryl esters. Less cholesteryl ester was present in the livers when the diet included choline also. The deposition of abdominal fat was inhibited when the animals were given diets containing excess cholesterol with free unsaturated fatty acids.

G. A. Garton.

818

HARPER, A. E., BENTON, D. A., WINJE, M. E. and ELVEHJEM, C. A. On the lipotropic action of protein. *J. Biol. Chem.*, 1954, 209, 171-177. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Rats were fed for 2 weeks after weaning on low-protein diets supplemented with different amounts of choline, methionine and protein. They were then killed and total liver lipids were estimated by ether extraction of the dried and ground tissue.

Neither choline nor methionine, in amounts satisfactory for normal growth, prevented the accumulation of some excess fat in the liver. Liver fat values were reduced to what is considered the normal range only when extra protein or threonine was added to the basal diet.

It is concluded that dietary protein exerts two distinct effects on deposition of liver fat; first, the well-established effect of methionine in sparing choline, and second, the provision of certain amino-acids (e.g., threonine), deficiencies of which cause fat to accumulate in the liver.—G. A. Garton.

819

HARPER, A. E., BENTON, D. A., WINJE, M. E., MONSON, W. J. and ELVEHJEM, C. A. **Effect of threonine on fat deposition in the livers of mature rats.** *J. Biol. Chem.*, 1954, **209**, 165-170. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Groups of rats were fed for several weeks on a basal diet consisting of sucrose 81.4, casein 9.0, maize oil 5.0, salts 4.0, methionine 0.3, tryptophan 0.1 and choline chloride 0.15 per cent. and adequate vitamin supplements; alterations in this diet were compensated by alterations in the amount of sucrose. Animals were killed at intervals for estimation of liver lipids and their cholesterol and P content.

The amount of liver fat in rats fed to appetite on the basal diet for 10 weeks after weaning decreased gradually as the animals matured and their protein requirement decreased. Fat accumulated in the livers of mature rats fed on the basal diet containing 5 per cent. protein, but fat deposition was less when supplementary threonine or glycine also was included in the diet.

G. A. Garton.

820

HARTMANN, F. and NICKEL, A. **Vergleichende Untersuchungen über die lipotrope Wirkung von Cholin und Methionin sowie einiger ihrer Verbindungen an der CCl₄-vergifteten Ratte.** [Comparative studies of the lipotropic action of choline and methionine and of some of their compounds on rats poisoned with carbon tetrachloride.] *Arch. exp. Pathol. Pharmacol.*, 1954, **222**, 518-522. [Med. Klin., Univ. Göttingen.]

Comparative estimations were made of the lipotropic effect of choline, methionine and 3 derivatives in lowering the content of total lipids and neutral fats in the liver of rats poisoned with CCl₄. All the substances tested had a lipotropic action,

but the best effect was given by a combination of choline and methionine, and by the choline salt of guanil urea sulphonic acid. The lipotropic effect of methionine and choline was enhanced in derivatives which increased the utilisation of CH₃-groups for phosphatide synthesis.—M. B. Richards.

821

BENDANDI, A. and MANFREDI, G. C. **Variazioni dei gruppi sulfidrilici epatici in corso di terapia lipotropa.** [Variations in sulphydryl groups in the liver in the course of lipotropic treatment.] *Arch. internat. Pharmacodyn.*, 1954, **98**, 152-160. [Ist. Clin. Med., Univ. Modena.]

Literature on the different behaviour of lipotropic agents on fatty liver characterised chemically by the presence of triglycerides and on cholesterol fatty liver is briefly discussed. Experiments were made on 135 male albino rats of weight between 150 and 200 g. Fatty liver was induced by subtotal removal of the liver; by giving CCl₄; by giving a diet with 40 per cent. fat of low iodine number and only 7 per cent. of milk protein for 16 days. The lipotropic substances tested were: methionine, 100 mg. daily by intramuscular injection; choline chloride, 25 mg. daily by the same route; inositol, 60 mg. daily by the same route; lipotropic substance from the pancreas, which was added to the high-fat, low-protein diet, or to a diet with 15 per cent. casein and 20 per cent. oil and given to rats from which part of the liver had been removed, or rats given CCl₄. At the end of the experiments the rats were killed by bleeding. SH groups in liver were estimated by the nitroprusside method of Fujita and Numata (*Abst. 25*, Vol. 9) in the modification of Leaf and Neuberger (*Abst. 2100*, Vol. 17).

Each of the lipotropic agents reduced liver fat. Choline and inositol had less effect on fat accumulating after removal of part of the liver; methionine was most and pancreatic extract least effective in CCl₄ poisoning. Each of the lipotropic agents increased SH groups in liver, which were greatly reduced in dietary fatty liver and below normal in CCl₄ poisoning. With and without lipotropic supplement, SH groups were well above normal in the stump of the liver.—I. Leitch.

822

WILGRAM, G. F., HARTROFT, W. S. and BEST, C. H. **Dietary choline and the maintenance of the cardiovascular system in rats.** *Brit. Med. J.*, 1954, ii, 1-5. [Banting and Best Dept. Med. Res., Univ. Toronto.]

In all, 421 rats, weighing initially from 70 to 120 g., were used, and experiments lasted for from 12 to 60 days. Five basal choline-deficient diets contained different amounts of protein and

methionine, and one containing 35 per cent. ethyl laurate was semi-liquid. The tissues of all rats were examined when they died or were killed.

The ethyl laurate diets produced cardiac necrosis, which was prevented by a choline supplement. Stainable fat droplets appeared in the heart muscle before necrosis developed. Several synthetic triglycerides, triacprolin, triacprilin, trilaurin, trimyristin and tripalmitin, also produced cardiac damage when given at 25 or 40 per cent. in choline-deficient diets. On a fat-free diet 2 of 13 choline-deficient rats developed cardiac necrosis and 4 succumbed to haemorrhagic kidney lesions, indicating that omission of fat reduced the severity of the deficiency. Beef fat and lard produced more severe changes than maize oil or coconut oil.

Cardiac lesions occurred in 25 rats in the absence of kidney damage, but never in the absence of fatty liver. It is suggested that lipotropic substances may be necessary not only for the liver, but also for the maintenance of normal cardiovascular and renal systems in rats.—D. Duncan.

823

PAGE, I. H. *Atherosclerosis. An introduction.* *Circulation*, 1954, 10, 1-27. [Res. Div., Cleveland Clin. Found., Ohio.]

Report of the Lewis A. Connor Memorial Lecture.

824

SINAPUS, D. Zur Ätiologie und Pathogenese der Atherosklerose. [Etiology and pathogenesis of atherosclerosis.] *Deutsch. med. Wochenschr.*, 1954, 79, 1135-1139. [Pathol. Inst., Städt. Krankenanst., Wiesbaden.]

A review.

825

SPAIN, D. M., BRADESS, V. A. and GREENBLATT, I. J. Post-mortem studies on coronary atherosclerosis and serum beta lipoproteins. *Amer. J. Pathol.*, 1954, 30, 638. *Proc.* [Beth-El Hosp., Brooklyn, N.Y.]

826

GOFMAN, J. W., GLAZIER, F., TAMPLIN, A., SPERISOWER, B. and DE LALLA, O. Lipoproteins, coronary heart disease, and atherosclerosis. *Physiol. Rev.*, 1954, 34, 589-607. [Donner Lab., Div. Med. Phys., Dept. Phys., Univ. California, Berkeley.]

827

SIMARRO-PUIG, J. Arteriosclerosis cerebral, colesternemia y tratamiento tiroideo. Estudio estadístico de nuestra casuística personal. [Cerebral arteriosclerosis, blood cholesterol and thyroid treatment. Statistical study of our own experience.] *Rev. clín. española*, 1954,

52, 36-40. [Inst. Neurol. Municip., Barcelona.] English and German summaries.

828

CAMELIN, A., RAMEL, P., SCLÉAR, F. and MINDUS, A. Hyperlipidémie provoquée et athérosclérose. [Deliberately produced high blood fat and atherosclerosis.] *Presse méd.*, 1954, 62, 1124-1125. [Serv. Méd., Hôp. Militaire Desgenettes, Lyons.]

A plasma lipid tolerance test for man has been developed. The level of blood lipids was studied before and 5 hr. after a meal containing about 70 g. each of fat, protein and carbohydrate.

In healthy subjects the difference between the pre- and post-prandial levels was less than 2 g. per cent.; in atherosclerotic patients it was 3 to 6 g. per cent., in arteriosclerotic diabetics 2 to 5 g. per cent., and in arteriosclerosis without diabetes 2.5 to 3 g. per cent. A normal rise in blood fat was observed in healthy obese subjects and in diabetics free from degenerative complications.

It is suggested that the method will be of use in studying the effect of therapeutic procedures in atherosclerotic and arteriosclerotic conditions.

G. A. Garton.

829

GOLDBLOOM, A. A., EIBER, H. B. and BOYD, L. J. Clinical studies in blood lipid metabolism. 9. Effect of lipotropic agents on serum lipid partitions in fifty patients with generalized atherosclerosis: a three year study. *Amer. J. Digest. Dis.*, 1954, 21, 152-157. [Med. Serv., New York Med. Coll., Flower and Fifth Avenue Hosps., N.Y.]

A diet low in fat and cholesterol was taken for 36 months by 50 hospital patients with general atherosclerosis and chronic coronary artery disease; 25 of these patients took 9 to 12 capsules daily of a lipotropic preparation containing, per capsule, choline dihydrogen citrate 2.5 g., dl-methionine 1.0 g., inositol 0.75 g., vitamin B₁₂ 18 µg. and liver concentrate and desiccated liver 0.78 g. Serum cholesterol, phospholipins, total lipids and neutral fat were estimated at the beginning of the experiment and thereafter at intervals of 6 months.

Except for a slight fall in the serum cholesterol values of all patients, attributable to the nature of the diet, no significant difference was found in any of the other lipid fractions; no clinical liver damage was occasioned, as judged by liver function tests.—G. A. Garton.

830

REINIS, Z. and HRABÁNEJ, J. Lipoproteiny v krvi u experimentální atheromatosis. [Blood lipoproteins in experimental atheroma.] *Čas. Lék. čes.*, 1954, 93, 497-502. [4. Int. Clin.] Russian and English summaries.

Rabbits were given cholesterol for 12 months and blood cholesterol and lipoproteins were estimated regularly by electrophoresis. Both values rose steadily. Injection of horse serum into the rabbits prevented the cholesterol-lipoprotein complex from being formed, so that the excess of cholesterol accumulated in the blood but the lipoproteins did not increase. (From summary.)

E. M. Hume.

831

FELCH, W. C., DOTTI, L. B., REISSNER, D. J. and KEATING, J. H. The time factor in atherosclerosis. *J. Lab. Clin. Med.*, 1954, 43, 914-917. [Dept. Med., St. Luke's Hosp., New York.]

Four groups each consisting of 6 rabbits were fed on a diet containing 6 g. cholesterol and 6 g. salad oil per head daily. The groups were killed after 5, 11, 18 and 25 days, before which blood samples were taken for estimation of total and ester cholesterol and lipid P. The aortas were examined for the presence of atherosclerotic lesions, which were found as early as 11 days.

Serum obtained from rabbits fed on the high-cholesterol diet was injected intravenously into normal animals. Traces of possible atherosclerotic lesions developed within 24 to 48 hr. Repeated daily injections of such serum into normal rabbits produced definite slight lesions after 4 and gross lesions after 30 injections.

It is suggested that a transient abnormality in serum lipids may lead in the end to clinical atherosclerosis.—G. A. Garton.

832

KRITCHEVSKY, D., MOYER, A. W., TESAR, W. C., LOGAN, J. B., BROWN, R. A., DAVIES, M. C. and COX, H. R. Effect of cholesterol vehicle in experimental atherosclerosis. *Amer. J. Physiol.*, 1954, 178, 30-32. [Viral and Rickettsial Res. Sect., Lederle Labs. Div., American Cyanamid Co., Pearl River, N.Y.]

Groups of rabbits were fed for 2 months on chow supplemented with 3 per cent. cholesterol, 3 per cent. cholesterol and 9 per cent. maize oil or 3 per cent. cholesterol and 9 per cent. hydrogenated vegetable oil. Total cholesterol and lipoproteins were estimated at the beginning and end of the experiment. The aortas were examined for atherosclerotic lesions and the livers were analysed for total non-saponifiable matter and cholesterol.

The atheromatous lesions were greatest in the groups given the cholesterol supplement alone or with hydrogenated vegetable oil; the lesions were less severe in animals given cholesterol with maize oil. The serum cholesterol and S₁ lipoproteins were increased to a greater extent on the diets containing both fat and cholesterol than on the diet with cholesterol only. Liver cholesterol and

total unsaponifiable matter were increased to the greatest extent on the diet containing maize oil and cholesterol, though the values found after cholesterol with hydrogenated vegetable oil were greater than those observed when the basal diet was supplemented with cholesterol only.

G. A. Garton.

833

KRITCHEVSKY, D., MOYER, A. W., TESAR, W. C., LOGAN, J. B., BROWN, R. A. and RICHMOND, G. Squalene feeding in experimental atherosclerosis. *Circulation Res.*, 1954, 2, 340-343. [Lederle Labs. Div., American Cyanamid Co., Pearl River, N.Y.]

The role of endogenous cholesterol in the production of atherosclerosis was studied by giving squalene, said to be an immediate precursor of cholesterol, to rabbits. One group was given 3 per cent. squalene for 7 weeks, another for 14 weeks. A third group was given 3 per cent. cholesterol and a fourth 3 per cent. cholesterol and 3 per cent. squalene for 7 weeks. The supplements were given in maize oil. A fifth group of control rabbits had the same basal diet but no supplement.

At the beginning and end of the experiment serum was examined by ultracentrifuge for β -lipoproteins. All animals were killed at the end of the experiment; livers were weighed and analysed for total non-saponifiable material and cholesterol and aortas were inspected for atherosclerotic lesions.

Seven weeks of squalene feeding caused an increase in total non-saponifiable material in liver and 14 weeks of squalene produced also increases in liver cholesterol and serum lipoproteins, but these increases were small compared to those produced by cholesterol with or without squalene. The addition of squalene to the cholesterol supplement did not lessen the severity of the induced atherosclerosis, and squalene alone did not produce appreciably more atherosclerosis than was seen in the control group.—F. C. Aitken.

834

MOSES, C. Effect of oral inositol phosphatide on development of experimental atherosclerosis. *Geriatrics*, 1954, 9, 325-326. [Addison H. Gibson Lab., Univ. Pittsburgh, Pa.]

Administration by stomach tube of 100 ml. of a 2 per cent. solution of inositol phosphatide 3 times a week for 4, 8 or 12 weeks to male rabbits receiving a high-cholesterol diet did not decrease the incidence of atherosclerosis and had no effect on weight gain, serum cholesterol partition, cholesterol:lipid P ratio, urea N, total serum protein or haematocrit.—F. C. Aitken.

835

- SIMMS, H. S., HARMISON, C. R. and BEST, R. B. Cholesterol and antilipofagin in arteriosclerosis. *J. Gerontol.*, 1954, 9, 133-141. [Dept. Pathol., Coll. Phys. Surg., New York.]

836

- ADLERSBERG, D., SCHAEFER, L. E. and WANG, C. I. Adrenal cortex, lipid metabolism and atherosclerosis: experimental studies in the rabbit. *Science*, 1954, 120, 319-320. [Dept. Med., Mount Sinai Hosp., New York 29.]

Groups of rabbits, fed on Purina chow, were treated with cortisone acetate, hydrocortisone acetate or corticotropin. Fractionation and estimation of plasma lipids revealed high total and ester cholesterol, phospholipins and neutral fat, especially the latter.

Other groups of rabbits, fed on high-cholesterol diets, were similarly treated with cortisone or hydrocortisone and showed an increase of all plasma lipid values greater than those observed when cholesterol alone was given; when corticosteroid treatment ceased the plasma lipid levels fell to those characteristic of high cholesterol intake alone. No significant additional increase of plasma lipid values was found when corticotropin was administered to cholesterol-fed rabbits.

G. A. Garton.

837

- BALAGUER-VINTRÓ, J. La aterosclerosis inducida por el colesterol y sus mecanismos de inhibición. [Atherosclerosis induced by cholesterol, and inhibitory mechanisms.] *Rev. española Fisiol.*, 1954, 10, 1-8. [Esc. Cardioangiol., Univ. Barcelona.] English summary.

A study was made of atherosclerosis in chicks when 4 per cent. cholesterol was added to their diet for 12 weeks from 1 month old. The effects of methionine, inositol and KI were also studied.

The degree of atherosclerosis of the thoracic aorta was greatest in the group receiving cholesterol only. In general both frequency and intensity of the lesions were less in the groups receiving one of the other substances in addition to cholesterol, although in all groups at least one animal showed lesions of maximum intensity. There was an inverse relation between the intensity of the affection and the total blood cholesterol. In the control group blood cholesterol average was on the average 130 and in the cholesterol group 360 mg. per cent., but the KI group, in which the intensity of the lesions was least, had a blood cholesterol value of 615 mg. per cent.

M. B. Richards.

838

- BAEDER, D. H., BECKFIELD, W. J. and SEIFTER, J. Effect of aluminium hydroxide gels on experimental hypercholesterolemia and atheroma-

tosis in chicks. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 326-329. [Wyeth Inst. Appl. Biochem., Univ. Pennsylvania, Philadelphia.]

Diets containing cholesterol and 3 per cent. of aluminium hydroxide gels were given to cockerels for 15 weeks; blood cholesterol was estimated at intervals and at the end of the experiment organs were removed, weighed and examined histologically. The aortas were graded according to the degree of atheromatosis.

Aluminium hydroxide gel did not prevent atheromatosis or raised blood cholesterol in these birds, a finding contrary to those of Rodbard *et al.* (*Circulation*, 1950, 2, 479) and Rodbard and Bolene-Williams (*Fed. Proc.*, 1952, 12, 118). Neither inanition nor paralysis resulted from these diets; the blood cholesterol value was proportional to the cholesterol intake. Some birds were given also cortisone acetate or boric acid, but neither influenced the development of arterial lesions.

G. A. Garton.

839

- WILGRAM, G. F., HARTROFT, W. S. and BEST, C. H. Abnormal lipid in coronary arteries and aortic sclerosis in young rats fed a choline-deficient diet. *Science*, 1954, 119, 842-843. [Banting and Best Dept. Med. Res., Univ. Toronto.]

Groups of young male rats were fed for 4 weeks on a low-choline, high-fat diet; control animals received the same diet supplemented with 0.85 per cent. choline chloride. Before the end of the experiment half the animals on the low-choline diet died from acute haemorrhagic renal lesions.

At post-mortem no gross or microscopic abnormality of the cardiovascular system was found in the animals with choline supplements. In the choline-deficient animals, lipid deposits were found in the walls of coronary arteries and aortas; microscopically the aortic lesions consisted of intimal and medial deposits of lipid, often associated with pathological amounts of Ca salts in the media. Wherever fat was demonstrable histologically in the lining endothelial cells they were distended.—G. A. Garton.

840

- McGILL, H. C. and HOLMAN, R. L. Alteration in ground substance in experimental necrotizing endocarditis. *Arch. Pathol.*, 1954, 57, 431-438. [Dept. Pathol., Sch. Med., Louisiana State Univ., New Orleans.]

About 90 per cent. of dogs fed on a high-fat diet rich in butter and with renal insufficiency, produced experimentally by several methods, developed necrotic arterial and endocardial lesions. Renal insufficiency or high-fat diet alone produced no such lesion.

Necrotic lesions of the left auricular endocardium were found in 7 of 11 dogs. Early lesions were

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associated with heavy deposits of acid mucopolysaccharide which disappeared as necrosis progressed. Much smaller quantities of similar material were found in auricular endocardium of apparently normal dogs and in those subjected to renal insufficiency only.—D. Duncan.

841

FIESER, L. F. Quelques aspects de la chimie et de la biochimie du cholestérol. [Some aspects of the chemistry and biochemistry of cholesterol.] *Bull. Soc. chim. France*, 1954, No. 5, 541-547.

842

BEST, M. M., DUNCAN, C. H., VAN LOON, E. J. and WATHEN, J. D. Lowering of serum cholesterol by the administration of a plant sterol. *Circulation*, 1954, 10, 201-206. [Inst. Med. Res., Sch. Med., Univ. Louisville, Ky.]

Of 9 hospital patients in this study 2 had serum cholesterol values within the normal range and were without evidence of cardiovascular or renal disease, the other 7 had high blood cholesterol values and all suffered from some vascular or renal disorder. The patients, on unrestricted diet, were each given 5 to 6 g. β -sitosterol daily immediately before food, for from 13 to 29 weeks; 2 periods of placebo administration were included in the experimental regimen of each. Total serum cholesterol and lipid P were estimated weekly. The lipoproteins of 3 patients were examined in the analytical ultracentrifuge.

After administration of β -sitosterol a significant reduction of total serum cholesterol was accompanied by a lowering of the ratio of serum cholesterol to lipid P; no toxic or unpleasant side effect was found. The ultracentrifuge studies revealed a reduction in the "atherogenic" S₁ 10-100 classes of lipoproteins.

It is considered that β -sitosterol interferes with the absorption of cholesterol, both that of dietary origin and that excreted into the digestive tract.

G. A. Garton.

843

BEHER, W. T. and ANTHONY, W. L. Effect of dihydrocholesterol and soy bean sterols on elevated tissue cholesterol. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 589-590. [Edsel B. Ford Inst. Med. Res., Henry Ford Hosp., Detroit, Mich.]

Mice received to appetite for 2 weeks a fat-free diet supplemented with 1 per cent. cholesterol and 0.5 per cent. cholic acid. They were then divided into 2 groups; the controls received the unsupplemented diet to appetite, and the others were fed on the same diet plus 2 per cent. dihydrocholesterol and 0.5 per cent. cholic acid. Groups of 7 or 8 mice were killed weekly for 4 weeks and

their liver cholesterol was estimated by the method of Beher and Anthony (Abst. 4850, Vol. 24).

Dihydrocholesterol did not increase the rate of mobilisation of liver cholesterol.

In further experiments rabbits were fed to appetite for 2 weeks on a diet of Rockland rabbit chow containing 1 per cent. cholesterol and 8 per cent. maize oil to raise their plasma cholesterol values. They were then divided into 2 groups; the control group was fed on the chow diet containing 8 per cent. maize oil and the other group received the same diet supplemented with 4 per cent. soya bean sterols. Plasma cholesterol values were estimated thereafter every few days.

The rate of fall of plasma cholesterol was not higher in the group receiving soya bean sterols than in the control group.—G. A. Garton.

844

SWELL, L., BOITER, T. A., FIELD, H. (Jr.) and TREADWELL, C. R. Esterification of soybean sterols *in vitro* and their influence on blood cholesterol level. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 295-298. [Veterans Admin. Centre, Martinsburg, W. Va.]

Rats in 6 groups of 8 animals were fed for 7, 14 or 21 days on diets without, or with 0.5, 1, 2, 3 or 4 per cent. soya bean sterols. The basal diet was composed of casein 20, starch 22, glucose 23, olive oil 25, salt mixture 5, Ruffex 2, cholesterol 2 and Na taurocholate 1 per cent., with adequate vitamin supplements; soya bean sterols were added at the expense of starch and glucose. Blood samples were taken for cholesterol analysis.

The presence of soya bean sterols in the diet inhibited the increase in blood cholesterol and the degree of inhibition increased as the amount of soya bean sterols increased.

In experiments *in vitro* it was demonstrated that pancreatic cholesterol esterase promoted the esterification of soya bean sterols, though it was slower than esterification of cholesterol.

It is concluded that, *in vivo*, soya bean sterols probably compete with cholesterol for the esterifying enzyme and so impair the absorption of cholesterol.—G. A. Garton.

845

LANDON, E. J. and GREENBERG, D. M. Endogenous cholesterol metabolism in the rat studied with C¹⁴-labeled acetate. *J. Biol. Chem.*, 1954, 209, 493-502. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

Male rats fed on a diet free from cholesterol were injected intraperitoneally with CH₃¹⁴COONa three times at 4-hr. intervals. Some were killed 4 hr. after the last injection and others later. The radioactivity of tissue cholesterol was estimated.

Carrier cholesterol was added for serial estimations of serum radio-activity on a single rat.

Most of the metabolism of cholesterol was evidently confined to liver, intestine and adrenal, which had high rates of turnover, the turnover time of liver being about 40 hr. Skin contained a large quantity of Δ^7 -cholesterol, which may be rapidly exchangeable with cholesterol. With normal animals interruptions in the decline of specific activity occurred in serum, intestine and liver. Rats with a bile fistula or a ligated bile duct did not show this effect, which was caused by secretion of radio-active cholesterol from the bile into the intestine and its re-absorption. All the secretion of radio-active cholesterol into the bile occurred within 6 hr. of the acetate injection.

The radio-activity of cholesterol in the spleen, lung, testis, kidney and adrenal was highest 16 hr. after the last injection of acetate. As at this time significant amounts of radio-active non-steroid precursors were not available for cholesterol formation, the turnover of cholesterol was thought to occur primarily by exchange in the plasma. The turnover time of cholesterol in the adrenals was about the same as that in liver, which supports the theory that adrenal cholesterol is the precursor of steroid hormones.

Castration 72 hr. before injection of acetate resulted in a marked slowing of the turnover of cholesterol in liver and intestine. As its low specific activity excludes the testis as a major site of catabolism, this reduced turnover is apparently effected directly or indirectly by the male sex hormones.—A. Hepburn.

846

BIGGS, M. W., LEMMON, R. M. and PIERCE, F. T. (Jr.) Observations on Δ^7 -cholesterol metabolism in the rabbit. *Arch. Biochem. Biophys.*, 1954, **51**, 155-160. [Radiation Lab., Univ. California, Berkeley.]

Tritium-labelled Δ^7 -cholesterol dissolved in cottonseed oil was given by stomach tube to 2 rabbits in which blood fat had been increased by continuous feeding with cholesterol. Blood samples were taken after 1, 2, 3, 4, 6 and 10 days for estimation of free and total cholesterol and measurement of radio-activity. A third rabbit was similarly treated after having been given tritium-labelled cholesterol by stomach tube.

After administration of radio-active cholesterol, tritium-labelled sterol appeared in the free and total cholesterol pools of the serum in a manner which was qualitatively similar to that found after administration of labelled cholesterol. The conversion of Δ^7 -cholesterol to cholesterol was confirmed by isolation of tritium-labelled cholesterol from the livers of both the animals which had received Δ^7 -cholesterol.—G. A. Garton.

847

LEMMON, R. M., PIERCE, F. T. (Jr.), BIGGS, M. W., PARSONS, M. A. and KRITCHEVSKY, D. The effect of Δ^7 -cholesterol feeding on the cholesterol and lipoproteins of rabbit serum. *Arch. Biochem. Biophys.*, 1954, **51**, 161-169. [Radiation Lab., Univ. California, Berkeley.]

One group of rabbits was fed on a diet containing 1 per cent. cholesterol and Wesson oil, the second group received Δ^7 -cholesterol instead of cholesterol and the third group 1 per cent. of each. Blood samples were taken before these diets were begun and after 1 and 2 weeks for lipoprotein analysis and estimation of serum cholesterol.

The Δ^7 -cholesterol produced a rise in low-density serum lipoproteins and cholesterol which was qualitatively the same as that produced by cholesterol. The 2 sterols together had an additive effect on the levels of serum lipoproteins.

G. A. Garton.

848

MÜLLER, F. Der Ketonkörperstoffwechsel im Hungerzustand und bei chronischer Unterernährung. [Ketone body metabolism in the fasting state and in chronic undernutrition.] *Ztschr. ges. exp. Med.*, 1954, **124**, 72-92. [Med. Klin., Univ. Greifswald.]

The aim was to investigate, with the help of metabolic test feeding, the course of fat combustion, ketogenesis and ketolysis in the fasting state and in chronic undernutrition. Preliminary experiments on healthy non-fasted dogs and human beings, given caproic acid, showed how actively and quickly fats take part in the combustion process, and contradicted the prevalent idea that fats are metabolically inert and burn with difficulty.

When dogs and human subjects were given injections of caproic acid after fasting, there was a striking delay in the fall of blood ketone values after the original rise. This delay could be most easily explained by inhibition of ketolysis. There was, moreover, especially in man, a considerable rise in blood ketone level. Ketogenesis in the liver was apparently not affected, since the high ketone peaks were reached in the same short time after injection as in the non-fasting subject. Inhibition of ketolysis after caproic acid was observed also in dystrophic dogs, although sufficient carbohydrate was provided by the diet. It is therefore concluded that the inhibition is not due to lack of carbohydrate, but is caused mainly by a fall in insulin production and deterioration of the metabolic turnover consequent on general cell damage. Both in complete starvation and in dystrophy the changes observed in fat metabolism were similar to those found in diabetes mellitus.

M. B. Richards.

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849

- CORNATZER, W. E. and GALLO, D. G. Effects of dietary aureomycin and sulfasuxidine on phosphorylation in the liver of rats. *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 15-18. [Med. Sch., Univ. N. Dakota, Grand Forks.]

Young rats weighing initially 100 to 110 g. received a basal low-protein, low-fat diet containing vitamin-free casein 5, dextrin 42, sucrose 42, Crisco 4, cod liver oil 1, salt mixture 4, and Ruffex 2 parts, with a vitamin supplement supplying vitamin B₁, riboflavin, pyridoxine, nicotinic acid, calcium pantothenate, inositol and *p*-aminobenzoic acid. Groups of rats received supplements of aureomycin, 25 mg. daily for 1, 2, 4 or 8 weeks, or

of sulphasuxidine, 5 per cent. for 5 or 7 weeks. At the end of these periods each rat received 2 to 4 μ C. ³²P intraperitoneally and was killed 6 hr. later for study of the liver P distribution.

Although aureomycin increased the growth and food consumption of the rats it had no significant effect on the quantity of liver lipids or on phospholipin or nucleoprotein formation. Sulphasuxidine inhibited growth and decreased food consumption, and the livers of these rats contained less lipid, but formation of phospholipin and nucleoprotein appeared to be increased.—D. Duncan.

See also. Absts. 499, 539, 540, 541, 562, 582, 583, 632, 718, 764, 766, 787, 933, 938, 978, 979.

MINERALS

GENERAL

850

- DAVIS, G. K. and LOOSLI, J. K. Mineral metabolism (animal). *Annu. Rev. Biochem.*, 1954, **23**, 459-480. [Dept. Animal Husb., Univ. Florida, Agric. Exp. Stat., Gainesville.]

851

- ALESSANDRI, H. and GAZMURI, R. Metabolismo hidrosalino. [Metabolism of salt and water.] *Rev. méd. Chile*, 1954, **82**, 165-201. [C&T. Med., Univ. Chile.]

A review.

852

- MCCHENNEY, E. W. Effects of long-term feeding of sulfonic ion exchange resin on the growth and mineral metabolism of rats. *Amer. J. Physiol.*, 1954, **177**, 395-400. [Sterling-Winthrop Res. Inst., Rensselaer, N.Y.]

Adult rats were fed on a stock diet alone or with sulphonic ion resin at 15, 10 or 5 per cent. Growth was restricted in animals receiving 15 per cent. resin and deaths occurred earlier in this group than others. Resin reduced absorption of Na and K and increased absorption of phosphate, but did not affect Ca or Mg. Animals receiving 10 per cent. resin grew and survived normally although the effective Na content of the diet was only 0.02 per cent.—R. Hill.

See also Abst. 667.

CALCIUM AND PHOSPHORUS

853

- WALKER, A. R. P. Does a low intake of calcium retard growth or conduce to stuntedness? *Amer. J. Clin. Nutrit.*, 1954, **2**, 265-271. [Human Biochem. Unit, S. African Inst. Med. Res., Johannesburg.] Spanish summary.

A review.

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854

- KYLE, L. H., SCHAAF, M. and ERDMAN, L. A. The metabolic effects of intravenous administration of calcium. *J. Lab. Clin. Med.*, 1954, **43**, 123-133. [Dept. Med., Sch. Med., Georgetown Univ., Washington, D.C.]

Experiments were made on normal subjects and on hospital patients with or without metabolic bone disease. All had a calculated Ca and P intake for 3 to 5 days before the test. Calcium gluconate was infused in NaCl solution for 3 hr., the total dose of Ca being about 10 mg. per kg. bodyweight or 600 mg. in all.

By the end of the Ca infusion a significant rise of serum P occurred in all control subjects and in those with osteoporosis and osteomalacia. The serum P level was not related to the Ca level or to immediate changes in urinary P excretion. In 2 patients with hypoparathyroidism slight depression of serum P occurred despite the increased serum Ca.

Normal subjects and those with osteomalacia and osteoporosis excreted less P on the day of the infusion than on earlier days, but in parathyroid disturbances P excretion was irregularly affected; one patient with post-operative hypoparathyroidism had increased P excretion, one with idiopathic hypoparathyroidism marked P retention, and in one with hyperparathyroidism due to a tumour, excretion increased slightly.

About 60 per cent. of the injected Ca was retained by normal subjects, more in osteomalacia and hypoparathyroidism.—D. Duncan.

855

- NICHELE, G. Aspetti clinici e patogenetici dell'osteopetrosi. Descrizione di un caso. [Clinical aspects and pathogenesis of osteopetrosis. Description of a case.] *Arch. ital. Pediat.*

Puericult., 1953, 16, 341-371. [Inst. Clin. Pédiat., Univ. Rome.] French, English and German summaries.

856

HANSARD, S. L., COMAR, C. L. and DAVIS, G. K. Effects of age upon the physiological behavior of calcium in cattle. *Amer. J. Physiol.*, 1954, 177, 383-389. [Univ. Tennessee Atomic Energy Commission Agric. Res. Program, Oak Ridge.]

The cattle were 36 Herefords aged from 10 days to 190 months. Each received a single dose of ^{45}Ca by mouth or by vein and was killed after a 7-day balance experiment.

In all animals urinary ^{45}Ca excretion represented less than 0.5 per cent. of the dose. The 2 routes of administration permitted separation of curves for excretion of unabsorbed and endogenous Ca in the faeces. In animals aged 10 days and 1 month all ^{45}Ca given by mouth was absorbed. Excretion of unabsorbed ^{45}Ca was complete after 93 hr. in the animal aged 6 months and the time taken increased with age to 147 hr. The rate of excretion of endogenous ^{45}Ca , whether the dose was given by mouth or by vein, was 3 times as great in old as in young animals.

Equations are presented for the rate of disappearance of ^{45}Ca from the blood, which decreased with advancing age. The rate of exchange of Ca between plasma and tissues in cattle at 10 days, 6 months and 160 months of age was estimated at 102, 72 and 26 per cent. per min., respectively. The peak concentration of ingested ^{45}Ca in the blood was highest and occurred earliest in young calves and generally became lower and later with advancing age.

Age had no effect on the Ca content of soft tissues. Bone Ca content increased up to 18 months of age and then remained constant except in the vertebrae, where it continued to increase until old age. The Ca : P ratio was very constant at 1.94 ± 0.2 and the Ca : ash ratio at 0.38 ± 0.03 .

The tissue distribution of ^{45}Ca at different ages is tabulated. The percentage of exchangeable Ca in bone, calculated from specific activity values, tended to decrease with age.—D. Duncan.

857

MURTHY, G. K., DUSTUR, N. N. and RAY, S. C. Effect of feeding iodinated casein on calcium and phosphorus metabolism in young heifers. *Indian J. Dairy Sci.*, 1954, 7, 93-97. [Indian Dairy Res. Inst., Bangalore.]

In balance trials with Gir and Sindhi heifers iodinated casein given at the rate of 2 g. per 100 lb. bodyweight had no effect on the metabolism of Ca and P except for a slight improvement in absorption of P.—J. N. Attkin.

858

CHARLET-LÉRY, G., FRANÇOIS, A. C. and LEKROY, A. M. Utilisation digestive et rétention par le porc du phosphore et du calcium d'un phosphate naturel defluoré. [Absorption and retention by pigs of phosphorus and calcium from a natural phosphate defluorinated.] *Ann. Zootech.*, 1953, 2, No. 4, 285-301. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

The details are presented of a balance experiment with 3 Large White pigs of approximately 30 kg. liveweight at the beginning. The basal ration was, per cent.: barley 30, manioc 35, oats 10, soya bean cake 5, meal 3, dried butter-milk 4, distillers' yeast 8, linseed cake 2 and alfalfa meal 3. In the first experimental period 1 per cent. pure CaCO_3 was added: in the next 4 periods 3 or 6 per cent. of a mixture of defluorinated phosphate 75, NaCl 15, MgCO_3 6.7, FeSO_4 3, CuSO_4 0.3. There was only 1 period with 6 per cent. and it had to be curtailed because of loss of appetite. The sixth period was without mineral supplement.

Absorption (intake less excretion in faeces) on the basal ration with CaCO_3 was for P 44.0 and for Ca 44.1 per cent.; and with the 3 per cent. supplement, roughly 33 per cent. of each. Corresponding retentions, as percentage of intake, were roughly P 43, Ca 40 and with the supplement 28 and 30. With a mean liveweight of 44.8 kg. and a mean rate of gain of 446 g. daily, the average retentions were 3.35 g. P and 7.06 g. Ca [reversed in para. 4° of summary], with a ratio of approximately 2 Ca : 1 P.—I. Leitch.

859

SHIRLEY, R. L., DRIGGERS, J. C., FEASTER, J. P. McCALL, J. T. and DAVIS, G. K. Effects of massive doses of P^{32} and Ca^{45} on laying hens. *Poultry Sci.*, 1954, 33, 612-615. [Dept. Animal Husb., Univ. Florida Agric. Exp. Stat., Gainesville.]

Year-old hens weighing 1500 to 1600 g. were given a complete laying ration. Two were injected with a total of 20.4 and 19.4 mC. ^{32}P , respectively, during 6 or 7 months; 2 other hens received a total of 32.5 and 30.5 mC. ^{45}Ca in the same time. No ill effect was observed in the next 2 years in the hens which received ^{45}Ca . The hens receiving the ^{32}P lost 200 g. liveweight, and died 11 and 12 days after the last and largest dose. When they died, 95 per cent. of the activity of the ^{32}P given had been expended. Post-mortem examination revealed haemorrhages in the heart, ovaries and magnum, necrotic right lobe of the liver, the presence of an abnormal green substance in the small intestine and blood in the caeca. There was no abnormality of bone, but a large concentration of the isotope was found there with no

apparent stratification. The blood of the hens given ^{32}P contained no monocytes or neutrophils during the 3 weeks before death and only occasional eosinophils and basophils. There was no effect on total red and white cell counts. Of the ^{32}P administered 43 per cent. was excreted within 10 days, but only 0.5 per cent. of the ^{45}Ca . Only 0.6 per cent. of the injected ^{32}P appeared in the eggs, and 14.5 per cent. of the injected ^{45}Ca . The bones contained 4 to 10 times as much ^{32}P as the soft tissues, the highest concentration being in the pubis, ilium and ischium.—M. J. Head.

860

DEVADATTA, S. C. and APPANNA, T. C. Availability of calcium in some of the leafy vegetables. *Proc. Indian Acad. Sci. [B]*, 1954, **39**, 236-242. [Christian Med. Coll., Vellore.]

Six groups of 4 to 6 rats were reared on a stock diet consisting of 2/3 whole wheat, 1/2 [1/3] whole milk powder, vegetables and supplements of vitamins A and D. At 28 days of age 1 group received a control diet of whole wheat 65, butterfat 10, skimmed milk powder 22, salt mixture 5 and maize starch 3 parts; the other 5 groups were given diets in which half the skimmed milk powder was replaced by ground dried leafy vegetables sufficient to provide the same amount of Ca as in the milk diet, the difference in weight being made up with maize starch. The 5 leafy vegetables used were Avati Keerai (*Sesbania grandiflora*), Mola Keerai (*Amaranthus gangeticus*), Chiru Keerai (*Amaranthus spinosus*), Karuvepilai (*Murraya koenigii*) and Murunga Keerai (*Moringa oleifera*). At 60 days of age the rats were killed and their carcasses were analysed for Ca.

The carcasses of the rats on the control diet and diets containing the dried vegetables contained, respectively, 0.764, 0.820, 0.787, 0.807, 0.906, and 0.810 per cent. of Ca. Availability of Ca, calculated from the ratio of Ca retention to Ca intake, was for the 6 diets, respectively, 0.85, 0.74, 0.78, 0.79, 0.54 and 0.69. Only the Ca of Karuvepilai was utilised by the rat significantly less well than that of milk; the Ca in the other 4 vegetables was utilised almost as well as that of milk. All 5 vegetables were good sources of Ca.—G. F. Garton.

861

GREIG, W. A. Anaemigenic and lipogenic actions of dietary calcium carbonate. *Proc. Nutrition Soc.*, 1954, **13**, iii-iv. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

862

TAYLOR, T. G., MOORE, J. H. and TOMLIN, D. H. Exchange of bone calcium and phosphorus *in vivo*. *Nature*, 1954, **173**, 1137-1138. [Dept. Agric. Chem., Univ. Reading.]

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Four laying pullets 8 months of age received a diet low in Ca; birds 1 and 2 laid 6 eggs and were estimated to have lost 38 per cent. of their skeletal Ca, birds 5 and 7 laid 2 eggs each and lost 15 and 17 per cent. Birds 3 and 8 received a ration high in Ca and were killed after laying 3 eggs. All the diets contained ^{45}Ca and ^{32}P . The specific activities of the elements were compared in cortical and medullary bone, since the latter undergoes rapid destruction and formation and is thus a suitable standard against which the activity of cortical bone may be judged.

There was a pronounced reciprocal relation between the exchange figures obtained for the 2 elements, and the figures were similar in magnitude to those obtained in an earlier study with young rats (Abst. 814, Vol. 24), so it is considered that "incorporation of tracers into bone minerals by exchange does not occur to such an extent as to preclude their use in studies of bone growth."

D. Duncan.

863

KAPLANSKII, S. YA., ZAMYATKINA, O. G. and KHESIN, R. V. K voprosu o vliyaniy belkovoi nedostatochnosti na skorost' obmena fosfornykh soedinenii v organizme zhivotnykh. [The effect of protein insufficiency on the rate of metabolism of phosphorus compounds in the animal organism.] *Biokhimiya*, 1953, **18**, 552-558.

Rats, on a diet containing 3 per cent. protein, were injected subcutaneously with dibasic sodium phosphate (^{32}P) after they had lost from 25 to 30 per cent. of their weight. Three hours later they were killed and tissues were analysed for ^{32}P and compared with those from control animals. Blood volume was estimated in one group by the dye method, and in another by injection of radio-active red cells.

In normal rats, blood volumes expressed as percentage of bodyweight were similar by both methods. In the protein-deficient animals the figure by the dye method was higher, but that by the red cell method was normal.

In deficient animals P uptake by the bones was much reduced, giving a higher blood level of ^{32}P than in controls, and hence a higher rate of uptake by other tissues. In animals returned to full diet after protein depletion, normal figures were again obtained.—D. W. Taylor.

See also Absts. 344, 367, 368, 508, 673, 745, 759, 786, 870, 880, 914, 985, 988.

MAGNESIUM

864

BREIREM, K., ENDER, F., HALSE, K. and SLAGSVOLD, L. (with NØRE, E., BØLSTAD, E., ULVESLI, O., SOLVANG, R., SØRVOLL, S.,

ROALKVAM, R. and FOSSEN, N.) Forsøk over hypomagneseemi og ketosis hos melkekyr. [Low blood magnesium and ketosis in dairy cows.] *Meld. Norges Landbrukshøgsk.*, 1954, 34, 373-479. English summary. See Abst. 2980, Vol. 19.

SODIUM, POTASSIUM, AND SODIUM CHLORIDE

865

WILSON, G. M., OLNEY, J. M., BROOKS, L., MYRDEN, J. A., BALL, M. R. and MOORE, F. D. Body sodium and potassium. 2. A comparison of metabolic balance and isotope dilution methods of study.

MOORE, F. D., EDELMAN, I. S., OLNEY, J. M., JAMES, A. H., BROOKS, L. and WILSON, G. M. 3. Inter-related trends in alimentary, renal and cardiovascular disease; lack of correlation between body stores and plasma concentration. *Metabolism*, 1954, 3, 324-333; 334-350. [Surg. Res. Lab., Peter Bent Brigham Hosp., Boston, Mass.]

For part 1 see Abst. 202, Vol. 25.

2. Studies were made on 16 subjects, 1 a normal student and the others patients with fractures (2), burns (1), duodenal ulcer (2), carcinoma (5), mitral stenosis (3), stricture of the common duct (1) and Cushing's syndrome (1). Na intake in a normal adult man is about 150 m. equiv. and K intake about 100 m. equiv. daily. Balance changes of that magnitude occur only after surgical interventions. Total body exchangeable Na and K are of the order of 2800 to 3000 m. equiv.

In all there were 27 paired records of Na exchange and balance, giving 17 comparisons in 10 patients. For K there were 35 paired records, giving 22 comparisons in 13 subjects. Agreement was within 125 m. equiv. a week in 33 of the 39 comparisons. The exceptions are discussed in detail. For both Na and K the balance technique tended to show greater retention or smaller loss than the isotope dilution method. The mean differences were not significant.

The chief disadvantage of the balance technique is that systematic errors are cumulative and the technique is subject to such errors from errors in food analysis or measurement of intake or output or analysis of excreta. In practice it has been found that balances of K tend to be slightly positive continuously, even in adults. On the other hand, isotope measurements have a random error that is not cumulative. The balance method is more sensitive for small changes; the isotope dilution method is much more reliable for serial measurements and gives a measure also of total body composition. Exchangeable Na excludes about 55 per cent. of the Na in bone, exchangeable K is about 95 per cent. of the total in the body.

3. When estimates of exchangeable Na and K

are combined with measurements of body water with deuterium, "total exchangeable hydrogen", and changes in bodyweight, light is thrown on "deficiencies" and their diagnosis. Tables summarise normal values of exchangeable Na and K in men and women, values found in obese subjects and subjects with disorders of the alimentary tract, renal failure, mitral stenosis or hypertension with and without oedema. The main findings are as follows:

The normal woman has less exchangeable K than the normal man because she has more fat and less muscle; the same is true of the obese. Chronic disease of the alimentary system with wasting gives the results to be expected from loss of fat, loss of muscle or both. Severe restriction of Na intake reduces blood pressure but, in a small group of subjects with severe hypertension, total exchangeable Na was within normal limits and changes in blood pressure showed no relation to change in total exchangeable Na. In oedema, exchangeable Na is greatly increased and K is reduced in consequence of muscle wasting. There was no correlation between serum values for Na and K and total exchangeable amounts in the body; they varied independently and sometimes inversely.—I. Leitch.

866

BERGSTROM, W. H. and WALLACE, W. M. Bone as a sodium and potassium reservoir. *J. Clin. Invest.*, 1954, 33, 867-873. [Dept. Paediat., Harvard Med. Sch., Boston, Mass.]

Acute sodium depletion and acidosis were induced in rats by intraperitoneal dialysis. A solution containing glucose and ammonium chloride was injected intraperitoneally and 4 hr. later as much peritoneal fluid as possible was withdrawn. The animals were killed 48 hr. after the injection and the long bones were removed for analysis.

The quantities of Ca, Na, and K present in treated adult rats were 7800, 119 and 10 m. equiv. per kg. bone, respectively, and in controls 8000, 173 and 30. In young rats, about 100 g. live-weight, the relative loss of each element was about 20 per cent. of that originally present.

The effect of severe dietary Na restriction on the composition of bone in rapidly growing rats was also studied. The Ca concentration was not affected, but that of Na was half that in controls and that of K even less.—R. Hill.

867

BULL, J. P. and ENGLAND, N. W. J. Fluid and electrolyte exchange in patients with burns. *Lancet*, 1954, 267, 9-17. [Med. Res. Comm. Indust. Injuries, Birmingham Accident Hosp.] The subjects were 33 patients aged from 13

N.A. and R., January 1955

months to 82 years with burns involving 12 to 69 per cent. of the body surface. All were undergoing routine treatment. Retention of Na and water usually occurred during the first few days. Older patients showed a greater tendency than younger to retain fluid. The volume of urine produced in the first 48 hr. was influenced by intake of non-colloid fluid, but in patients with large burns the large amount of non-colloid fluid required to increase urine output may be clinically undesirable. Moderately negative K balances, noted in the first few days, were readily corrected by increased intake. There was no sustained anuria and no indication of tubular lesion.

F. C. Aitken.

868

TATUM, H. J. **Compartmental distribution and shift of water and electrolytes in pre-eclampsia. 1. Distribution of electrolytes in the serum and edema fluid.** *Amer. J. Obstet. Gynecol.*, 1954, **67**, 1197-1201. [Dept. Obstet. Gynaecol., Sch. Med., Louisiana State Univ., New Orleans.]

Na, K and chloride were estimated in serum from 44 patients with pre-eclampsia and 36 controls, and in oedema fluid obtained from pre-tibial subcutaneous tissue from 39 oedematous patients, of whom 31 were considered to have pre-eclampsia. All were in the last third of pregnancy. The mean level of serum Na in the pre-eclamptics was 137.5 m. equiv. per litre, range 116.4 to 149.8, and in the normal controls 142.3, range 136.7 to 146.9. The difference is highly significant. A significant reduction of serum chloride levels was also found in pre-eclampsia. Serum K levels were unaffected. In pre-eclampsia the Na content of oedema fluid was higher than that of serum, the average difference being 2.05 m. equiv. per litre; in the controls it was lower, difference 0.58 m. equiv. per litre. In both groups K levels were lower in oedema fluid than in serum, and chloride levels were higher. These findings add to the evidence that Na retention in pre-eclampsia is accompanied by withdrawal of Na from the serum to the tissue fluid, and that shifts of Na and chloride are not reciprocal. The data do not point to any great disturbance of K metabolism in pre-eclampsia.—A. M. Thomson.

869

SCHLEGEL, J. U. **Return of sodium loads in normal subjects following restricted sodium intake.** *Surgery*, 1954, **35**, 848-856. [Sch. Med. Dent., Univ. Rochester, N.Y.]

The proportion returned of an Na load given by mouth to subjects previously on a low-Na diet showed a gradual drop, increasing with the length of time they had been on low Na intake. The return, which might be down to about 20 per cent.

after only 2 days of Na-deficient diet, was independent of the magnitude of the Na load and of the total Na loss in the urine before the load was given. Two days of starvation were sufficient to reduce the return of an Na load to 25 per cent. of the normal.

The results indicate the undesirability of restricting the Na intake of a patient pre-operatively for any length of time, since this may aggravate post-operative salt retention. It is suggested rather that the patient pre-operatively should get adequate amounts of Na as well as of K, since this may prevent any extensive drop in serum Na induced by the stress.—M. B. Richards.

870

FOURMAN, P. **Experimental observations on the tetany of potassium deficiency.** *Lancet*, 1954, **267**, 525-528. [Dept. Exp. Med., Med. Res. Council, Univ. Cambridge.]

Mild tetany was observed in 2 men who had been depleted of K by administration of resin. Data on plasma electrolytes and balances of Ca, K and Na are presented and discussed in relation to the cause of the tetany. See also Abst. 3390, Vol. 24. F. C. Aitken.

871

CHAKRAVARTI, H. S. **Abnormal potassium metabolism in clinical practice.** *Calcutta Med. J.*, 1954, **51**, 130-137. [Clin. Res. Unit, Indian Council Med. Res., Sch. Trop. Med., Calcutta.]

872

HANSEN, J. D. L. and BROCK, J. F. **Potassium deficiency in the pathogenesis of nutritional oedema in infants.** *Lancet*, 1954, **267**, 477. [Dept. Med., Univ. Cape Town, S. Africa.]

Six infants with nutritional oedema associated with incorrect post-weaning feeding and diarrhoea were the subjects of Na, K, Cl and N balance studies. Some of the infants apparently had kwashiorkor. All had low blood albumin and were treated with skimmed milk preparations.

From the start of treatment there was retention of K and N in the ratio of 9:1 for the first 3 days and thereafter of 3.5:1. There was an initial small retention of Na and Cl and a gain in weight followed by considerable losses accompanied by diuresis, loss of weight and loss of oedema. Two infants were given a mixture of Na and K salts with glucose and water for 4 and 5 days before milk feeding was begun. During this time K was retained and a negative balance of water, Na and Cl, with modification of the oedema, was obtained. There was no change in serum protein during this period.

Serum K was below normal on admission and rose with treatment. Serum Na was not related to degree of oedema or to treatment.—F. C. Aitken.

873

CORT, J. H. and MATTHEWS, H. L. **Potassium deficiency in congestive heart-failure. Three cases with hyponatraemia, including results of potassium replacement in one case.** *Lancet*, 1954, 266, 1202-1206. [Dept. Physiol., Med. Sch., Birmingham.]

Resistance to mercurial diuretics developed in 3 patients with congestive heart failure. All 3 showed low serum Na and Cl levels and were in strongly negative K balance. Alkalosis was suspected, as the serum bicarbonate:chloride ratio was increased. Estimation of electrolytes in muscle biopsy material showed that the tissue cells were grossly deficient in K and were over-hydrated; their Na content was normal or slightly raised. The K deficiency was calculated to be about 800 m. equiv. in one of the patients.

Potassium therapy was studied in one patient; when small doses were given there was retention of K and a rise in serum Na and in urinary volume, but the urine remained Na-free. When the dose of K was increased there was a further rise in serum Na and Cl and in urine volume and finally the serum chemistry became normal and Na appeared in the urine; at this time a further muscle biopsy showed increased intracellular K and lowered intracellular Na and water. As the serum and muscle chemistry became normal the clinical condition improved. The role of K depletion in this condition is discussed.—L. Wills.

874

PESCHEL, E. and RACE, G. J. **Studies on the adrenal zona glomerulosa of hypertensive patients and rats, with special reference to the effect of dietary salt restriction.** *Amer. J. Pathol.*, 1954, 30, 634-635. *Proc.* [Dept. Med., Sch. Med., Duke Univ., Durham, N.C.]

875

SPARGO, B. **Kidney changes in hypokalemic alkalosis in the rat.** *J. Lab. Clin. Med.*, 1954, 43, 802-814. [Dept. Pathol., Univ. Chicago, Ill.]

The K reserves of 3-month-old male rats were reduced by protein depletion. The rats were then maintained on a low-K, high-Na diet, with amino-acids as the source of N, and kept in positive N balance. They were fed by tube to ensure equal intakes. Control rats received K in place of Na in the diet.

The 2 groups remained comparable for 4 days, except that the low-K high-Na group drank and excreted more water, the urine becoming neutral in reaction. Thereafter animals of this group became indolent, and developed distended abdomens and muscular weakness, even foreleg paralysis. Faeces retention increased, but weight

gains were steady and comparable with those of the controls. Deaths, apparently from cardiac decompensation, began on the tenth day.

Every other day from the fourth onwards, 2 K-deficient rats and a control were killed. Carcase analysis showed no difference in water, fat or protein, and blood Hb and total serum protein remained constant. In the low-K group, K excretion fell sharply on the fourth day, and Na excretion on the ninth day, at which time also water intake and output returned to the level of the controls. Alkalosis developed on the fourth day and increased in severity, and blood N.P.N. increased progressively.

Kidney weight gradually increased in the low-K group, but this was not accompanied by changes in the levels of water, fat or protein. The first microscopic changes appeared on the sixth day, with increased mitoses in the collecting tubules, hydropic change and some dilation of the tubules in the mid-medullary zone. Ca casts were seen at 8 days. Maximum changes, seen at 14 days, were increased lumen size in the distal and collecting tubules with severe hyaline droplet change in the collecting tubules and an increase in the number and size of the cells in the tubular wall, with evidence of regeneration. Indeed, proliferative changes far exceeded degenerative changes. No change was seen in the glomeruli. The collecting tubules near the papillae showed coarse granular intracellular substances, probably glycoproteins. Small fat droplets were evident in the junctional zone. Alkaline phosphatase was reduced, but acid phosphatase and esterase were unchanged.

Heart lesions were constantly found after 6 days, and became increasingly severe, but there was no change in the glycogen content of cardiac muscle. Pituitary and adrenals showed no change.

When similar rats were kept in negative N balance, the lesions of K deficiency were slight and irregular. It is suggested that this is because utilisation of tissue protein released K.

W. A. Greig.

See also Absts. 585, 640, 671, 699, 1140, 1141, 1267, 1318.

HALOGENS

876

HAM, M. P. and SMITH, M. D. **Fluorine balance studies on four infants. Fluorine balance studies on three women.** *J. Nutrition*, 1954, 53, 215-223; 225-232. [Dept. Food Chem., Univ. Toronto, Ont.]

Fluorine balances were studied in 4 healthy male infants. At the time of the first 3-day balance test the infants were 6 to 14 weeks old and received milk only; at the second test they were 16 to 18 weeks old and received in addition to the milk 32 to 50 g. Pabulum daily.

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In the first period 3 infants retained F and the fourth infant was almost in balance; in the second period all retained F. The percentage of dietary F retained was from - 2 to + 29, mean + 16, in the first period and from 22 to 50, mean 34, in the second. The total F intake in the second period was between 476 and 706 μg . daily.

In the second study the subjects were 3 women aged 23 to 24 years. F balances were studied in three 3-day periods; on normal diet, but avoiding food high in F such as tea and fish; on a diet including 70 g. Pabulum daily; and on a diet including 1360 to 1815 ml. tea infusion daily. The daily F intakes in the 3 periods were 429 to 792, 946 to 1435 and 1200 to 1368 μg ., respectively.

The mean F retention in the 3 periods was 43, 33 and 40 per cent., respectively, and the percentage excreted in the urine 34, 22 and 44. If faecal F is unabsorbed, absorption was only 55 per cent. on Pabulum diet, and reached 84 per cent. when tea was taken.—D. Duncan.

877

WADHWANI, T. K. Effect of fluorine on the composition of bones: changes in the composition of bones of rats. 1. *Proc. Indian Acad. Sci. [B]*, 1954, 39, 223-235. [Sect. Pharmacol., Indian Inst. Sci., Bangalore 3.]

Young rats were fed on a complete diet with 2 mg. NaF daily. A control group without NaF was offered the amount of food consumed by the experimental group.

F decreased the N content of dry fat-free bone and increased the Na and carbonate contents. Increasing the F to 4 mg. daily exaggerated these effects but also increased the Ca and in most bones also the P content.

The effects of F in N or Ca and P deficiency were similar, but usually greater than those produced on a balanced diet.—R. Hill.

878

KONO, K. [Influence of chronic fluorosis on the bone growth, particularly on the epiphyseal cartilage (Report 2). The growth and bone changes of growing rats fed on varied contents of fluorine.] *Shikoku Acta Med.*, 1954, 5, 30-39. [Dept. Int. Med., Sch. Med., Tokushima Univ.] In Japanese: English summary.

Rats aged 30 to 50 days were given a standard Sherman diet alone or with 375, 100, 50, 10, 5 or 2 p.p.m. F as sodium fluoride. Groups were killed at intervals of about a month.

Rats receiving 2 or 5 p.p.m. F grew better than controls; those receiving 50 p.p.m. or more grew less well. The groups receiving 2 or 5 p.p.m. showed premature synostosis of epiphyseal cartilage and good development of bones and trabe-

culae. With 50 p.p.m. or more the trabeculae and cortex became thinner and osteoporosis developed, while synostosis was retarded. Cells in the epiphyseal cartilage showed atrophy and pyknosis. (From summary.)—D. Duncan.

879

IOHICAWA, M. [Histochemical studies on the changes of calcium and alkaline phosphatase in experimental fluorosclerosis of rats.] *Osaka Daigaku Igaku Zasshi*, 1954, 6, 243-254. [Dept. Pub. Health, Wakayama Med. Coll.] In Japanese: English summary.

Rats were given a diet containing 1, 5, 10, 50 or 100 p.p.m. F and were killed after 107, 192 or 210 days. Alkaline phosphatase and calcium deposition in the distal ends of femurs were examined histochemically by the method of Shimizu and Anzono [reference given in Japanese].

At the levels of 50 and 100 p.p.m. phosphatase activity was greatly reduced in the periosteum, Haversian and Volkmann's canals and epiphyseal plate; at the lower levels of 5 and 10 p.p.m. there was reduction only if the period of administration was prolonged. The calcium reaction of bone shafts, trabeculae and epiphyseal plate was negative at the lower and positive at the higher, 50 or 100 p.p.m., levels, but after prolonged administration of F a positive reaction was obtained also with 5 or 10 p.p.m. (From English summary.)

D. Harvey.

880

BÉLANGER, L. F., LOTZ, W. E., VISEK, W. J. and COMAR, C. L. Autoradiographic visualization with Ca^{45} of normal growth of the incisor of pigs and the effect of fluorine feeding. *Anat. Rec.*, 1954, 119, 53-69. [Dept. Histol., Univ. Ottawa.]

Five hours after the injection of ^{45}Ca , autoradiographic lines were visible in the incisor teeth of normal pigs at the limit of predentine and dentine, and at the outer surface of the cement. Ten days after injection the lines were displaced from their original positions, and more so after 45 days. Animals fed on diets containing 200 p.p.m. NaF_2 showed no great difference from the normal if fed to appetite, but on restricted feeding there was retardation of the growth of dentine and cement. In all pigs given 1000 p.p.m. NaF_2 there was marked retardation in the growth of dentine, cement and alveolar bone, and a coarse wavy pattern of the autoradiographic band appeared over dentine. These defects are apparently related to toxicity and abnormal mineral deposition.

M. B. Richards.

881

ZIPKIN, I. and MCCLURE, F. J. Cariostatic effect and metabolism of ammonium fluosilicate.

Pub. Health Rep., Washington, 1954, 69, 730-733. [Lab. Oral Biol. Chem., Nat. Inst. Dent. Res., Pub. Health Serv.]

Ammonium fluosilicate was studied when supplying 50 p.p.m. F in the drinking water of rats and its effects were compared with those of NaF alone or of a composite mixture of NaF, sodium silicate and ammonium carbonate which supplied the same concentration of Si and NH_4 ions as did the fluosilicate. A cariogenic diet (see Abstr. 923, Vol. 22) was given to the 3 experimental groups and to a control group, each with 30 rats, and after 99 days the animals were killed, the degree of caries was assessed and ash and F were estimated in bones and teeth. There was no gross evidence of toxicosis in the rats, and no difference in the rate of growth of the different groups.

Ammonium fluosilicate was as effective as NaF in preventing caries and, because of its cheapness and solubility, is considered suitable for the fluoridation of municipal water supplies.

D. Harvey.

882

CARR, L. M. A method controlling dental caries in rats by injections of sodium fluoride. *Dent. J. Austral.*, 1954, 26, 51-56. [Commonwealth Dept. Health, Canberra.]

Female hooded rats were given a high-sucrose diet and 40 of their offspring were divided among 5 groups before weaning. Treatments for these during the period between calcification and eruption of first and second molars were: (1) no fluoride, (2) 0.24 mg. fluoride on fifteenth day of age, (3) 0.24 mg. on each of fifteenth, sixteenth and seventeenth days, (4) 0.12 mg. and (5) 0.024 mg. also on these 3 days. Sodium fluoride was injected parenterally and was equivalent to 20, 20, 10 and 2 mg. per kg. bodyweight. At 21 days the rats were weaned and for 8 weeks they were given a coarse-particle diet with 67 per cent. maize meal, followed by a high-sucrose diet with 60 per cent. sugar, after which they were killed. Caries was studied by a modification of the technique of Cox *et al.* (Abstr. 4523, Vol. 9).

In the control group the number of carious lesions per rat was 7.1 and in the experimental groups 7.6, 4.7, 5.4 and 6.6, respectively. Changes in incidence were only slight in groups 2 and 5 but in groups 3 and 4 the incidence was 34 and 24 per cent. less than in the control group. The percentages of lower first and second molars with gross caries were 21, 20, 8, 5 and 25 in the respective groups; in groups 3 and 4 none of the upper molars was grossly affected.

The differences, although not statistically significant, suggested that the incidence of caries in rats might be reduced by administering large quantities of fluoride between the time of com-

pletion of calcification of the enamel and eruption of the tooth.—D. Harvey.

883

MITTLER, S. and BENHAM, G. H. Nutritional availability of iodine from several insoluble iodine compounds. *J. Nutrition*, 1954, 53, 53-58. [Armour Res. Found., Inst. Technol., Chicago, Ill.]

Any insoluble iodine compound which can be incorporated in an animal salt lick without toxic effect has a distinct advantage in that the I cannot be leached out on exposure to weather.

Five female albino rats of 35 to 50 g. were reared on a low-iodine diet, and 10 comparable animals were fed on this diet plus 265 μg . I as KI per kg. food. Another 3 groups of 10 were given the same amount of I as Cu_2I_2 , diiodo-dithymol or 3-5-diiodosalicylic acid mixed in the food. At the end of 5 weeks the control rats had an average thyroid weight of 15.4 ± 3.5 mg. per 100 g. bodyweight. The other 4 groups had average thyroid weights of 10.0 ± 1.1 , 9.8 ± 1.9 , 12.5 ± 2.4 and 11.9 ± 1.4 mg. per 100 g. bodyweight, respectively. All 3 insoluble compounds had provided nearly the same amount of I as the KI and prevented enlargement of the thyroid to about the same extent.

In another test 4 groups of rats were fed on the same diet plus 265, 200 and 150 μg . I as Cu_2I_2 per kg. food. The controls had thyroids averaging 18.1 ± 2.1 mg. per 100 g. bodyweight, and the experimental groups thyroids averaging 7.3 ± 1.8 , 8.5 ± 2.2 and 9.2 ± 2.4 mg. per 100 g. bodyweight, respectively. As little as 1.5 μg . I as Cu_2I_2 per day prevented enlargement. Acute and chronic toxicity studies on Cu_2I_2 and 3-5-diiodosalicylic acid showed that these compounds were not toxic in the amounts required to protect the thyroid gland from I deficiency.—B. W. Simpson.

See also Abstrs. 674, 690, 1047, 1262, 1290, 1522-26.

IRON AND COPPER

884

LAUFBERGER, V. Železo ve výživě. [Iron in nutrition.] *Sborn. pathofys. tráv.*, 1954, 8, 9-13. [Dept. Physiol., Fac. Med., Karel's Univ., Prague.]

885

DONNER, L. K pathogenesis poruch proměny železa. [Pathogenesis of disturbances in iron metabolism.] *Čas. Lék. čes.*, 1954, 93, 645-650. [2. Int. Clin.] English and Russian summaries.

886

JOHNSTON, F. A., INGALLS, R. L. and MUKA, B. O. The use of $\alpha\alpha'$ -dipyridyl for determining the

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amount of ferrous iron formed in the digestive tract of women before and after the addition of beef to the diet. *J. Nutrition*, 1954, **53**, 83-91. [New York State Coll. Home Econ., Cornell Univ., Ithaca.]

Two healthy women, aged 36 and 50 years, were given for 6 days a diet adequate in energy and protein and as complete in other respects as possible but low in Fe. On the seventh and the eighth day 0.15 g. $\alpha\alpha'$ -dipyridyl was given by mouth; the subjects were kept on the low-Fe diet for 2 more days. The same procedure was then repeated with 300 g. ground beef substituted for part of the sugar in the low-Fe diet.

The Fe content of the faeces did not rise on administration of $\alpha\alpha'$ -dipyridyl with either diet. This indicated that $\alpha\alpha'$ -dipyridyl did not combine with ferrous Fe in the digestive tract to form an insoluble compound and therefore cannot be used to measure the amount of ferrous Fe formed. One subject absorbed 4 per cent. and one 35 per cent. of the Fe of the beef.—G. F. Garton.

887

GRACE, W. J., DOIG, R. K. and WOLFF, H. G. (with STEINHOUSE, D. W.) Absorption of iron from the gastrointestinal tract. *J. Clin. Nutr.*, 1954, **2**, 162-167. [Dept. Med., New York Hosp.-Cornell Med. Centre, New York.] Spanish summary.

Serum Fe level, estimated 2 hr. after administration of 2 mg. Fe per kg. by mouth, in 7 healthy subjects was 192 μg . per 100 ml. after ferrous Fe and 166 μg . per 100 ml. after ferric Fe. No difference resulted from simultaneous administration of bicarbonate. In a subject with gastric fistula, as in the healthy subjects, Fe absorption varied widely from day to day, lower values being obtained with ferric than with ferrous salts. The levels were almost the same when the pH of the gastric contents was about 2 as when it was between 5 and 8 after administration of Na bicarbonate.

Absorption of Fe is not necessarily related to acidity of the stomach contents, but is probably related to the absorptive capacity of the upper gastro-intestinal tract. The difference in the absorption of ferric and ferrous Fe is probably not of clinical importance.—M. B. Richards.

888

BOTHWELL, T. H., VAN DOORN-WITKAMPF, H. VAN W., DU PREEZ, M. L. and ALPER, T. The absorption of iron. Radioiron studies in idiopathic hemochromatosis, malnutritional cytosiderosis, and transfusional hemosiderosis. *J. Lab. Clin. Med.*, 1953, **41**, 836-848. [Dept. Med., Univ. Witwatersrand, Johannesburg.] Absorption of radio-active Fe was studied in 5

patients with idiopathic haemochromatosis, 5 with malnutritional cytosiderosis, 3 with transfusional haemosiderosis, and 8 controls with no anaemia. Increased Fe absorption was found in the first group, part of the absorbed Fe being used for Hb formation and the remainder being deposited in the liver and other organs. Neither phosphates nor fat-soluble vitamins influenced the rate or pattern of absorption. In the second group absorption of Fe from the gut seemed low in 4 subjects; in the other there was a significant uptake by blood, and abnormal deposition in the liver. In the third group Fe absorption was not completely absent, but Hb utilisation was very low in 2 patients. Apparently absorption of Fe may continue in spite of saturated body Fe stores. In the control group there was wide variation in the level of radio-active Fe in the Hb, and the evidence suggested that all the absorbed Fe was not being immediately used for Hb formation.

M. B. Richards.

889

REMY, D. Der Eisenstoffwechsel bei der Hämo-chromatose. [Iron metabolism in haemochromatosis.] *Deutsch. med. Wochenschr.*, 1954, **79**, 1042-1044. [Med. Klin., Städt. Krankenanst., Bremen.]

In haemochromatosis absorption of Fe is not controlled as in normal subjects. Values for transferrin are low normal and synthesis of ferritin appears to be normal. Serum Fe is high and the movement of Fe from blood to tissues is greatly accelerated. Excretion appears to be normal. The cause of the disease is not known and hence treatment must be directed simply to controlling Fe supply and accumulation. Treatment by blood letting with return of plasma and a diet of low Fe content is recommended.—I. Leitch.

890

STERN, P., KOŠAK, R. and MISIRLIJA, A. Beitrag zur der Eisenresorption. [Absorption of iron.] *Experientia*, 1954, **10**, 227. [Pharmakol. Inst., Univ. Sarajevo.] English summary.

Rabbits of 1500 to 3000 g. liveweight received 30 mg. terramycin and 25,000 I.U. penicillin daily. After 3 to 4 days bacterial tests of the stools were negative except for the presence of *Proteus vulgaris*. Other animals were rendered anaemic by bleeding and similarly treated. All then received 30 mg. FeSO_4 per kg. bodyweight. Serum analysis 18 hr. later showed no Fe absorption. Absorption was restored by the addition to the diet of strains of *Bact. coli* or of enterococci resistant to terramycin.

W. Godden.

891

EVERETT, N. B., GARRETT, W. E. and SIMMONS, B. S. Lymphatics in iron absorption and

transport. *Amer. J. Physiol.*, 1954, **178**, 45-48. [Dept. Anat., Sch. Med., Univ. Washington, Seattle.]

With radio-active Fe in rats evidence was obtained supporting an earlier observation that the lymphatics are not involved in Fe absorption and transport.—R. Hill.

892

SPOENDLIN, H. Die enterale Eisenaufnahme und Speicherung bei Mangeldiät und toxischer Leberschädigung im Tierversuch. [Absorption of iron from the digestive tract and storage of iron with a defective diet and liver damage due to poisoning in animal experiments.] *Ztschr. ges. exp. Med.*, 1954, **124**, 131-145. [Inst. Pathol., Univ. Zürich.]

Rats on otherwise normal diet with added Fe thrived well, and only after 20 to 23 weeks were the first particles of haemosiderin visible in the liver cells of the periportal zone. On a maize diet with the same amount of Fe, haemosiderin particles were found in the liver cells after 7 weeks, with a rapid increase in the next few weeks. Apparently the deficient diet caused a disturbance of regulation of Fe absorption by the intestinal mucosa. Fe storage occurred only in the periportal liver cells. Thus a liver cell block, in the same sense as the intestinal block, appeared to hinder excessive Fe storage, and this block was not noticeably disturbed by the maize diet. In rats on the maize diet which received injections of CCl_4 there was little deposition of haemosiderin in the liver. Apparently only functionally active liver cells are capable of storing Fe. Thus haemosiderin storage is to be regarded as the expression of a healthy, functionally active cell, and not as a sign of injury or degeneration, as in fatty liver. In the maize-Fe group there was haemosiderosis of the distal convoluted tubules of the kidneys, such as is found in haemochromatosis. This differs from the effect of Fe given parenterally.—M. B. Richards.

893

KAUFMAN, N., KINNEY, T. D. and KLAIVINS, J. Effect of ethionine-induced pancreatic damage on iron absorption. *Amer. J. Pathol.*, 1954, **30**, 620. *Proc.* [Cleveland City Hosp., Ohio.]

894

WISSLER, R. W., BETHARD, W. F., BARKER, P. and MORI, H. D. Effects of polyoxyethylene sorbitan monolaurate (Tween 20) upon gastrointestinal iron absorption in hamsters. *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 170-177. [Dept. Pathol., Univ. Chicago, Ill.]

In hamsters, diets containing 5 per cent. Tween 20 produced after 8 weeks a consistent and progressive increase in Fe absorption and storage.

D. Duncan.

895

LAHEY, M. E., GUBLER, C. J., BROWN, D. M., SMITH, E. L., JAGER, B. V., CARTWRIGHT, G. E. and WINTROBE, M. M. Studies on copper metabolism. 8. The correlation between the serum copper level and various serum protein fractions. *J. Lab. Clin. Med.*, 1953, **41**, 829-835. [Dept. Med., Coll. Med., Univ. Utah, Salt Lake City.]

Electrophoretic analyses of the sera of 19 subjects with serum Cu values ranging from 24 to 402 μg . per cent. showed a high correlation between serum Cu and the $(\alpha_2 + \alpha_3)$ -globulin fraction ($r = +0.79$), and good correlation between Cu and the $(\beta_1 + \beta_2)$ -globulin fraction ($r = +0.62$). The samples included umbilical vein serum (low Cu), normal serum, serum from pregnant women and from patients with infections and leucaemia (high Cu). No significant correlation was observed between serum Cu and other protein fractions estimated electrophoretically. No significant correlation was observed between serum Cu and total mucoproteins in 33 subjects, or between serum Cu and total proteins, albumin and globulin estimated by a standard salt fractionation method in 110 subjects with Cu values varying from 63 to 291 μg . per cent. Electrophoretic analyses of rat sera gave results contrasting with those in human subjects in that a high correlation was found between plasma Cu and the α_2 -globulin fraction ($r = +0.76$), and little or no correlation between $(\alpha_2 + \alpha_3)$ -globulin and Cu. In the rat as in man a high degree of correlation ($r = +0.80$) was found between Cu and the $(\beta_1 + \beta_2)$ -globulin fraction.

M. B. Richards.

896

GUBLER, C. J., TAYLOR, D. S., EICHWALD, E. J., CARTWRIGHT, G. E. and WINTROBE, M. M. Copper metabolism. 12. Influence of manganese on metabolism of copper. *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 223-227. [Dept. Med., Coll. Med., Univ. Utah, Salt Lake City.]

The administration of large amounts of Mn to rats initially weighing about 100 g. reduced growth. Urinary excretion of Cu was less and concentration of Cu in plasma and brain higher than in control rats. Microcytic hypochromic anaemia was present.

In similar rats given large amounts of Cu, growth was almost normal and all tissues studied, except brain, contained abnormally high concentrations of Cu. There was no anaemia.

Simultaneous administration of Mn and Cu reduced growth more than Mn alone, and the concentrations of Cu in tissue were all greater than those produced by Cu alone. Anaemia similar to that produced by Mn was present in these animals.

R. Hill.

897

VAN KOERTSVELD, E. E. Enkele aspecten van de koperstofwisseling. [Some aspects of copper metabolism.] *Tijdschr. Diergeneesk.*, 1954, 79, 495-504. [Inst. Moderne Veevoeding "de Schothorst", Hoogland.] English, French and German summaries.

The literature dealing with the Cu of blood and tissues investigated with ^{64}Cu is reviewed. Cu is absorbed from the upper small intestine and, because of the nature of the portal circulation, it will be deposited preferentially in the right lobe of the liver. The same will be true in the ruminant unless Cu is absorbed from the true stomach, and that has not been shown. Liver biopsy to assess Cu stores is unreliable since Cu may be unevenly distributed. Cu is involved in the formation of both hair pigments and hair keratin. The estimation of Cu in clean hair, shorn periodically, is a good index of Cu supply. Data will be published for both Cu and Mn in cattle hair (see Title 4665, Vol. 24).—I. Leitch.

898

DICK, A. T. Studies on the assimilation and storage of copper in crossbred sheep. *Austral. J. Agric. Res.*, 1954, 5, 511-544. [Div. Animal Health Prod., C.S.I.R.O., Animal Health Res. Lab., Parkville, Victoria.]

Storage of Cu in the livers of wether sheep aged 1 to 2 years was proportional to the amount eaten as copper sulphate over the range 3 to 20 mg. Cu daily. The quantity stored in 6 months was 4.5 to 5.0 per cent. of intake. Blood Cu concentration was not affected by these levels of Cu intake.

The addition of ferrous sulphide to a high-Cu diet greatly reduced Cu storage. This was apparently due to the formation of insoluble copper sulphide, since Cu given as sulphide did not increase the liver content. Neither elementary S nor thio-sulphide reacted like sulphide in reducing Cu storage.

The effects of Zn and Ni on Cu assimilation were small, but Mo as ammonium molybdate significantly reduced liver Cu. This effect was greatly increased by high concentrations of sulphate in the diet.—R. Hill.

See also Absts. 123, 567, 598, 601.

OTHER MINERALS

899

MITTLER, S. Nutritional availability of cobaltic oxide, Co_2O_3 . *Nature*, 1954, 174, 88-89. [Armour Res. Found., Illinois Inst. Technol., Chicago 16.]

Two lambs each received 3 mg. $^{60}\text{Co}_2\text{O}_3$ containing 27 μC . radio-activity per mg. by mouth daily for 7 days and were killed on the eighth day. A third lamb received 10 mg. of the labelled oxide in one dose and was killed 48 hr. later.

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The ^{60}Co was well absorbed and distributed throughout the body, especially in the liver. It is suggested that Co_2O_3 is cheaper and less soluble than the Co salts usually used for feeding.

D. Duncan.

900

GRAY, L. F. and DANIEL, L. J. Some effects of excess molybdenum on the nutrition of the rat. *J. Nutrition*, 1954, 53, 43-51. [U.S. Plant, Soil Nutrit. Lab., Bur. Plant Indust., U.S. Dept. Agric., Ithaca, N.Y.]

The effects of vitamin B_{12} , methionine and Cu on the retardation of growth produced by excess Mo in the diet were studied. Vitamin B_{12} did not increase growth over that produced by the basal diet without Mo but it reduced significantly the growth-retarding effect of Mo.

Either methionine or Cu reduced the growth-retarding effect of Mo, methionine more effectively than Cu, but growth was not greater with both methionine and Cu added to the Mo diet than with methionine alone.

None of the additions completely eliminated the effect of Mo.—R. Hill.

901

WASE, A. W., GOSS, D. M. and BOYD, M. J. The metabolism of nickel. I. Spatial and temporal distribution of Ni^{63} in the mouse. *Arch. Biochem. Biophys.*, 1954, 51, 1-4. [Div. Biol. Chem., Hahnemann Med. Coll., Philadelphia, Pa.]

Intraperitoneal injections of ^{63}Ni were given to 56 mice and groups were killed at intervals after injection.

Ni was widely distributed through the body, though only small quantities were found in brain and muscle. Retention was greatest in lung and brain.—R. Hill.

902

KULWICH, R., PEARSON, P. B. and LANKENAU, A. H. Effect of coprophagy upon S^{35} uptake by rabbits after ingestion of labeled sodium sulfate. *Arch. Biochem. Biophys.*, 1954, 50, 180-187. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

Six rabbits aged 7 to 12 weeks, maintained on commercial pellets, were given by stomach tube less than 12 μg . carrier-free sulphate containing 150 to 300 μC . ^{35}S . Each animal was then kept in a metabolism cage which allowed the separation of urine and faeces; these were collected quantitatively. Three of the animals were fitted with wooden collars to prevent coprophagy. After 4 days all 6 were killed and ^{35}S was estimated in urine, faeces and selected tissues.

In both collared and uncollared animals about 65 per cent. of the ^{35}S given was excreted in the urine within 4 days; in the uncollared rabbits the faecal excretion of ^{35}S was less than in the collared rabbits. Coprophagy also produced a considerable increase in the uptake of ^{35}S by the blood.

Collar wearing did not reduce the uptake of ^{35}S in cartilaginous tissue, but the ^{35}S content of liver, muscle, brain, kidney, and blood was much less.
G. F. Garton.

See also Absts. 345, 412, 413, 452, 453, 534, 535, 606, 838, 896.

ACID BASE EQUILIBRIUM

903

LOWREY, G. H., GRAHAM, B. D. and TSAO, M. U. (with SLOAN, C., WYNGARDEN, L. and WARK, S.) Chemical homeostasis in the newborn infants of diabetic mothers. *Pediatrics*, 1954, 13, 527-535. [Dept. Paediat., Univ. Michigan, Ann Arbor.] Spanish summary.

In 11 infants of diabetic mothers there was wide variation in plasma chloride and total base

levels. Uncompensated acidosis was often present and appeared to be directly related in degree to the severity of the clinical picture, i.e., oedema, cyanosis, lethargy and vomiting. Blood sugar levels did not differ significantly from those of infants of normal mothers. The cause of the acidosis is not known.—D. Duncan.

See also Abst. 1030.

METABOLISM OF WATER

904

HOOPER, J. M. D., EVANS, I. W. J. and STAPLETON, T. Resting pulmonary water loss in the newborn infant. *Pediatrics*, 1954, 13, 206-210. [Paediat. Unit, St. Mary's Hosp. Med. Sch., London.] Spanish summary.

The apparatus used is described and illustrated. Data tabulated for 24 infants are age, sex, weight, minute volume, minute loss of water, minimum loss of water per day and per kg. bodyweight, and percentage saturation of the expired air, assumed to be at a temperature of 37°C.

Pulmonary water loss was proportional to minute volume. There was an approximately linear relationship between minimum daily water loss from the lungs and bodyweight. For the 24 infants, minimum daily loss per kg. bodyweight ranged from 6.4 to 12.3, average 8.6 g.

F. C. Aitken.

905

ELLIS, F. P., FERRES, H. M. and LIND, A. R. The effect of water intake on sweat production in

hot environments. *J. Physiol.*, 1954, 125, 61P-62P. [Royal Naval Trop. Res. Unit, Singapore.]

906

MACH, R. S. Les états de déshydratation. [States of dehydration.] *Bull. Soc. sci. Hyg. aliment.*, 1954, 42, 14-30. [Fac. Méd., Geneva.]

A review.

907

HOFMANN, F. G., KNOBIL, E. and CATON, W. L. The effect of pregnancy on the excretion of water loads by rats. *Endocrinology*, 1954, 55, 114-115. [Biol. Res. Lab., Harvard Sch. Dent. Med., Boston, Mass.]

No significant difference was found in the ability of groups of non-pregnant and of pregnant intact or hypophysectomised rats to excrete excess water after a test dose of 5 ml. per 100 g. bodyweight.—A. M. Thomson.

See also Absts. 460, 667, 699, 724, 727, 851, 867, 974, 981.

METABOLISM OF OTHER SUBSTANCES

908

FOURNIER, P. L'utilisation de l'alcool par l'organisme. [Utilisation of alcohol by the body.] *Bull. Soc. sci. Hyg. aliment.*, 1954, 42, 63-76.

909

MARSHALL, E. K. (Jr.) and FRITZ, W. F. The metabolism of ethyl alcohol. *J. Pharmacol. Exp. Therap.*, 1953, 109, 431-443. [Dept. Pharmacol., Johns Hopkins Univ., Baltimore, Md.]

910

LIVIERATO, S., DANOFULOS, E. and MARATOS, K. The functional control of the RES in patients with undernutrition. *Acta med. scand.*, 1954, 148, 469-476. [I. Med. Clin., Univ. Athens.]

Blood alcohol curves were studied in 23 undernourished patients after administration of 0.6 ml. ethanol per kg. bodyweight by mouth as a 10 per cent. solution. In another 17 patients with oedema the alcohol content of the oedema fluid was also studied.

In 4 normal subjects the highest point of the

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alcohol curve did not exceed 0.65 per thousand, and almost the whole amount of alcohol had disappeared after 4 hr. In the 23 patients with little or no oedema the height of the curve increased with the severity of the undernutrition; in the 3 examples given the peaks were 1.6, 1.55 and 1.1 per thousand, and appreciable levels of alcohol were still present after 4 hr. The ability to metabolise alcohol was still further impaired in the oedematous patients.

It is considered that the results indicate functional impairment of the reticulo-endothelial system in undernutrition. Alcohol should not be given to such patients as a source of energy.

D. Duncan.

911

JOHANNESMEIER, K., REDETZKI, H. and PFLEIDERER, G. Zur Frage der Beschleunigung des Blutalkoholabbaus. [The problem of accelerating alcohol breakdown in the blood. [*Klin. Wochenschr.*, 1954, 32, 560-563. [Inst. Gerichtl. Med., Univ. Hamburg.]

Alcohol and pyruvic acid were estimated in the blood of 2 sheep at intervals after administration of 40 ml. of 96 per cent. ethanol, alone or with 25 g. fructose or 25 g. glucose, or 3.68 or 2.80 g. pyruvic acid, or 300 mg. diphosphopyridine nucleotide. The supplements were given by intravenous injection simultaneously with the alcohol or at intervals up to 65 min. after it. They had no effect in accelerating the disappearance of the alcohol from the blood.

Oral administration of fructose 2 hr. after alcohol to 4 human subjects caused vomiting in 2 and did not affect the level of alcohol in the blood of the other 2.

In the human subjects and the sheep, administration of fructose or glucose alone caused the pyruvic acid value in the blood to rise to about the same extent.—E. M. Hume.

912

MARDONES, J., SEGOVIA, N., ALCAINO, F. and HEDERRA, A. Effect of synthetic thioctic or alpha lipoic acid on the voluntary alcohol intake of rats. *Science*, 1954, 119, 735-736. [Lab. Nutric., Inst. Educación Física, Univ. Chile, Santiago.]

Rats received for at least 90 days a diet with 11 pure vitamins as the only source of the vitamin B complex, and were allowed alcohol at will until their intake was fairly stable. When these rats were given α -lipoic or thioctic acid for from 4 to 10 days, in total doses of 62.5, 125 or 750 μ g. per 100 g. bodyweight by mouth or the smallest dose subcutaneously, alcohol intake subsequently decreased slightly but significantly. The decrease was less consistent than that produced by 2 g. dried liver per 100 g. bodyweight daily for 10 days.

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This supplement represents 40 to 80 μ g. thioctic or α -lipoic acid, and these substances therefore are not wholly responsible for the effect of liver in decreasing alcohol consumption.—D. Duncan.

913

DAUGHADAY, W. H. and LARNER, J. (with HOUGHTON, E.) The renal excretion of inositol by normal and diabetic rats. *J. Clin. Invest.*, 1954, 33, 1075-1080. [Dept. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

The excretion of inositol was studied in normal and partly depancreatized rats on low, medium and high inositol intakes and in alloxan-diabetic rats on low and high inositol intakes. Absorption and renal clearance of inositol were also studied.

Normal rats excreted little inositol even when the intake was 1623 mg. in 24 hr. Partly depancreatized rats excreted much more at all 3 levels of intake, but insulin treatment reduced inositol excretion almost to normal, even when the insulin treatment was accompanied by salt diuresis. Alloxan-diabetic rats also excreted large proportions of the inositol intake.

Absorption of inositol was more rapid in diabetic than in normal rats, 46 per cent. in 6 hr. compared with 26 per cent. The urinary clearance of inositol in diabetic rats was at least 10 times the normal. When normal rats received glucose intravenously the clearance of inositol rose to the range found in diabetes.

It is concluded that the increased excretion of inositol in diabetes can be attributed to the increased renal clearance produced by glycosuria.

D. Duncan.

914

ALSTRÖM, I. The effect of inositol on the rate of phosphorus metabolism in the liver of rats. *Acta med. scand.*, 1954, 148, 433-438. [Dept. Metabol. Res., Wenner-Gren's Inst., Stockholm.]

Addition of 200 mg. inositol to 100 g. of a semi-synthetic diet free from inositol had no effect on the rate of growth of young rats in a 30-day experiment. This indicates that the supply of inositol was adequate, probably because of formation of inositol by the bacterial flora. In rats starved for 72 hr. after being given a complete diet, subsequent addition of 200 mg. inositol to 100 g. of the complete diet caused a decrease in the rate of P metabolism in the liver, as measured with 32 P.—M. B. Richards.

915

HOLLMANN, S. Über das Schicksal der Glucuronsäure im tierischen Organismus. 2. Die Glucuronsäure-Resorption aus dem Darm. [Fate of glucuronic acid in the animal body. 2. Absorption of glucuronic acid from

intestine.] 3. Vergleichende Untersuchungen über den Glucuronsäure-Abbau in verschiedenen Säugetiergeweben. [3. Comparative studies of the breakdown of glucuronic acid in different mammalian tissues.] *Hoppe-Seyler's Ztschr.*, 1954, 297, 74-82; 83-91. [Physiol.-Chem. Inst., Univ. Göttingen.]

2. Glucuronic acid absorption from the intestine was studied in man, dog, rabbit and guineapig, to find whether incomplete absorption after oral intake could be the cause of results previously reported (*Hoppe-Seyler's Ztschr.*, 1952, 290, 91), in which urinary excretion of glucuronic acid was much less after ingestion than after intravenous injection of 3 g. glucuronic acid lactone. These experiments showed that man could absorb at least 7-5 g. of the lactone, and up to this level the lower excretion after oral ingestion was due to breakdown of the acid in the liver. With 3 g. lactone the absorption losses were at most 2 per cent. In the rabbit urinary excretion of glucuronic acid was lower after intraperitoneal than after intravenous or subcutaneous injection, since part of it was broken down in traversing the liver. In the dog with an Eck fistula the diminished excretion after oral intake was partly due to breakdown in the liver, and partly to incomplete absorption from the intestine. The glucuronic acid deficit after intravenous injection might be due mainly to breakdown in extra-hepatic tissues, as indicated in the following paper.

3. The relative activity of different tissues in the breakdown of glucuronic acid was estimated by measuring the increase in the oxygen consumption of guineapig tissues caused by 0.005 M K glucuronate in phosphate buffer of pH 7.0. The greatest increase was in the liver, followed in order by skeletal muscle, kidney, spleen, brain, lung and

heart. Guineapig and dog tissues were used to estimate the activity as measured by the disappearance of glucuronate when broths of the tissues were treated with K glucuronate at 39° C. in the phosphate buffer solution. Again the liver showed the highest activity, followed by kidney, muscle, brain, lung, heart and spleen.

M. B. Richards.

916

KREBS, H. A. Some aspects of the metabolism of adenosine phosphates. *Bull. Johns Hopkins Hosp.*, 1954, 95, 34-44. [Med. Res. Coun. Unit Res. Cell. Metabol., Univ. Sheffield.] Report of Herter Lecture 2.

917

PEGNI, U. and BEFANI, A. Azione dell'acido adenosintrifosforico (ATP) sulla cirrosi epatica da CCl_4 e sulle capacità rigenerative del fegato in tale condizione morbosa. [Effect of adenosine triphosphate (ATP) on hepatic cirrhosis caused by carbon tetrachloride and capacity of the liver to regenerate in such morbid conditions.] *Gastroenterologia*, 1954, 81, 153-166. [Ist. Clin. Med. Gen., Univ. Siena.] German, English and French summaries.

The experiment was with 24 male albino rats in 3 groups of which all were made to inhale CCl_4 on alternate days, one was given 5 mg. ATP daily, one every second day and the third was control. After 65 days liver changes were well developed in controls and less in the groups given ATP in proportion to the total amount given. After removal of part of the liver regeneration was more rapid in those given ATP.—I. Leitch.

See also Abst. 600.

METABOLISM OF CELLS, TISSUES, ETC.

GENERAL PHYSIOLOGY

918

CLARK, R. T. (JR.), CHINN, H. I., ELLIS, J. P. (JR.), PAWEL, N. E. R. and CRISCUOLO, D. Tissue respiratory studies during altitude and cold exposure. *Amer. J. Physiol.*, 1954, 177, 207-210. [U.S. Air Force Sch. Aviation Med., Randolph Field, Tex.]

The oxygen consumption of liver slices from 26 male rats which had been maintained at successively lowered barometric pressures, reaching a simulated altitude of 18,000 ft. after 30 days, was estimated in 100 per cent. oxygen with β -glycerophosphate in Locke's solution; 20 rats acted as controls. In a second experiment the oxygen consumption of liver slices was estimated under 100 per cent. and reduced oxygen atmospheres for

6 adult rats maintained at 18,000 ft. for 35 to 38 days and exercised for 1 hr. daily on a treadmill, for 13 control rats similarly exercised at ground level and 9 rats maintained at altitude without exercise. In a third experiment the oxygen consumption of liver slices was estimated for 8 male rats kept at 4° C. for 10 weeks; 7 animals acted as controls.

A slight, but significant, decrease occurred in the oxygen consumption of liver slices from the rats chronically exposed to altitude and there was a much higher oxygen consumption in liver slices from rats exposed to cold. Liver slices from exercised rats exposed to altitude had a significantly lower oxygen consumption than had slices from the control animals similarly exercised at ground level; no significant difference was noted

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when the liver slice was allowed to respire in air or 12-5 per cent. oxygen. The cyclophorase activity of liver and kidney of rats exposed to cold and of liver, kidney, diaphragm, heart, soleus muscle, gastrocnemius muscle and brain of rats exposed to altitude was also estimated; only the activity of diaphragm was significantly higher after exposure to altitude, but considerable variations in cyclophorase activity were found among different groups of animals.—G. F. Garton.

919

WEISS, A. K. Adaptation of rats to cold air and effects on tissue oxygen consumptions. *Amer. J. Physiol.*, 1954, 177, 201-206. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

After groups of rats aged 6 weeks or 6 months had been in an environment at $5^{\circ} \pm 1^{\circ}$ C. for 10 or 26 days with food to appetite the oxygen consumption of slices of diaphragm, liver, kidney, heart and brain cortex was estimated by the Warburg method; littermates served as controls.

With the exception of brain cortex, all the tissues from 6-week-old rats showed an increase in oxygen consumption after exposure to cold; liver showed the greatest percentage increase and kidney the least. The tissues of 6-month-old rats showed no increase in oxygen consumption on exposure to cold for either 10 or 26 days; occasionally liver tissue showed a significant increase. The oxygen consumption rates at 37° C. were about double those at 24° C.; changes which were interpreted as having a significance at 37° rarely had as great a significance at 24° and, usually, no significance. When 6-week-old rats, previously exposed to cold for 10 days, were returned to room temperature for 2 days all the tissue oxygen consumptions studied remained high. When weanling rats were exposed to $5^{\circ} \pm 1^{\circ}$ C. most died, but when they were exposed to $12^{\circ} \pm 2^{\circ}$ C. for 5 days no significant increase in tissue oxygen consumption was found. The adrenals of all the rats exposed to cold were enlarged; the extent of the hypertrophy was correlated with the severity of the cold. In general the tissues from young rats respired at a greater rate than those from older rats and tissues which did not alter their oxygen consumption in response to cold did not show a modification with age.—G. F. Garton.

920

FRUNDER, H. Über Sauerstoff-Aufnahme und Glykogengehalt verschiedener Rattenzwerchfellanteile. [Oxygen uptake and glycogen content of different parts of the rat diaphragm.] *Hoppe-Seyler's Ztschr.*, 1954, 296, 228-231. [Physiol. Chem. Inst., Univ. Leipzig.]

Rat diaphragm is extensively used in studies of

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tissue metabolism. In such work care must be taken to equalise the natural differences in parts of the diaphragm. The dorsal segments respire more rapidly and contain less glycogen than the ventral.—I. Leitch.

921

LIBBECCO, C. The carbohydrate metabolism of the isolated diaphragm of the rat. Glucose uptake and body size. *Biochem. J.*, 1954, 58, 65-70. [Lab. Biochim., Univ. Liège.]

922

KATZ, J., ABRAHAM, S., HILL, R. and CHAIKOFF, I. L. Importance of glycolytic and "oxidative" pathways in glucose utilization by liver. *J. Amer. Chem. Soc.*, 1954, 76, 2277-2278. [Dept. Physiol., Univ. California, Berkeley.]

The suggestion advanced by Bloom *et al.* (Title 2019, Vol. 24) that not more than 25 per cent., and possibly none, of the CO_2 arising from glucose metabolism in rat liver is formed glycolytically, is questioned. From revised equations applied to the data of Bloom *et al.* and to the authors' own results, they conclude that at least 80 per cent. of the CO_2 is formed in this way.—D. Duncan.

923

RENOLD, A. E., HASTINGS, A. B. and NESBETT, F. B. Studies on carbohydrate metabolism in rat liver slices. 3. Utilization of glucose and fructose by liver from normal and diabetic animals. *J. Biol. Chem.*, 1954, 209, 687-696. [Dept. Biol. Chem., Harvard Med. Sch., Boston, Mass.]

Liver slices from normal and diabetic rats were incubated in a cationic medium with glucose or fructose uniformly labelled with ^{14}C in all carbon atoms. In the livers from diabetic rats glucose uptake and glycogen deposition from glucose were about 50 and 98 per cent. below normal, respectively, and glucose output was increased by 50 per cent. Fructose utilisation was nearly normal and there was significant formation of glycogen, though only 1/4 to 1/9 of that in normal liver. Glycogen formation from glucose and from fructose in normal liver slices was almost identical.

With both glucose and fructose, only one labelled, as substrates and formation of the osazone at the end of incubation, the comparative utilisation of the hexoses was studied. A minimum and maximum value for total glucose phosphorylation was calculated from this, and in diabetic liver slices it was between 1/4 and 1/10 of normal. Fructose utilisation was normal, but 70 per cent. was converted into glucose as compared with 32 per cent. in normal liver, which indicated the increased tendency to gluconeogenesis in diabetic liver.

A. Hepburn.

924

CHARI, A. and WERTHEIMER, E. The effect of ketone bodies on the carbohydrate metabolism of rat diaphragm. *Biochem. J.*, 1954, **57**, 443-449. [Dept. Biochem., Hebrew Univ., Hadassah Med. Sch., Jerusalem.]

Diaphragms from rats weighing from 80 to 120 g. were incubated in phosphate-buffered saline medium. When the medium contained 0.1 per cent. glucose, addition of 0.1 per cent. acetoacetate decreased glycogen formation, 0.25 per cent. β -hydroxybutyrate increased it and 0.05 per cent. acetone or 0.1 per cent. β -hydroxybutyrate had no effect. Similar effects were found with liver slices. In the absence of glucose 0.1 per cent. acetoacetate did not affect the rate of glycogen breakdown, but 0.1 per cent. β -hydroxybutyrate or 0.05 per cent. acetone decreased it. The decrease in glycogen formation in the presence of acetoacetate depended on the relative concentrations of glucose and acetoacetate present. In the presence of acetoacetate both glucose and oxygen were utilised more rapidly. The increase in glycogen formation occurring in the presence of 0.1 unit of insulin was inhibited by acetoacetate, but not by the other ketone bodies studied.

The presence of 0.1 per cent. β -hydroxybutyrate decreased the effect of the acetoacetate. The effect of 0.001 *M* methylene blue was similar to that of acetoacetate and the two were not synergistic. The effect of acetoacetate was absent with diaphragms from diabetic rats or from rats fasted for 5 to 7 days, but was present with diaphragms from rats fed on a high-fat diet for 12 days. Injection of acetoacetate within 6 hr. before the rats were killed decreased glycogen formation *in vitro* and also depressed the blood sugar level *in vivo*. Injection of β -hydroxybutyrate cancelled the effect of the acetoacetate.

It is concluded that acetoacetate, at concentrations comparable to those found in diabetic coma, is the only ketone body decreasing glycogen formation.—D. Duncan.

925

NEWMAN, L. H., DONALDSON, K. O. and MARSHALL, L. M. *In vivo* carboxylations in the liver of the chick after hatching. *Amer. J. Physiol.*, 1954, **178**, 97-99. [Dept. Biochem., Sch. Med., Howard Univ., Washington, D.C.]

A previous paper (Khan *et al.*, *Amer. J. Physiol.*, 1954, **176**, 461) deals with carboxylations in the liver of the chick embryo. Both are studies with ^{14}C .—D. Duncan.

926

COCHRAN, K. W. and DuBOIS, K. P. The influence of certain steroids on the oxidation of α -keto acids. *Endocrinology*, 1954, **55**, 10-20. [U.S. Air Force Radiation Lab., Chicago, Ill.]

The synthesis of citrate from pyruvate and fumarate by liver homogenates from rats was inhibited *in vitro* by testosterone, deoxycorticosterone, ethinyl oestradiol, progesterone and diethylstilboestrol; steroids which were relatively ineffective as inhibitors were oestradiol, oestrone, pregnenolone, methyl androstenediol, cortisone, cholesterol and ouabain. The synthesis of acetoacetate from pyruvate was greatly inhibited by testosterone, deoxycorticosterone, progesterone and diethylstilboestrol. Steroids which inhibited the synthesis of citrate and acetoacetate also inhibited the oxidation *in vitro* of α -ketoglutarate, but not that of succinate.—G. F. Garton.

927

ZAMECNIK, P. C. and KELLER, E. B. Relation between phosphate energy donors and incorporation of labeled amino acids into proteins. *J. Biol. Chem.*, 1954, **209**, 337-354. [Med. Labs., Collis P. Huntington Mem. Hosp., Harvard Univ., Massachusetts Gen. Hosp., Boston.]

A preparation that would incorporate leucine- ^{14}C into protein anaerobically was made by partly homogenising rat liver and centrifuging at 5000 *g* to remove mitochondria. Incorporation was greatly stimulated by hexosediphosphate with nicotinamide or by phosphocreatine, phosphoryl pyruvate or 3-phosphoglycerate, but not by adenosine triphosphate (ATP) or coenzyme A. A similar preparation after treatment with activated charcoal needed both ATP and one of the other substances. Most of the incorporation was into the protein of the microsome-rich fraction obtained by centrifuging at 105,000 *g*. The essential components of the incorporating system were this microsome-rich fraction, a soluble, heat-labile, non-dialysable fraction, an ATP-generating system and the amino-acid. Arsenate, dinitrophenol or ethionine caused little inhibition of the incorporation itself, though iodoacetate, ribonuclease or deoxycholate inhibited strongly. When several amino-acids were added together there did not seem to be competition between them. The reaction was specific for natural L-amino-acids. Degradation of the labelled protein released labelled leucine at about the same rate as unlabelled leucine. A radio-active peptide has been isolated from a partial hydrolysate and is being further studied.—C. Warner.

928

ATEN, A. H. W. (Jr.), COUSSINS, R., MASSART, L. and PETERS, G. Incorporation of $\text{Na}_2^{35}\text{O}_4$ and Na_2^{32}S in milkproteins by the perfused cow's udder. *Arch. internat. Pharmacodyn.*, 1953-54, **96**, 356-364. [Lab. Nuclear Phys., Amsterdam.] French summary.

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Both halves of the excised udder of a lactating cow were perfused separately for 2 hr. with heparinised, oxygenated blood containing $1 \mu\text{C. Na}_2^{35}\text{SO}_4$. Blood and milk samples were collected.

The total activity of the blood and of the inorganic S of the blood were much less than before perfusion; the protein activity remained about the same. Casein and lactalbumin from milk had a low but definite activity, much higher than that from incubation with $\text{Na}_2^{35}\text{SO}_4$ *in vitro*.

$\text{Na}_2^{35}\text{SO}_4$ continuously added to the perfusion blood produced only slight radio-activity in the casein and albumin fractions. The activity disappeared on washing with inactive Na_2S solution. Incubation *in vitro* with Na_2^{35}S yielded strongly active proteins in milk and blood. As washing with inactive Na_2SO_4 and finally with Na_2S greatly diminished activity, a large quantity of Na_2S was thought to be bound by chemical reaction or by absorption. Incubation *in vitro* with $\text{Na}_2^{35}\text{SO}_4$ produced only slight activity in blood and milk proteins.—A. Hepburn.

929

SHMERLING, ZH. G. and MOGILEVSKAYA, Z. G. Obmen glyutamina i aspargina v platzente i embriionakh krysi i krolikov. [Metabolism of glutamine and asparagine in the placenta and in embryo rats and rabbits.] *Biokhimiya*, 1954, 19, 30-35. [Inst. Med. Biol. Khim., Akad. Med. Nauk SSSR, Moscow.]

Metabolism of glutamine and asparagine in tissue slices and homogenates from embryos and placenta of rat and rabbit was studied at different stages of foetal development. Glutamine was present in placental and embryonic tissues of the rat at all stages, the amount increasing with growth. Synthesis of glutamine from glutamic acid and ammonia was observed in rabbit placental slices, but could not be demonstrated in either slices or homogenates of rat placenta. *In vivo*, however, formation of glutamine could be demonstrated in these tissues after injection of ammonium salts.

Glutaminase was found to be present in both rat and rabbit placenta, but asparaginase was absent from rat placenta although it appeared in embryonic tissues of both rat and rabbit towards the end of pregnancy.—D. W. Taylor.

930

JOHNSON, R. M., LEVIN, E. and ALBERT, S. Lipide metabolism during cell division. *Arch. Biochem. Biophys.*, 1954, 51, 170-175. [Richard Cohn Radiobiol. Lab., Detroit Inst. Cancer Res., Mich.]

Adult rats were each given a single subcutaneous injection of $45 \mu\text{C. NaH}_2^{32}\text{PO}_4$ per g. bodyweight either 1, 3 or 18 days after partial removal of the

liver and were killed 1 hr. later. The animals killed 3 days after operation were given also 0.03 mg. colchicine per 100 g. bodyweight by subcutaneous injection. Liver lipids were extracted.

In the regenerating liver tissue maximum ^{32}P activity in the phospholipin fractions was in rats killed at 3 days; the administration of colchicine caused an increase of about 50 per cent. in the incorporation of ^{32}P into the cephalins and slight increases in the incorporation of ^{32}P into the other 2 fractions. Since colchicine, a metaphase inhibitor, did not abolish the uptake of ^{32}P into phospholipins it is suggested that the high ^{32}P uptake is associated with either interphase or prophase, but not with anaphase or telophase. Coincident with the period of hypertrophy on the day after operation in the regenerating livers there was an increase in the concentration of trienoic fatty acids and a decrease in tetraenoic acids. Three days after operation, when there was maximum mitotic activity, there was a considerable increase in the concentration of dioenoic acid; the inhibition of mitosis in metaphase with colchicine did not affect the level of dioenoic fatty acids.—G. A. Garton.

931

HATZIOLOS, B. C., YAMIN-SMITH, M. L. and SHAW, J. C. Histochemical studies of fat metabolism in mammary glands of lactating cows. *J. Dairy Sci.*, 1954, 37, 924-931. [Dairy Dept., Maryland Agric. Exp. Stat., College Park.]

Active mammary tissue from 3 dairy cows in mid-lactation was excised immediately after the animals were stunned and also 0.5, 1, 2 and 4 hr. *post mortem*. After fixing in formalin the tissue was stained with fat stains.

All the fatty droplets in the secretory cells appeared to consist of neutral fat; no free fatty acid was detected. It is concluded that, if free fatty acids are formed in the secretory cells as a result of the hydrolysis of blood fat, conversion to glycerides must be very rapid.—G. A. Garton.

932

JEDEIKIN, L. A. and WEINHOUSE, S. Studies of the incorporation of palmitate-1- C^{14} into tissue lipides *in vitro*. *Arch. Biochem. Biophys.*, 1954, 50, 134-147. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

Palmitate-1- ^{14}C was incubated in a Warburg apparatus with tissue slices or tissue homogenates obtained from fasting and normally fed rats, usually for 3 hr. at 38°C ., under oxygen or nitrogen. Phospholipins were then isolated by acetone precipitation and their constituent fatty acids were isolated for radio-active assay. Fatty acids were also isolated from the P-free lipids and were assumed to have been derived mainly from glyceride fat.

All the tissues examined were able to oxidize palmitate, the most active being kidney, heart, spleen and liver; incorporation of palmitate was generally greater in non-phospholipins than in phospholipins and occurred in all except adipose tissue. The incorporation of the labelled acid was significantly higher in tissues from fed than from fasted rats. The uptake of palmitate into phospholipins was influenced positively by the presence of oxygen and was impaired by the presence of respiration inhibitors, *e.g.*, cyanide, and phosphorylation inhibitors, *e.g.*, azide and dinitrophenol. Similar effects were not observed on the incorporation of palmitate into non-phospholipins.

Coenzyme A was found to stimulate the incorporation of palmitate into phospholipins in pigeon liver preparations; a similar effect could not be consistently demonstrated in rat liver.

It is suggested that the fatty acid ester bonds of phospholipins are formed by stepwise transesterification between acyl coenzyme A and either glycerophosphate or glycerophosphorylcholine.

G. A. Garton.

933

LYON, I. and GEYER, R. P. **Fatty acid metabolism and hepatic lipogenesis.** *J. Biol. Chem.*, 1954, 203, 529-536. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Octanoate- 1^{14}C was incubated with rat liver slices as described earlier (Abst. 2395, Vol. 20) to study its conversion to CO_2 , acetoacetate, cholesterol and long- and short-chain fatty acids in the presence of pyruvate, succinate, or fumarate, alone or in combination with malonate.

Long-chain fatty acid synthesis was inversely related to the amount of acetoacetate formed. Malonate alone did not affect the incorporation of octanoate into long-chain fatty acids, though less $^{14}\text{CO}_2$ was formed; the ^{14}C content of the resulting acetoacetate and short-chain acids increased. The addition of malonate to the incubation medium containing pyruvate, succinate or fumarate increased long-chain fatty acid synthesis and decreased conversion of octanoate to acetoacetate and short-chain fatty acids.—G. A. Garton.

934

GREEN, D. E. **Fatty acid oxidation in soluble systems of animal tissues.** *Biol. Rev.*, 1954, 29, 330-366. [Inst. Enzyme Res., Univ. Wisconsin, Madison.]

935

PENNINGTON, R. J. and SUTHERLAND, T. M. **The metabolism of propionic acid by sheep-rumen epithelial tissue.** *Biochem. J.*, 1954, 58, vii-viii. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

936

ANNISON, E. F. and PENNINGTON, R. J. **The metabolism of short-chain fatty acids in the sheep. 3. Formic, *n*-valeric and some branched-chain acids.** *Biochem. J.*, 1954, 57, 685-692. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Rumen epithelial tissue, liver and kidney slices were incubated with isobutyrate, *n*-valerate, isovalerate and α -methylbutyrate, with techniques already described (Absts. 2562, Vol. 22 and 3434, Vol. 24). All the acids were metabolised by rumen epithelial tissue: small amounts of acetate and propionate were formed from isobutyrate, *n*-valerate and α -methylbutyrate, and isovalerate gave rise to acetate and possibly to isobutyrate. The valerate isomers increased formation of ketone bodies. In the absence of CO_2 from the gas phase of the incubation mixture, isovalerate inhibited respiration of rumen epithelium. Liver and kidney slices also broke down the acids to shorter-chain products.

The absorption of these salts from the rumen was studied in a ewe with the rumen tied off; blood samples for analysis were withdrawn from the carotid artery and the posterior rumen vein and absorption of all 4 acids was demonstrated.

Chromatographic evidence revealed the presence of formate in sheep blood. Liver slices utilised formate; kidney, which utilised the other short-chain acids more rapidly than did liver, was less active, and rumen epithelium did not metabolise formate.—G. A. Garton.

937

DAVISON, J. P., SIMONSON, C. and CORNATZER, W. E. **Effect of coenzyme A on phospholipide synthesis in rat liver slices.** *Biochim. biophys. Acta*, 1954, 15, 141-142. [Dept. Biochem., Med. Sch., Univ. N. Dakota, Grand Forks.]

Liver slices from rats were incubated in Krebs Ringer phosphate buffer, pH 7.3, for 4 hr. at 37°C . in the presence of approximately $2\ \mu\text{Ci. }^{32}\text{P}$, in a Warburg apparatus under an atmosphere of 95 per cent. oxygen and 5 per cent. CO_2 . Coenzyme A (CoA), adenylic acid, ADP, ATP, succinate and cysteine were added singly or in combinations. The metabolic activity of the slices was terminated by the addition of trichloroacetic acid (TCA) and the radio-activity and P content of the lipid and TCA fractions were estimated.

CoA at a concentration of $7.7 \times 10^{-4}\text{ M}$ caused a decrease of 69.4 per cent. in the incorporation of phosphate into phospholipins, but with a lower concentration, $1.54 \times 10^{-4}\text{ M}$, stimulation of synthesis resulted. Adenylic acid, ADP or ATP with CoA at the lower concentration decreased the rate of phospholipin synthesis. Cysteine with CoA inhibited phospholipin formation; succinate had little effect.—G. A. Garton.

938

WERTHESSEN, N. T., MILCH, L. J., REDMOND, R. F., SMITH, L. L. and SMITH, E. C. Biosynthesis and concentration of cholesterol by the intact surviving bovine aorta *in vitro*. *Amer. J. Physiol.*, 1954, 178, 23-29. [Dept. Physiol., Southwest Found. Res. Educat., San Antonio, Tex.]

Aortas removed from bull calves aged between 3 and 14 days were maintained *in vitro* as described by Werthessen and Schwenk (Title 2046, Vol. 23). The perfusion fluid contained sodium acetate-1-¹⁴C. Samples of the aortas were analysed for cholesterol before and at intervals after perfusion; glucose consumption from the perfusing medium was estimated.

Cholesterol was concentrated by the isolated aortas; the increase in concentration was related to the utilisation of glucose. Radio-active cholesterol digitonide was isolated, showing that cholesterol had been formed.

Cholesterol elaborated by the aorta itself may prove to be as important in the genesis of atherosclerosis as cholesterol taken up directly from the bloodstream.—G. A. Garton.

939

SOBEL, A. E., GOLDENBERG, H. and SCHMERZLER, E. Calcification. 11. Studies of the incorporation of citrate in calcification *in vitro*. *J. Dent. Res.*, 1954, 33, 497-503. [Dept. Biochem., Jewish Hosp., Brooklyn, N.Y.]

940

DOBSON, A. and PHILLIPSON, A. T. The forces moving chloride ions through rumen epithelium. *J. Physiol.*, 1954, 125, 26P-27P. *Proc.* [Rowett Research Inst., Bucksburn, Aberdeenshire.]

941

BAKKE, J. L. and LAWRENCE, N. The metabolism of inorganic iodide in thyroid slices, with delineation of a new iodide compartment. *J. Clin. Endocrinol.*, 1954, 14, 771. *Proc.* [Veterans Admin. Hosp., Univ. Washington, Seattle.]

See also Absts. 380, 386, 471, 479, 741.

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942

HIRT, R., FISCHER, R. and BERCHTOLD, R. Zum Wirkungsmechanismus cancerogener Substanzen. [The mechanism of action of carcinogenic substances.] *Biochem. Ztschr.*, 1954, 325, 497-504. [Forschungsinstit. A. Wander A.G., Berne.]

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943

LIEFLÄNDER, M. and TRONNIER, H. Über die Amino-säureverteilung in normaler menschlicher Haut und in Epitheliomen. [Distribution of amino-acids in normal human skin and in epitheliomas.] *Naturwissenschaften*, 1954, 41, 282-283. [Hautklin., Univ. Göttingen.]

944

STEINFELD, J. L., WHITE, L. P., PETRAKIS, N. L. and SHIMKIN, M. B. Negative effects of some metabolite analogs in human neoplasms. *Cancer Res.*, 1954, 14, 315-318. [Lab. Exp. Oncol., Nat. Cancer Inst., Bethesda, Md.]

In 28 patients with advanced cancer no benefit was observed after administration by mouth or by vein of 8-azaguanine, benzimidazole, aminopterin, isoriboflavin, flavotin, isonicotinic acid hydrazide or ethionine.—D. Duncan.

945

ALLARD, C. and CANTERO, A. Adenosinetriphosphatase study during rat liver damage. 2. ATP-ase activity of rat liver during 4-dimethylaminoazobenzene carcinogenesis. *Rev. canad. Biol.*, 1953, 12, 35-39. [Cancer Inst., Montreal.] French summary.

Rats weighing from 150 to 200 g. were maintained for from 15 to 90 days on a low-protein, semi-synthetic diet with or without 0.06 per cent. 4-dimethylaminoazobenzene. Adenosinetriphosphatase was estimated in homogenates of the liver and in nuclear, mitochondrial and supernatant fractions from the homogenates. The enzyme was low only in the mitochondrial fraction, which seemed to be due to a decrease in the number of mitochondria rather than to a decrease in the enzyme activity of individual mitochondria.

No evidence was thus obtained of any relation between adenosinetriphosphatase activity of the liver and the process of carcinogenesis.

E. M. Hume.

946

NELSON, D., SZANTO, P. B., WILLHELM, R. and IVY, A. C. Hepatic tumors in rats following the prolonged ingestion of milk and egg yolk. *Cancer Res.*, 1954, 14, 441-444. [Dept. Clin. Sci., Coll. Med., Univ. Illinois, Chicago.]

Ten male and 10 female rats were given a diet designed to produce arteriosclerosis, consisting of 5 per cent. powdered egg yolk in whole milk. The mixture was homogenised in a Waring Blender, but the yolk rose to the top during the day and so the diet as consumed contained more than 5 per cent. egg yolk. Initially the males were 10 to 23 weeks and the females 15 to 19 weeks old.

Moribund animals were killed and all the survivors were killed at the end of 2 years.

No rat which survived less than 1½ years had a hepatic tumour, but of those which lived more than 1½ years 3 of the 4 males and 3 of the 6 females developed hepatic tumours. The average age of these 6 rats was 111 weeks, and all received the yolk diet for at least 78 weeks. In the stock colony among 25 rats of comparable age there was no hepatic tumour.

In all the rats with tumours the liver was enlarged, with fatty changes and focal necrosis, but no cirrhosis. Tumour nodules replaced the liver parenchyma, and appeared to be liver-cell hepatomas. The genesis of the tumours is discussed.

D. Duncan.

947

DUNNING, W. F. and CURTIS, M. R. Further studies on the relation of dietary tryptophan to the induction of neoplasms in rats. *Cancer Res.*, 1954, 14, 299-302. [Dept. Microbiol., Univ. Miami, Coral Gables, Fla.]

This paper extends the studies reported in Absts. 2410 and 3933, Vol. 20, to a lower, slightly inadequate concentration of tryptophan. Diethylstilboestrol-treated rats on a diet containing 26 per cent. tryptophan-free casein hydrolysate supplemented with 0.14 per cent. DL-tryptophan lost less weight and showed a greater increase in pituitary weight than rats on a similar but unsupplemented diet; they survived longer and developed more mammary cancer with longer average latent period, in contrast to the decreased latent period previously found when 1.4 per cent. tryptophan was used.

Among rats given 0.06 per cent. 2-acetylaminofluorene to induce liver cancer, those given tryptophan developed more neoplasms and survived for a shorter time. In contrast to the previous experiments, when 1.4 or 4.3 per cent. tryptophan was given and all other conditions were the same, no bladder tumour was found.

It is concluded that a partial chronic deficiency of dietary tryptophan did not protect against induced liver or mammary gland neoplasms.

C. Warner.

948

SHTENBERG, A. I. and NAUMOVA, L. P. Nekotorye kriticheskie zamechaniya po voprosu o roli peregretykh zhirov v vozniknovenii zlo-kachestvennykh novoobrazovaniy (obzor inostrannoi literatury). [Some critical comments on the role of superheated fats in the genesis of malignant neoplasms (a review of the foreign literature).] *Vop. Pitan.*, 1954, 13, pt. 2, 41-46. [Toksikol. Lab., Otdel. Pishch. Gigen., Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

949

LE BRETON, E. Role déterminant d'un facteur alimentaire simple dans l'obtention certaine du cancer du foie chez le rat Wistar ingérant un cancerigène (*p*-diméthylaminoazobenzène.) [Dominant role of a simple food factor in the certain production of liver cancer in the Wistar rat consuming a carcinogen (*p*-diméthylaminoazobenzène).] *C.R. Acad. Sci.*, 1954, 238, 2446-2448.

It was earlier shown (Abst. 2464, Vol. 22) that on a balanced diet containing 5 per cent. cholesterol, *p*-diméthylaminoazobenzène (butter yellow) produced no liver cancer in rats even after 30 to 36 months of ingestion. The diet contained, per 100 g.: casein 17, lactalbumin 3, sucrose and lactose 60, purified lard 10, brewer's yeast 2.5, salt mixture 5, agar 2.5, with choline 0.2, riboflavin 0.002, all the other B vitamins and vitamins A, D and E, and butter yellow 0.06 g. To 100 g. diet was added 5 g. cholesterol.

In 100 rats on this diet no liver cancer developed. When 10 per cent. sucrose replaced the lard or when choline was omitted, the incidence of liver tumours was 100 per cent.

This is the first report that by modification of a single dietary factor (the choline:glyceride ratio) it is possible to obtain liver cancer with certainty.

D. Duncan.

950

LAU, H. and BAIER, P. Über Versuche zur gelenkten Krebszerzeugung durch Zusammenwirken einer spezifischen Krebsnoxo (*2*-Acetylaminofluoren) und einer nichtkrebspezifischen Schädigung (Cholinmangelernährung). [Experiments on the controlled production of cancer by the combined effect of a specific carcinogen (*2*-acetylaminofluorene) and damage due an agent not producing cancer (choline-deficient diet).] *Langenbecks Arch. klin. Chirurg.*, 1954, 278, 156-172. [Chirurg. Klin., Univ. Heidelberg.]

Rats were given for 5 days a choline-free diet containing 0.05 per cent. 2-acetylaminofluorene and thereafter a stock diet containing the same amount of the carcinogen. Many animals died before reaching the age at which tumours were likely to appear. The frequency of liver tumours in the remainder was not greater than that reported for animals given choline, and the conclusion, with reserve in view of the severe experimental conditions, is that the choline-deficient diet did not increase the number of liver tumours induced by 2-acetylaminofluorene.—M. B. Richards.

951

DE ANGELIS, G., CIUSA, W. and NEBBIA, G. Acidi grassi non saturi e idrocarburi oncogeni. 2. [Unsaturated fatty acids and oncogenes]

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hydrocarbons. 2.] *Acta vitaminol.*, 1954, 8, 161-163. [Ist. Mercol., Univ. Bologna.] French, English, German and Spanish summaries.

All 16 groups of 10 to 20 adult white rats received 3:4-benzpyrene in 0.3 per cent. solution by external application to shaved skin twice weekly. The experimental groups received 0.25 ml. per head daily of an emulsion containing 4 per cent. of unsaturated fatty acids.

Tumours appeared earlier, on the average after 75 instead of 118 days, in the rats given fatty acids. The incidence of tumours was 39.23 per cent. without and 59.23 per cent. with fatty acids.

D. Duncan.

952

BARVICK, L. and GOODSON, L. H. Effects of combined chemotherapy on Sarcoma 180, with special reference to food intake, body-weight

changes, and survival time. *J. Nat. Cancer Inst.*, 1954, 15, 177-189. [Chem. Res. Div., Midwest Res. Inst., Kansas City, Mo.]

Mice bearing transplants of sarcoma 180 received singly or in combination amethopterin, N,N-bis(2-chloroethyl)-aniline, triethylene melamine and erythromycin, all by intraperitoneal injection. Singly all were toxic, and effects on the host could not be separated from those on the tumours. Amethopterin with triethylene melamine or with N,N-bis(2-chloroethyl)-aniline, and the latter with erythromycin, were effective in increasing the time of survival, in spite of losses in bodyweight.

Experiments with food restriction and starvation, designed to separate the effects of these agents on the nutritional state of the mice from effects on the tumour, were inconclusive.—D. Duncan.

See also Absts. 265, 324, 655.

METABOLISM OF GROWTH, REPRODUCTION AND SENESCENCE

GROWTH

953

SPIES, T. D. Influence of pregnancy, lactation, growth and aging on nutritional processes. *J. Amer. Med. Assoc.*, 1953, 153, 185-193. [Dept. Nutrit., Northwestern Univ. Med. Sch., Chicago, Ill.]

A lecture.

954

PATWARDHAN, V. N. The influence of malnutrition on child growth and physical development. *Calcutta Med. J.*, 1954, 51, 117-129. [Nutrit. Res. Labs., Indian Coun. Med. Res., Coonoor, S. India.]

A lecture.

955

HERDAN, G. The relation between birth weight and subsequent weight in childhood. *Arch. Dis. Childhood*, 1954, 29, 220-223. [Dept. Prevent. Med., Univ. Bristol.]

Examination of published data and the author's Bristol data on the weights of children at birth, 3 months and 6 months showed that the positive correlation between birthweight and subsequent weight decreased with age. In the Bristol study average weight gain at 3 and 6 months was inversely related to birthweight. These results are discussed.—F. C. Aitken.

956

THOMSON, J. Birth weight and weight increment in the first year. *Med. Officer*, 1954, 92, 75-76. [Dept. Child Life, Univ. Edinburgh.]

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A cross-sectional study was made of the weights at 2, 4, 12, 26, 40 and 52 weeks of healthy single first-born boys and girls born in Edinburgh Royal Infirmary; most groups were of 100 or more.

Boys gained more weight than girls, especially in the first 12 weeks. Most of the correlations between birthweight and weight increment were small and negative and none was significant after 4 weeks for boys and 12 weeks for girls, in agreement with the author's other findings (Abst. 4966, Vol. 24) and those of Parfit (Abst. 2424, Vol. 21).

W. M. Deans.

957

PHILLIPS, H. T. The seasonal growth of nursery-school children in relation to social and ethnic factors. *S. African J. Clin. Sci.*, 1954, 5, 82-96. [Inst. Family Health, Merebank, Natal.]

The weights and heights of 3 groups of South African nursery schoolchildren, lower income white, upper income white and Bantu, were taken regularly for 15 years and the results are analysed statistically to investigate the seasonal variations in increases.

In weight gains in the lower income white group there was no difference with age except for 3-year-old girls who gained significantly more in summer than did 4-year-old girls. There was no significant difference with sex. White children in the lower income group and the Bantu children had gains significantly greater in autumn and winter than in spring and summer; upper income group boys gained significantly more in winter and in summer than in spring, but girls of this group showed no significant seasonal change. In autumn lower income group boys gained significantly more than

upper income boys; Bantu girls gained in winter significantly more and in summer significantly less than did white girls.

Seasonal growth in height was studied only in the lower income white group and in Bantu children. There was no significant seasonal difference for the lower income children, but the growth of the Bantu children was significantly better in spring and summer than in autumn and winter.

G. F. Garton.

958

MULCOCK, D. A short study of the onset of puberty in boys. *Med. Officer*, 1954, 91, 247-249.

Height, weight, bipelvic diameter, and criteria of development were recorded at quarterly examinations of 100 boys between 10 and 15 years randomly selected from 257 pupils of a preparatory school for the well-to-do in Leeds. The results are compared with those of Ellis (Abst. 2264, Vol. 17) and several U.S. workers.

In each age group the more mature were heavier and taller. The mean age of appearance of pubic hair was 12 years 3 months, which is between 6 and 12 months earlier than that quoted in the literature. Over three-quarters of the boys belonged to the Registrar-General's classes 1 and 2, but even so puberty was earlier in the most prosperous of 3 groups. In the age group 12 to 13, 65 per cent. were judged pubescent, 5 per cent. adolescent and 30 per cent. pre-pubescent. For 30 Anglicised Jewish boys considered separately, the average age of onset of puberty was about a year lower than in the whole group of 100, of which they formed part.—W. M. Deans.

959

MURO, A., ACEÑA, A. and VIVANCO, F. Patrones de crecimiento de niños normales españoles. [Growth patterns of normal Spanish children.] *Rev. clín. española*, 1954, 53, 360-363. [Inst. Nac. Hig. Aliment. Nutric., Madrid.] English, German and French summaries.

Heights and weights are tabulated according to age for 4940 healthy boys, from 6 to 18 years old, at 2 schools in Madrid. The means are compared with those of Wetzel (Abst. 1498, Vol. 11) and Suárez and Teixeira (*Proc. VIII Congreso Nac. Pediat., Barcelona*, 1952). It is concluded that the data may be regarded as representative of the growth of normal Spanish boys.—D. Duncan.

960

MURO, A. and ACEÑA, A. Nuevo metodo grafico para la determinacion de la edad de crecimiento infantil. Gegonia auxologica Muro-Aceña. [New graphic method of determining the age of growth of infants. Gegonia auxologica of Muro and Aceña.] *Rev. clín.*

española, 1954, 53, 364-366. English, German and French summaries.

From the data in the preceding paper the authors have prepared a new grid system for assessing growth according to age, height and weight. The graph is given the name "gegonia auxologica", and is considered useful with Spanish children.—D. Duncan.

961

LELONG, M., JOSEPH, R., CANLOBE, P. and SCHOLLER, R. Une nouvelle méthode de représentation graphique de la croissance. [A new method of representing growth graphically.] *Presse méd.*, 1954, 62, 701-704. [Centre Endocrinol. Infantile, Clin. Pédiat., Hôp. Saint-Vincent-de-Paul, Paris.]

The measurements recorded are, in addition to age, weight, standing height, finger-tip breadth, height from upper edge of pubic symphysis to ground, girth at the xiphisternum and umbilicus (as a measure of state of nutrition) and bi-lumeral and bi-trochanteric diameters (as a measure of sexual maturity). Height is the reference measurement and the others are compared with "normal" measurements for the height of the child examined. Its use as described is clinical. Examples are for children with myxoedema, precocious sexual development, pituitary nanism and genetically slow growth.—I. Leitch.

962

GARCIA ALVAREZ, M. R. Desarrollo físico de un grupo de niños de una zona rural. [Physical development of a group of children in a rural area.] *Medicamenta*, 1954, 22, 65-72. [Inst. Laboral, Ribadavia, Orense.]

The subjects were 79 pupils of the Centro Laboral de Ribadavia, aged from 10 to 18 years. They were grouped by age and variations in weight, height and thoracic circumference were studied [the groups aged 15, 17 and 18 consisted of 1, 1 and 2 subjects].

Although the children came from poor agricultural families their development was similar to that of other Spanish children of good economic position and well nourished American and Central European children (Baldwin and Wood, and von Pirquet), when compared by Wetzel's methods. It is considered that in contrast to low-income groups in Spanish towns, the country children are well fed.—D. Duncan.

963

ABRAMSON, E. and ERNEST, E. Height and weight of schoolboys at a Stockholm secondary school, 1950, and a comparison with some earlier investigations. *Acta paediat.*, 1954, 43, 235-246. [State Inst. Pub. Health, Tomtebodavägen, Sweden.] French, German and Spanish summaries.

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Mean heights and weights at yearly intervals with standard deviations are tabulated for 871 of the 912 boys attending a secondary school in Stockholm in 1950. When they were divided into 3 groups according to parents' income after tax deduction, no significant difference in weight was found, but the boys from the lowest income group were significantly shorter ($P = 0.05$). At constant age, the correlation between height or weight and income was almost zero. When the grouping was by father's occupation, the sons of "civil servants and other employees" were the tallest and the difference between them and sons of "workers" was highly significant.

The results are compared with those of Key in 1883 and of Broman *et al.* in 1938 (Abst. 2500, Vol. 15). Mean height for the whole age range 10½ to 20½ years has risen by 14.3 cm. since 1883 and mean weight by 11.5 kg., and the figures suggest that this secular change is still continuing. The yearly increase in height is nearly twice that for conscripts from the whole country.—W. M. Deans.

964

BOUILLIÈRE, F., HUARD, P., NGUYEN VAN NHUNG and TRAN Vx. La croissance staturale et segmentaire des Vietnamiens du nord. [Growth in stature and segmentary growth in Vietnamese of the north.] *C.R. Acad. Sci.*, 1954, **238**, 2564-2567.

There is little information on the relative growth ratio of different parts of the human body, and it is impossible, for example, to determine whether climate can affect the relative length of the limbs in some specific nationality. A comparative study has been begun of the growth of different parts of the body of different peoples in their native climates and in others to which they are not suited by heredity, and this paper reports the results of a study on Vietnamese at Hanoi. A table is presented of means by age and sex of stature, leg length, trunk length, and arm length, with standard errors. There is also a graph showing at different statures what proportion of growth in stature is represented by growth in the 3 measures stated above. Stature ranges from 0.85 m. to 1.60 m.

Several conclusions are drawn, among these that growth in leg length is more important in the younger children (aged 3+), and in the later years of growth increase in trunk length becomes more important. This change in relative importance takes place somewhere between 9 and 12 years, before puberty. Growth is completed by 17 years of age, which, the authors state, is earlier than among Europeans.

It is pointed out that a study of Vietnamese born in France would be necessary to determine how far this difference was due to genetic and how far to ecological factors.—A. W. Boyne.

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965

ABE, K. and YANO, K. An analytical study of the growth curve.

YANO, K. A comparative study on the growth in height and weight of normal, blind, and deaf school-children. *Kurume Med. J.*, 1954, **1**, 67-70; 71-84. [Dept. Environmental Hyg., Sch. Med., Kurume Univ., Kurume-shi, Japan.]

Curves of (1) growth in height, (2) rate of increase, (3) rate of relative increase, *i.e.*, (2) ÷ (1), and (4) rate of acceleration for normal, blind, and deaf boys and girls, based on Educational Ministry school statistics for 1950, are reproduced. The rate of increase curve for the handicapped children had several peaks instead of one, *i.e.*, their growth was erratic.

Curves of growth in height and rate of relative increase based on Educational Ministry statistics for 1948-1951 for normal, blind, and deaf boys and girls confirmed the previous findings. Results for weight are stated to be similar. From a further study of the 1951 figures it was concluded that the blind and deaf are inferior to the normal in both height and weight at ages 18 and 19, *i.e.*, when growth is completed, and that their rate of growth is more variable. Individual growth studies extending from 1940 to 1952 on 125 deaf children and 200 normal children from the same localities showed that on the average these deaf children were not retarded in growth, but the group contained more retarded and more advanced in growth than the normal group.

An addendum states that the degree of loss of hearing makes no difference to growth, so that abnormalities are ascribed to the peculiar environment of the deaf.—W. M. Deans.

966

PARNEL, R. W. The physique of Oxford undergraduates. Relationship with weight variation, schooling and habits. *J. Hyg.*, 1954, **52**, 369-378. [Warneford Hosp., Oxford.]

The height and weight of Oxford undergraduates are discussed. It is not stated how they were sampled, but the implication from text and tables is that they are represented by students who attended the pilot student health service from 1947 to 1950. These are compared with the general community divided into social classes and found to be taller and heavier. Comparisons are made between those who came from boarding schools, private day schools and government-aided schools.

Undergraduates were similar in weight and height to those of 1908 to 1910, but the construction of the 2 samples is not compared.

The commoner somatotypes are shown to be taller and heavier than American students of similar somatotypes.

Weight change during university residence is examined, the samples being broken down by origin of students. A sample of female students is similarly analysed. In both sexes the younger students gain more weight. Investigations are made of the association between loss of weight and psychological upset and the association between weight change and the habits of playing games and smoking.—A. W. Boyne.

967

CLEMENTS, E. M. B. and PICKETT, K. G. **Body-weight of men related to stature, age, and social status. Weight of Scotsmen measured in 1941.**

Chest girth of men related to stature, age, bodyweight, and social status. Chest girth of Scotsmen measured in 1941. *Brit. J. Prev. Social Med.*, 1954, 8, 99-107; 108-116. [Dept. Anat., Univ. Birmingham.]

The extent to which social, geographical, economic and other conditions affect bodyweight of Scotsmen was studied. The men were examined in 1941 by the Scottish medical boards of the Ministry of Labour and National Service.

The mean weight by age-groups presented for each region shows men of the Northern region to be the heaviest and those of the West Central region to be lightest, and also shows a tendency for weight to increase with age. The analysis is subsequently refined, so that log weight is investigated and the effects of stature, age, geography and social class on this transformed variate are considered. Log weight is linearly related to stature; up to age 30 weight increases with age, but beyond that age the trend is small; when age and stature have been taken into account the social classes do not differ significantly.

The sample is random within occupations and age-groups, but is not representative of the civilian population.

By similar methods of analysis, log girth was found to be related to log weight, to stature, and to age. The data were standardised for this relation and it was found that for each social class there were significant differences between the results for different medical boards. It was not possible to say how far this was due to differences in measuring technique and how far to real geographical differences. The standardised girth did not differ significantly between social classes, and was greater in men fit for service than in the unfit. A. W. Boyne.

968

HRACHOVEC, J. **Sur une formule s'appliquant à la courbe de croissance d'un animal. [A formula for application to the growth curve of an animal.]** *C.R. Acad. Sci.*, 1954, 238, 2356-2358.

It is suggested that the empirical is the most reasonable approach to the problem of obtaining mathematical equations to represent growth and to search for an equation which best approximates to function.

For the rabbit, a third order exponential function represented growth as a function of time. Such an equation also fits the growth of the mouse, horse, cattle, sheep and other domestic animals. The fit of this function to data representing the growth of mice is shown in a graph.

A second order exponential function is not such a good fit for the growth of an animal, but much better for that of a colony of *Vorticella*, whose growth is considered by Teissier to be intermediate between that of a population and an animal. A first order exponential function has already been postulated by others for the growth of a population.—A. W. Boyne.

969

BHASKAR, S. N., WEINMANN, J. P. and SCHOUR, I. **The growth rate of the tibia of the *ia* rat from 17 days insemination age to 30 days after birth.** *Anat. Rec.*, 1954, 119, 231-245. [Dept. Oral Pathol., Univ. Illinois.]

In rats of strain *ia*, bone tissue is not resorbed and the perichondral splint which first forms around the middle of the cartilaginous tibia persists as a landmark from which the growth rate can be measured. The tibias were studied of 6 rats between 17 days after insemination and birth, 11 rats from birth to 5 days old, 7 between 9 and 12 days and 7 between 15 and 30 days.

Rapid growth occurred at the times of appearance of ossification centres, between 17 and 19 days of foetal age and between 10 and 12 days after birth. The proximal and distal epiphyses grew at about the same rate until 11 days after birth, after which the proximal epiphyses grew the faster. Growth of the tibia was arrested for about 2 days after birth and was then rapid until about the twelfth day, after which it slowed down and secondary centres of ossification appeared. The growth of the medullary cavity and rate of replacement of cartilaginous epiphyses closely corresponded to the rate of growth of the cartilages.

D. Duncan.

970

RANKIN, J. J. **Lack of correlation between thymus and body weights during adolescence and early maturity.** *J. Physiol.*, 1954, 125, 316-321. [Univ. Coll. W. Indies, Jamaica.]

In a series of mice [number unstated] killed at ages from birth to 494 days, the maximum weight and length of the thymus was reached at 23 days.

The greatest ratio of thymus weight to body-weight was reached at 14 days, and in early growth there was close correlation between these weights

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($r = +0.93$). During adolescence and early maturity the correlation disappeared and there was great fluctuation in thymus weights. Caution is advised in the assessment of experiments on rates of thymic involution.—D. Duncan.

See also Absts. 1233, 1234.

REPRODUCTION AND LACTATION: MAMMALS

971

PROBST, V. and ROTH, O. A. Über einen Pflanzen-extrakt mit hormonartiger Wirkung. [A plant extract with hormone-like activity.] *Deutsch. med. Wochenschr.*, 1954, 79, 1271-1274. [Frauenklin., Univ. Tübingen.]

"Alyt", an alcoholic extract obtained from seeds of *Agnus castus* and previously shown to have an effect on the oestrous cycle of rats, was used in experiments on women. The patients studied included 24 with primary or secondary amenorrhoea, 16 with oligo-hypomenorrhoea and 40 with cystic-glandular hyperplasia of the endometrium.

With very few exceptions Alyt produced a distinct rise in the basal temperature, a secretion phase in the histological picture of the endometrium and a progesterone effect in the vaginal smear. The effect of Alyt on the ovaries was shown by ovulation and formation of a corpus luteum. Whether this was a direct or an indirect effect on the ovaries cannot yet be decided. The possible mechanism of the action is discussed.

M. B. Richards.

972

REPKE, K. and MARKWARDT, F. Versuche zum Lichteinfluss auf die jahreszeitliche Oestrus-periodizität. [Effect of light on the seasonal periodicity of oestrus.] *Arch. exp. Pathol. Pharmacol.*, 1954, 223, 259-270. [Pharmakol. Inst., Univ. Greifswald.]

The hypothesis that the role of light in the seasonal occurrence of oestrus might consist in conversion in the skin of the relatively inert oestrone to the relatively active oestradiol 17 β was tested in rats, which were irradiated after receiving injections of oestrone. There was no increase of activity. The effect of light is therefore thought to be of nervous origin, transmitted via the retina and hypothalamus to the pituitary to cause liberation of gonadotropic hormones.—I. Leitch.

973

CLEMETSON, C. A. B. The placental transfer of amino-acids in normal and toxæmic pregnancy. *J. Obstet. Gynaecol. Brit. Empire*, 1954, 61, 364-371. [University Coll. Hosp., London.]

Plasma α -amino-acid N levels of maternal and foetal blood were estimated in 43 cases immediately after delivery of the baby. In 18, pregnancy

was apparently normal, but in 7 of these the umbilical cord was found coiled around the baby's neck. There were 9 women with mild toxæmia, 10 with pre-eclampsia and 4 with toxæmia and with the cord round the baby's neck.

The mean foetal amino-acid N levels were similar in all groups, slightly below 5 mg. per 100 ml. The mean maternal amino-acid N level was 2.96 ± 0.11 mg. per 100 ml. in the normal group, 3.23 ± 0.21 in mild toxæmia and 3.52 ± 0.22 in pre-eclampsia. When the cord was round the baby's neck the mean maternal level was 3.52 ± 0.15 and 3.65 ± 0.22 mg. per 100 ml. in the non-toxæmic and toxæmic groups, respectively.

It is concluded that amino-acids are actively transferred from the maternal to the foetal circulation across the placenta and that their level rises in the maternal blood when this transfer is impeded by an obstructed umbilical cord or when placental function is impaired in toxæmia of pregnancy.

F. E. Hytten.

974

RÖTTGER, H. Über den Wasserhaushalt in der physiologischen und toxischen Schwangerschaft. 2. Der Wasserhaushalt bei Schwangerschaftsspättoxikosen. [Water metabolism in normal and toxæmic pregnancy. 2. Water metabolism in toxæmia of late pregnancy.] *Arch. Gynäkol.*, 1953-54, 184, 629-642. [Frauenklin., Med. Akad. Düsseldorf.]

For part 1 see Abst. 3480, Vol. 24. The water metabolism was studied by the methods there described in 18 patients with renal disorders of pregnancy, pre-eclampsia or eclampsia, all with manifest oedema.

In 15 of the 18 cases plasma volume was below the mean found in normal pregnancy at the corresponding stage, but interstitial tissue fluid was much increased, often by 8 to 10 litres above that of the normal non-pregnant woman. The changes were rapidly reversed in the puerperium; the plasma volume increased despite loss of blood at parturition, and the oedema was reduced by diuresis.

D. Duncan.

975

ABDINE, F. H., GHALIOUNGUI, P. and EL RIDI, M. S. Über die Zusammensetzung der Amnionflüssigkeit. [Composition of amniotic fluid.] *Hoppe-Seyler's Ztschr.*, 1954, 296, 44-55. [Inst. Biochem., Med. Fak., Kasr el Aini, Cairo.]

976

KAYSER, H. W. Die Permeabilität der Placenta für P_{22} , zugleich ein Beitrag zur Frage der Blutdurchströmung des intervillösen Raumes. [Permeability of the placenta to ^{32}P ; a contribution to the problem of the blood circulation

in the intervillous space.] *Arch. Gynäkol.*, 1953-54, 184, 385-413. [Frauenklin., Univ. Kiel.]

Data are presented from experiments in which 30 to 40 $\mu\text{C.}^{52}\text{P}$ in 5 ml. saline was injected into the right cubital vein of 50 women in labour. Immediately after delivery blood was taken from the left cubital vein and from the cord. Recorded are age, parity, earlier abortions, menstrual age of the foetus, blood pressure, duration of labour; weight and length of the child and weight of the placenta; haematocrit, Hb and red cell count for both mother and child; interval between injection and delivery and the activity of whole blood, plasma, and erythrocytes in both maternal and cord blood, and activity of the placenta.

The activity per unit volume of cord plasma equalled that of maternal plasma after about 1 hr. and thereafter equalled it or exceeded it by up to 100 per cent. In red corpuscles cord activity on the average rose to about 40 per cent. of maternal at 1 hr., but did not on the average rise above that level. Total activity in maternal blood always exceeded that in foetal. It is computed that a total of about 0.17 $\mu\text{C.}$ was transferred to the foetus.

The activity of the several layers of the placenta was the same 2 min. after injection and remained constant for a long time. From this it is computed that the rate of blood flow to supply the placenta is not slow, as has been supposed, but that the maternal blood in the intervillous spaces is renewed at about the same rate as foetal blood in the placental vessels, with complete renewal in about 1 min.—I. Leitch.

977

ROMBAUTS, P., BOURDEL, G. and JACQUOT, R. Sur la signification de l'étendue des facultés anabolisantes des femelles gestantes. [Significance of the increased anabolism of pregnant female animals.] *C.R. Acad. Sci.*, 1954, 238, 2260-2262.

During a preliminary period, 24 adult female rats were given a diet containing 20 per cent. protein as casein, supplemented by cystine; although their weights remained at about 200 g. after the eighth day, they were in positive N balance at a level of about +15 per cent. After 74 days, the rats were divided into 5 groups: (1) pregnant animals, given a 20 per cent. protein diet to appetite; (2) and (3), respectively, pregnant and non-pregnant animals given a diet containing N at a maintenance level, 100 mg. daily, plus an allowance calculated to provide twice the N demands of the products of conception; (4) and (5), respectively, pregnant and non-pregnant animals receiving 100 mg. N daily.

The rats in groups 2 and 3 ate about the same

amounts, 5.7 g. dry matter daily; those in group 4 about 9.2 g. dry matter. The weight of control animals in groups 3 and 5 remained stationary, all pregnant animals gained weight; their weights post partum were 40 per cent. (group 1), 25 per cent. (group 2) and 19 per cent. (group 4) above starting weights. In groups 2, 3 and 4, change to the experimental diets resulted in a negative N balance for 4 days, but the balance then became and remained positive, even in group 4 where N intake was at maintenance level for the non-pregnant animal. In group 5 the N balance was in equilibrium.—A. M. Thomson.

978

FERGUSON, N. L. Changes in the liver fat of the pregnant sheep at different levels of nutrition and during starvation. *Brit. J. Nutrition*, 1954, 8, 269-280. [Sch. Agric., King's Coll., Univ. Durham.]

From mating to the one-hundredth day of pregnancy, 44 halfbred ewes, fed individually indoors, increased in weight from 149 to 168 lb. Fifteen ewes were then fed on a high-plane diet and gained a further 17 lb. in the 138th day of pregnancy. Eighteen ewes were placed on a low-plane diet and lost 32 lb. in the same period.

The well-fed pregnant ewes had 13.1 per cent. liver fat, no more than non-pregnant ewes, but the amount rose considerably with growth. Starved pregnant ewes were starved. Liver fat of ewes on the low-plane diet from the one-hundredth day of pregnancy rose to 26.7 per cent. by the 138th day, but starvation imposed at this time reduced the fat content. Pregnancy reduced the fat content of 13 low-plane ewes before starvation was imposed.

979

FERGUSON, N. L. Relationship between maternal liver fat and foetal weight in ovine pregnancy. *Nature*, 1954, 174, 277-278. [Sch. Agric., King's Coll., Univ. Durham.]

Eight ewes fed on a high plane throughout pregnancy were compared with 6 fed on this high plane for the first 100 days of pregnancy and thereafter on a low plane, on which they lost much weight. Total liver fat of low-plane ewes (6 twins) was 8.8 and of high-plane ewes (4 twins, 4 singles) 26.7 per cent. of fresh weight. Significant positive correlation was found between maternal liver fat and weight of foetuses in the low-plane but not in the high-plane ewes. In the latter the body reserves did not appear to have been used.

J. C. Gill.

980

KARVONEN, M. J. and RÄIHÄ, N. Permeability of placenta of the guinea pig to glucose and fructose. *Acta physiol. scand.*, 1954, 31, 194-202. [Inst. Occupational Health, Helsinki.]

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The permeability of the placenta of the guinea-pig to glucose and fructose was studied *in situ* by infusing the sugar into the maternal circulation, or by injecting it into the foetus. When glucose was infused into the mother, the rise in foetal blood sugar was closely parallel to the rise of glucose in the mother, showing that the placenta was freely permeable to glucose coming from the maternal side. When glucose was injected into the foetus, the glucose level fell fairly rapidly to that of the mother, indicating that the placenta was permeable to glucose from the foetal side. The transfer of glucose from the foetus was possibly somewhat slower than from mother to foetus, but further study is needed on the point. The transfer of fructose through the placenta in each direction was considerably slower than that of glucose. It is concluded that the transfer of glucose through placenta in both directions is an active process in the guinea-pig, as it is in the sheep, in spite of the differences in carbohydrate metabolism between the 2 species.—M. B. Richards.

981

MORRISON, S. D. Water balance of pregnant rats. *J. Physiol.*, 1954, 125, 48P. *Proc. [Inst. Physiol., Univ. Glasgow.]*

982

CROSS, B. A. Emotional inhibition of the milk-ejection reflex. *J. Physiol.*, 1954, 125, 43P. *Proc. [Dept. Vet. Clin. Studies, Univ. Cambridge.]*

983

HYTTEN, F. E. Clinical and chemical studies in human lactation. 7. The effect of differences in yield and composition of milk on the infant's weight gain and the duration of breast-feeding. *Brit. Med. J.*, 1954, i, 1410-1413. [*Midwifery Dept., Univ. Aberdeen.*]

A study of the weight gain of infants and duration of breast feeding in women whose milk was analysed on the seventh day showed that only yield and fat content were related to the clinical findings. Seventh-day milk fat output was directly related to the weight gain of the infants in hospital from the third to the seventh day. In a 13-week follow-up study of 148 of the 167 women whose milk was sampled, fat output on the seventh day was directly related to the duration of breast feeding. Accurate weights of 83 infants available during the follow-up study showed a direct relation between seventh-day fat output and weight gain during the first month.—F. C. Aitken.

984

BATEMAN, N. The measurement of milk production of mice through preweaning growth of suckling young. *Physiol. Zool.*, 1954, 27, 163-173. [*Inst. Animal Genetics, Edinburgh.*]

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The relative contribution of the mother and the young to variations in growth was investigated during a study of milk production in the mouse. The weight at 12 days of age of whole litters and of individual young was recorded and calculations were made of variance due to differences between and within families. Prenatal and postnatal maternal effects on growth were examined and also the effect of the number in the litter. The 12-day weight of the whole litter is not a reliable guide to lactation performance unless there is independent evidence that postnatal or lactational factors are the sole variants in the study.

A. M. Copping.

985

FOURNIER, P., DUPUIS, Y., SUSBIELLE, H. and BOURDEAU, A. L'action protectrice du lactose sur le squelette de la ratte allaitante. [Protective action of lactose on the skeleton of the lactating rat.] *C.R. Soc. Biol.*, 1954, 148, 265-268. [*Lab. Physiol. Nutrit., École Hautes-Études, Paris.*]

The experiment has been described in *Abst. 3492, Vol. 24.*

The prevention of loss of skeletal Ca in the lactating rats receiving 12 per cent. lactose was due to greatly increased absorption and utilisation of dietary Ca, the Ca output being the same as in rats on standard diet.—D. Duncan.

See also *Absts.* 253, 257, 258, 260, 319-20, 346, 350, 459, 496, 660, 693, 701, 707, 771, 772, 796, 807, 868, 907, 931, 953, 1061, 1079, 1094, 1130, 1149, 1300.

REPRODUCTION: BIRDS

986

ROMJN, C. Untersuchungen über künstliche Bebrütung von Hühnereiern. 1. Physiologische Untersuchungen. [Artificial incubation of hen eggs. 1. Physiological investigations.] *Arch. Geflügelk.*, 1954, 18, 173-183. [*Lab. Vet.-Physiol., Reichsuniv., Utrecht.*] English summary.

This resumé of work by the author on the chick embryo, reported more fully elsewhere, includes a table showing the bodyweight, oxygen consumption and R.Q. corrected for CO₂ given off by the shell for each day of incubation, as well as a diagram showing the changes in composition of the gas in the air space. Oxygen consumption begins to rise rapidly about the 10th day, along with bodyweight, and the percentage of oxygen in the air space falls. Diffusion experiments showed that most of the oxygen required has to come through the part of the egg shell covering the air space. The most favourable conditions were a relative humidity of from 56 to 58 per cent., raised to 75 or even more when the chicks began to emerge.

W. M. Deans.

987

COTTE, J. La choline de l'oeuf en incubation. [Choline in the egg during incubation.] *C.R. Acad. Sci.*, 1954, 238, 2569-2571.

The total choline content of the hen's egg remained constant up to the 13th day, then decreased steeply during the 3rd week of incubation. The choline in the embryo increased throughout incubation, more rapidly than embryo weight up to the 15th day and then more slowly. The daily choline increment per 100 g. embryo reached a maximum, as did also the free choline in the remainder of the egg, at the 14th day. Both then fell as the total choline content decreased.

It was concluded that the choline as lecithin was converted to a water-soluble form before being metabolised by the embryo.—A. Hepburn.

988

TYLER, C. Studies on egg shells. 4. The site of deposition of radioactive calcium and phosphorus. *J. Sci. Food Agric.*, 1954, 5, 335-339. [Dept. Agric. Chem., Univ. Reading.]

Two laying pullets were fed on a diet of normal composition with part of the Ca in radio-active form. The total Ca required for egg production was included in the mash and the whole daily allowance of mash was consumed between 9.30 and 11.00 a.m. each day. For 7 days the time was noted at which each egg was laid. Collection of eggs was continued for a further 7 days after radio-active Ca was discontinued.

Antoradiographs of shell sections were prepared from each egg laid and by comparing the patterns of radio-activity of eggs laid at different times it was possible to suggest which part of each shell was formed from dietary and which from bone Ca.

Most eggs were laid during the morning, and with only one feed daily, the shells of these eggs were formed in the early stages from food Ca and later from bone Ca. Shells of eggs laid after about 3.30 p.m. contained food Ca in the outer parts, showing that by this time food Ca consumed between 9.30 and 11.00 a.m. was available in the shell gland.

The experiment was repeated with radio-active P. Most of the small amount of P associated with the shells was on or near the surface.

R. Hill.

See also Abst. 859.

SENESCENCE

989

COMFORT, A. Biological aspects of senescence. *Biol. Rev.*, 1954, 29, 284-329. [Dept. Zool., University Coll., London.]

990

BOGDONOFF, M. D., SHOCK, N. W. and PARSONS, J. The effects of stilbestrol on the retention of nitrogen, calcium, phosphorus, and potassium in aged males with and without osteoporosis. *J. Gerontol.*, 1954, 9, 262-275. [Sect. Gerontol., Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

Six aged males, 3 with and 3 without evidence of osteoporosis, were studied. Four control 5-day periods were each followed by 4 similar periods when 2 mg. stilbestrol was administered by mouth 3 times daily; each experimental period was followed by a 5-day recovery period. Food intake was constant through all 12 periods; the energy intake was 2600 Cal. daily and, from chemical analysis of the diets, the daily intake was found to be: N 16.8 g., P 1322 mg., K 70 m. equiv. and Ca 624 mg. Fasting blood samples were taken at the end of periods 1, 3, 5, 6, 8, 9, 11 and 12 for estimation of Ca, P, total protein, albumin, globulin, K and alkaline phosphatase. Urine and faeces were also analysed.

Stilbestrol had no significant effect on the retention of N in the 6 subjects on diets permitting positive N balance. The retention of K was similar to that of N during the control periods, but administration of stilbestrol reduced K retention. Stilbestrol reduced urinary excretion of Ca in all 6 subjects, but there was a significant net retention in only 2 subjects, both of whom had osteoporosis. P retention was not affected by stilbestrol in the normal subjects, but was increased in the 2 subjects who showed increased Ca retentions.—G. F. Garton.

991

CHESROW, E. J. and BLEYER, J. M. The glucose tolerance test on the aged. *Geriatrics*, 1954, 9, 276-282. [Cook County Inst., Oak Forest, Ill.]

The subjects were 46 men and 34 women aged from 60 to 109 years, 41 going about and 39 confined to bed or chair. Oral glucose tolerance tests were made on all, and intravenous tests 8 days later on those whose oral test curves were abnormally prolonged.

In 9 inactive and 9 active patients the blood sugar curves in the oral test were prolonged beyond the third hour, resembling the curves of diabetes mellitus. There was no uniform relation of tolerance curve and age within the range tested. Intravenous tests were made on 16 of these 18 patients, and all gave normal non-diabetic curves. It is suggested that the oral tolerance test should be prolonged to at least 3 hr. in people over 60, and that intravenous tests are valuable in differentiating "normal" prolonged curves from those of diabetes mellitus.—D. Duncan.

N.A. and R., January 1955

992

- FINZI, M. I grassi cosiddetti essenziali nella dietetica geriatria. [The so-called essential fats in the geriatric diet.] *Acta gerontol.*, 1954, 4, 97-102.
A review.

993

- FINZI, M. Osservazioni dietologiche sugli aminoacidi in rapporto all'età senile. [Dietological observations on the amino-acids in relation to

old age.] *Acta gerontol.*, 1954, 4, 38-44.
[Bologna.]
A review.

994

- GOLDNER, M. G., BROWN, R. A., COHEN, C., COX, H., LASSER, R. P. and LOEWE, L. Serum lipoprotein patterns in a group of elderly diabetics. *Amer. J. Med. Sci.*, 1954, 227, 618-623. [Jewish Sanitarium, Brooklyn, N.Y.]
See also Absts. 689, 953.

EXPERIMENTAL STUDIES OF IMMUNITY AND MICRO-ORGANISMS

995

- SINGH, J., NAIR, C. P., RAMAKRISHNAN, S. P. and RAY, A. P. Studies on Nuri strain of *P. knowlesi*. 1. Effect of milk diet on blood-induced infection. *Indian J. Malariol.*, 1953, 7, 253-260. [Malaria Inst. India, Delhi.]

Of 14 adult rhesus monkeys, 3 received a normal diet of gram, wheat flour, vegetables and fruit, 2 were starved after inoculation and for 1 or 3 days before it, and 7 were given 1½ oz. full-cream milk powder made up with water, 3 times a day by stomach tube. Two were used for inoculation from some of the others. All the monkeys except the last 2 were inoculated intravenously with, per kg. bodyweight, 5 million red blood cells parasitised with the Nuri strain of *Plasmodium knowlesi*. Blood counts for parasites were made twice daily.

With normal diet or starvation the infection ran a quickly fatal course. Milk diet exercised a powerful protective effect, which varied in degree according to the time the diet was begun in relation to the time of inoculation. If milk diet was begun some days before inoculation, the infection did not become patent as long as the milk was continued, but monkeys inoculated with blood from those thus treated eventually developed malaria. Milk diet given in addition to standard diet had much the same effect as milk diet alone.

E. M. Hume.

996

- RAMAKRISHNAN, S. P., PRAKASH, S., KRISHNASWAMI, A. K. and SINGH, C. Studies on *Plasmodium Berhei* N.Sp. Vincke and Lips, 1948. 13. Effect of glucose, biotin, para-aminobenzoic acid and methionine on the course of blood-induced infection in starving albino rats. *Indian J. Malariol.*, 1953, 7, 225-228. [Malaria Inst. India, Delhi.]

Thirty rats, 6 months old, were inoculated with one million organisms of *P. berghei*. They were then starved for 10 days with water to appetite. Small groups were given daily 0.75 mg. p-aminobenzoic acid or 0.05 mg. biotin intraperitoneally, or 72 mg. methionine subcutaneously, or 12 g.

glucose orally, or water or saline intraperitoneally; one group received a standard complete diet. Blood counts were made daily for parasites.

With starvation, and glucose or biotin or injections of water or saline there was little growth of parasites. With p-aminobenzoic acid there was a small increase, and with methionine increase was considerable, though not as great as with standard diet, suggesting that methionine was an essential nutrient for the parasite.—E. M. Hume.

997

- TEERI, A. E. Effect of D-amino acids on growth of *Lactobacilli*. *J. Bacteriol.*, 1954, 67, 686-688. [Dept. Agric. Biol. Chem., Agric. Exp. Stat., Univ. New Hampshire, Durham.]

998

- DREIZEN, S., MOSNY, J. J., GILLEY, E. J. and SPIES, T. D. The amino acid requirements of oral acidogenic microorganisms associated with human dental caries. *J. Dent. Res.*, 1954, 33, 339-345. [Dept. Nutrit., Northwestern Univ. Med. Sch., Chicago, Ill.]

Pure cultures of oral strains of *Lactobacillus acidophilus*, *Streptococcus salivarius*, *Staphylococcus albus* and a glucose-fermenting *Saccharomyces* were isolated from patients with active dental caries. The requirements of each for the biologically active amino-acids found in human saliva were estimated.

None of the 19 acids tested was required by *Streptococcus salivarius* or the *Saccharomyces*, but 3 were needed for *Staphylococcus albus* and 6 for *Lactobacillus acidophilus*. With mixtures of the 4 micro-organisms acid production was significantly less in tubes lacking the amino-acids required by the lactobacillus. In pure cultures of *Lactobacillus acidophilus* and *Staphylococcus albus*, the amino-acid requirements varied with strain as well as with species. All 6 classes of amino-acids were required by the lactobacillus. The streptococcus required the monoaminodicarboxylic acids and

the sulphur-containing amino-acids, and *Staphylococcus albus* required the heterocyclic amino-acids, but neither required the diaminomono-carboxylic acids. In all the other acids tested these 2 strains grew poorly. In contrast, the growth of the mixed cultures was significantly reduced when any one class of acids was absent.

In mixed cultures of acid-forming bacteria prepared from saliva of 15 patients with dental caries, the distribution of types of bacteria was lactobacilli 11 cultures, streptococci 15, staphylococci 6, "yeast" 5, diphtheroids 2, *Neisseria* 2 and diplococci 2. Growth of these mixed cultures was poorest when glutamic acid was absent, and sub-maximum growth was obtained when tyrosine, tryptophan, arginine, isoleucine, leucine, valine, cystine, methionine, or phenylalanine was absent. In cultures containing lactobacilli, the greatest inhibition was found when the amino-acids required by the pure culture of lactobacillus were absent. Acid production in mixed cultures was least when monoaminodicarboxylic acids or sulphur-containing acids were withheld.

M. J. Dobson.

999

HARTLES, R. L., SLACK, G. L. and WASDELL, M. R. The metabolism of the oral flora. 3. The utilisation of different carbohydrates by a strain of lactobacillus isolated from the mouth. *Brit. Dent. J.*, 1954, 97, 67-69. [Dept. Biochem., Sch. Dent. Surg., Univ. Liverpool.]

A strain of lactobacillus isolated from a 5½-year-old child with no clinically detectable caries had a limited ability to ferment carbohydrates; after 24 hours' incubation only glucose, cellobiose and salicin were fermented, and after 96 hr. maltose and lactose were sometimes fermented, but sucrose and raffinose were not.

In washed suspensions of the culture the only marked glucosidase was a β -glucosidase. Cellobiose, gentiobiose and salicin were all metabolised. Some trehalose activity was found. Maltose, turanose, maltotriose, melezitose, sucrose, raffinose, lactose and melibiose were not broken down. Glucose, fructose and mannose were readily broken down and to a less extent galactose. Ribose was slightly metabolised, but xylose and arabinose, dulcitol, mannitol, gluconic acid and rhamnose were not.

The synthesis of invertose or maltose was not stimulated by subculturing in the presence of the appropriate sugar.

The pH of the saliva from which the lactobacillus was isolated was 7.0 on 3 days separated by 3-day intervals. The lactobacillus counts per ml. saliva on these 3 days were 3600, 48,230 and 21,600, and Snyder's test for caries susceptibility gave values of 2, 3 and 3, where 0 = no activity and 4 = high caries activity.—M. J. Dobson.

1000

ANDREASEN, A. A. and STIER, T. J. B. Anaerobic nutrition of *Saccharomyces cerevisiae*. 2. Unsaturated fatty acid requirement for growth in a defined medium. *J. Cell. Comp. Physiol.*, 1954, 43, 271-281. [Dept. Physiol., Univ. Indiana, Bloomington.]

1001

SHOCKMAN, G. D. and TOENNIES, G. Growth response of *Streptococcus faecalis* to the stereoisomers of methionine and some derivatives. *Arch. Biochem. Biophys.*, 1954, 50, 1-8. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

Streptococcus faecalis utilised D-methionine during its post-logarithmic growth phase if L-methionine was present, and independently of pyridoxal or pyridoxamine. The isomers of L-methionine sulphoxide gave growth curves similar to that of L-methionine. The 2 isomers of DL-methionine sulphoxide at first gave a response proportional to their L-methionine sulphoxide contents, but later utilisation of D-methionine compounds became apparent. The N-formyl and N-acetyl derivatives of methionine gave responses similar to those of their parent compounds. Neither DL-methionine sulphone nor L-methionine methyl sulphonium ion produced any growth response. The ketone body corresponding to methionine partly replaced methionine when pyridoxamine was also present.

A. Dobson.

1002

SHOCKMAN, G. D. and TOENNIES, G. Formation of D-methionine from L- by *Streptococcus faecalis*. *Arch. Biochem. Biophys.*, 1954, 50, 9-17. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

When *Streptococcus faecalis* was grown with L-methionine only 67 per cent. of the latter could be recovered from the cell hydrolysate and the medium. With ^{35}S L-methionine nearly 20 per cent. of the ^{35}S remained unassimilated in a form which ran on chromatograms like methionine or its sulphoxide. D-Methionine was identified by isotope dilution in quantities accounting for part of the loss. Further loss could be accounted for as methionine sulphoxide which was formed by incubation of methionine in the medium alone. This reaction was catalysed by the riboflavin present.—A. Dobson.

1003

MANN, S. O. and OXFORD, A. E. Studies of some presumptive lactobacilli isolated from the rumens of young calves. *J. Gen. Microbiol.*, 1954, 11, 83-90. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

In the course of a study of the effects of aureomycin, 13 Gram-positive rods were isolated from

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the rumen of calves. Of these 10 were catalase-negative, and were studied with methods for lactobacilli. The other 3 were catalase-positive and were not studied further. The 10 isolates fell into 3 groups, the morphology and biochemical reactions of which are described.

The authors do not claim to have isolated all the lactobacilli from the rumens of the calves, but it is considered important that lactobacilli were specially plentiful in the youngest calves and that no catalase-negative rods were isolated from the oldest group of calves, killed some weeks after milk feeding ceased. It is suggested that lactobacilli are organisms of passage capable of multiplication in the rumen of young calves.

M. J. Dobson.

1004

MANN, S. O., MASSON, F. M. and OXFORD, A. E. **Effect of feeding aureomycin to calves upon the establishment of their normal rumen microflora and microfauna.** *Brit. J. Nutrition*, 1954, 8, 246-252. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The 3 groups of 3 calves each were reared to 5, 8 and 12½ weeks of age, respectively, and then slaughtered. Milk and calf gruel were given to 6 weeks of age, and gruel but no milk thereafter. From the third week onwards, linseed meal, hay and oats were offered. Grass was given to appetite after the sixth week. Pure aureomycin hydrochloride was given to 2 calves in each group at a daily rate of 40 mg. to 6 weeks of age. Treated calves remaining on experiment after this age received 60 mg. daily. The third calf in each group was used as a control and received no aureomycin. After slaughter the contents of the rumen and reticulum, omasum and abomasum were weighed and were subjected to protozoological and bacteriological examination. The concentration of aureomycin in the rumen, omasum and abomasum was estimated by the pad plate method.

The growth rate of the treated calves was slightly higher than that of the controls. The rumen contents of the aureomycin-fed calves were heavier and less acid than those of the controls, and more quickly reached a pH suitable for large-scale bacterial action.

A detectable concentration of aureomycin was found in the abomasum and traces in the omasum. None was found in the rumen or caecum. It was concluded that the aureomycin had no direct effect on the rumen micro-organisms.—J. N. Aitken.

1005

FAUCONNEAU, G., FRANÇOIS, A. C., LEROY, A. M. and ZELTER, S. Z. **Processus digestifs des ruminants. 1. Étude in-vitro de la digestion du foin de luzerne. [Digestion processes in the ruminant. 1. Study in vitro of the digestibility**

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of alfalfa hay.] *Ann. Zootech.*, 1953, 2, No. 4, 275-284. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

Rumen fluid from newly-killed sheep was incubated in artificial saliva medium with alfalfa hay as substrate, and the gases were collected.

The mean proportions of volatile fatty acids of the rumen fluid before incubation were acetic 65.7, propionic 19.9 and butyric 14.4 per cent., and after 48 hr. of incubation 60.6, 28.0 and 11.5. On the average 66 per cent. of the reducing sugars and 42.7 per cent. of the cellulose in the hay were utilised. The values for carbohydrate digestion and total volatile fatty acid formation were almost identical with those obtained *in vivo*, although the proportions of the fatty acids differed. About 83.8 per cent. of the carbohydrate lost could be accounted for as volatile fatty acid. The production of volatile fatty acids was about 224 (range 153.4 to 263.4) g. per kg. alfalfa hay dry matter.

D. Duncan.

1006

BENTLEY, O. G., JOHNSON, R. R., VANECKO, S. and HUNT, C. H. **Studies on factors needed by rumen microorganisms for cellulose digestion in vitro.** *J. Animal Sci.*, 1954, 13, 581-593. [Ohio Agric. Exp. Stat., Wooster.]

Samples taken through a fistula from the rumen of a steer fed on alfalfa were incubated with a basal medium and cellulose for 24 to 48 hr. The amount of cellulose digested was taken as a measure of microbiological activity.

Cellulose digestion in the basal medium was slow. The addition of autoclaved rumen juice increased cellulose digestion as much as did whole rumen juice. Increases in activity were obtained when water extracts of several plant materials or roughages were added. Alfalfa leaf meal, molasses, yeast and rumen juice were most effective. Of the B vitamins tested, biotin, *p*-aminobenzoic acid and vitamin B₁₂ were beneficial. A mixture of alfalfa ash, purines and uracil was ineffective, but combinations of either alfalfa ash or purines and uracil along with the 3 B vitamins already found effective were better than the B vitamins alone.

A substance which increased cellulose digestion was partly isolated from rumen juice.

M. J. Dobson.

1007

KITTS, W. D. and UNDERKOFER, L. A. **Hydrolytic products of cellulose and the cellulolytic enzymes.** *J. Agric. Food Chem.*, 1954, 2, 639-645. [Chem. Dept., Iowa State Coll., Ames.]
Samples of rumen contents from a fistula were strained and inoculated into a synthetic medium containing 1 per cent. cellulose and gassed with CO₂.

Carboxymethylcellulose (CMC) was digested rapidly, finely ground filter paper and alphasel slowly. Thymol, chloroform, sodium fluoride, toluene, *m*-xylene and iodoacetic acid were, in this order, decreasingly effective as inhibitors of the conversion of sugars to volatile fatty acids. In most of the subsequent experiments thymol or NaF was used to stop the fermentation of cellulose at the glucose stage. With ground filter paper and CMC as substrates in fermentation tests at 40° C., only glucose was detected after 48 hr., and no cellobiose. When 2 per cent. cellulose was used, after 2 hr. the principal intermediate was glucose. Slight traces of cellobiose were found up to 6 hr., but thereafter none. Faint spots of xylose were seen on the chromatograms from each hourly sample for 16 hr. No oligosaccharide greater than cellobiose was ever found.

A cell-free extract of rumen micro-organisms possessed good cellulolytic activity. No short-chain volatile fatty acids were formed in 24 hours' incubation. For the first few hours glucose only was detected. After 20 and 24 hr. traces of xylose were found, suggesting that the extract contained an enzyme hydrolysing xylans to xylose. Cellobiose was not detected. Further experiments showed that cellobiose was hydrolysed to glucose very quickly, and this explained the difficulty in detecting cellobiose when cellulose was fermented.

A cell-free extract from a pure culture of a rumen organism hydrolysed cellulose to glucose. No other product was detected on chromatograms.

M. J. Dobson.

1008

McNAUGHT, M. L., SMITH, J. A. B. and BLACK, W. A. P. The utilization of carbohydrates of seaweed by rumen microflora *in vitro*. *J. Sci. Food Agric.*, 1954, 5, 350-352. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Rumen micro-organisms *in vitro* were able to utilise laminarin, but it did not produce as much protein synthesis as maltose. Fucoidin and L-fucose were not utilised. The fronds, but not the stipes, of *Laminaria cloustoni*, one of the commonest seaweeds on British coasts, supported bacterial activity to about the same extent as maltose. No inhibitory substance was found in the stipes. *Ascophyllum nodosum* supported little activity and when it was incubated with maltose it reduced the value of the maltose. Up to 36 per cent. laminarin may be found, on a dry matter basis, in *L. cloustoni*. It is the only constituent of seaweed so far investigated by the authors that is readily utilised by rumen bacteria.—M. J. Dobson.

1009

BELASCO, I. J. New nitrogen feed compounds for ruminants. A laboratory evaluation. *J. Animal Sci.*, 1954, 13, 601-610. [Polychem. Dept.,

E. I. du Pont de Nemours and Co., Inc., Wilmington, Del.]

Numerous nitrogenous compounds were examined by an artificial rumen technique similar to that described by Burroughs *et al.* (Abst. 490, Vol. 20). Subcultures were made at the end of 24 hr. and repeated for 4 successive 24-hr. periods. Each series of fermentations had 2 controls, a positive, with urea at a level of N equivalent to that in the experimental flasks, and a negative, with no additional N other than that in the inoculum on the first day. Analyses were made for NH₃ and cellulose and the results were compared by expressing them as a percentage of the response obtained with urea.

The compounds tested belonged to the following groups and numbered 16 urea derivatives, 14 amides, 10 amidines, 16 ammonium salts, both organic and inorganic, and 19 other organic substances in a miscellaneous group.

Among ammonium salts, succinate, lactate, formate, α -ketoglutarate and malate showed rates of N utilisation higher, and free NH₃ levels lower, than those with urea or the other NH₄ salts; with them bacterial growth was excellent. The guanidine salts, carbonate, hydrochloride and acetate, also were valuable; creatinine and creatine slightly less. Amides of monocarboxylic acids provided available N, but with them the rate of cellulose digestion was less than with urea. The diamides of dicarboxylic acids were poor sources of N. Among purine derivatives uric acid and allantoin could be utilised by rumen microflora.

D. Harvey.

1010

ANDERSEN, H. E. Changes of the intestinal flora produced by peroral administration of penicillin in normal swine. *Nord. Vet.-Med.*, 1954, 6, 622-642. [Royal Vet. Agric. Coll., Copenhagen.] German and Danish summaries.

Doses of 60,000 I.U. procaine penicillin were given by mouth to one or two pigs for 4, 8, 12 and 21 days, respectively. In another experiment half of a litter of newly-weaned pigs received 15,000 I.U. per head daily for 135 days.

With the large dose streptococci disappeared almost completely in the first week. Non-haemolytic staphylococci were apparently unaffected. Lactobacilli were reduced; coliform bacteria greatly increased in number and were found as far up the gut as the stomach, compared with the lower jejunum in control pigs. After 21 days the distribution of lactobacilli and coliform bacteria in the 2 penicillin-fed pigs was not consistent. With the lower dose the differences in the distribution of coliform bacteria and lactobacilli were also less conspicuous. Coliform bacteria were not detected in the anterior regions of the gut.

It is suggested that during prolonged treatment with penicillin the intestinal micro-organisms had become partly adapted.—M. J. Dobson.

1011

RHODES, R. A., SARLES, W. B., MONSON, W. J., HARPER, A. E. and ELVEHJEM, C. A. Stimulation and inhibition by antibiotics of intestinal bacteria in chicks. *J. Nutrition*, 1954, 53, 289-302. [Dept. Bacteriol., Univ. Wisconsin, Madison.]

Chicks on diets with 25 µg. per 100 g. or no folic acid and receiving antibiotics grew better than those not receiving antibiotics. The number of coliform bacteria in the intestine of chicks receiving antibiotics generally increased and the number of

lactobacilli generally decreased. Bacitracin with penicillin increased the number of coliform bacteria, most in the lower intestine, and almost eliminated lactobacilli. Aureomycin was less effective in the elimination of lactobacilli, but appeared to increase the number of coliform bacteria, especially in the upper intestine. Bacitracin tended to accumulate in the caeca.

It is concluded that not only may the antibiotics cause increases in coliform organisms and therefore increases in the amount of folic acid formed in the gut, but by reduction of the numbers of lactobacilli may also make more of the folic acid available to the host.—M. J. Dobson.

See also Absts. 246, 317, 318, 392, 474.

MISCELLANEOUS FEEDING EXPERIMENTS

1012

WALDSTEIN, S. S., SCHOOLMAN, H. M. and POPPER, H. The effect of feeding large amounts of emulsifiers polyoxyethylene (20) sorbitan monostearate (Tween 60) and sorbitan monostearate (Span 60) to humans. *Amer. J. Digest. Dis.*, 1954, 21, 181-185. [Hektoen Inst. Med. Res., Cook County Hosp., Chicago, Ill.]

Tween 60 was given to 19 hospital patients without metabolic disorder, Span 60 to 16, 6 g. daily in 2 doses for 28 days, and a placebo to 9, all in similar gelatine capsules. Members of the hospital staff, 3 groups of 10, also participated. Laboratory tests made beforehand and after 14 and 28 days included studies of blood and urine and liver function tests.

There was no clinically recognisable adverse effect and no change in urine, blood picture, or blood proteins, cholesterol, phospholipins, N.P.N. or urea N was found. Doubt about the variable results of bromosulphalein retention tests was dispelled by a re-test with another batch of patients. It was concluded that there was no evidence of any deleterious effect in man of these emulsifying agents in doses much larger than would be ingested normally in foods or pharmaceutical preparations.

W. M. Deans.

1013

SUR, G., KUMARI REDDY, S., SWAMINATHAN, M. and SUBRAHMANYAN, V. Supplementary value of food yeast (*Torula utilis*) to poor vegetarian diets based on cereals. *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, 3, 111-112.

The possibility of using food yeast as a supplement to human diets was further investigated in growth experiments with rats. Replacement of part of the *ragi* or milo of the diet by 5 per cent. food yeast greatly stimulated growth; the effect was less with *jowar*, rice or whole wheat.—J. S. Thomson.

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1014

BELL, J. M. and GIDYK, M. The effects of frost damage on the nutritional value of wheat. *Canad. J. Agric. Sci.*, 1954, 34, 305-312. [Dept. Animal Husb., Univ. Saskatchewan, Saskatoon.]

Analyses were made of 4 samples of wheat which had been frosted at different stages of maturity and weighed 57, 52, 44 and 28 lb. per bushel, the last 2 being well below milling quality. A sample of elite seed weighing 63 lb. per bushel was used as control.

Wheat weighing as little as 44 lb. per bushel closely resembled sound wheat in composition. In the poorest sample there were slight increases in percentage of protein, crude fibre, ash and ether extract and a corresponding decrease in N-free extract.

Growth experiments with mice in which starch, protein as skimmed milk powder or linseed meal and B vitamins as brewer's yeast were added to the different grades of wheat showed that the nutritive value of wheat weighing as little as 44 lb. per bushel was not seriously affected by freezing; the vitamin B content was adequate. The addition of the supplements, with minerals and fat-soluble vitamins, to wheat weighing 28 lb. per bushel did not effect full restoration of nutritive value, indicating changes not explained by changes in chemical composition.

Antibiotics containing vitamin B₁₂ slightly improved the feeding value of wheat weighing 63 or 44 lb. per bushel, but depressed growth on wheat weighing 28 lb. Addition of methionine to all rations depressed growth, suggesting a toxic effect.

It is suggested that bulkiness is responsible for the decreased feeding value of badly frosted wheat.

J. S. Thomson.

1015

MORIMOTO, H. and YOSHIDA, M. **On the nutritive value of starches. 1.** *Bull. Nat. Inst. Agric. Sci., Japan* [G], 1954, 8, 43-51. Japanese summary.

The digestibility of N-free extracts of maize, wheat, sweet potato and potato starches was compared in trials with cocks; in that order coefficients were 100, 99, 90 and 40 per cent.

In feeding experiments with rats given these starches to appetite or in restricted amount, growth was poorest with potato starch, and dilatation of the caecum was common. Sweet potato starch was slightly inferior to the cereal starches for growth and, like them, did not cause dilatation of the caecum. When potato starch was given to appetite after having been boiled for 15 min. the caecum was not enlarged, but growth remained poorer than with the other starches.—D. Harvey.

1016

NARAYANA RAO, M., SWAMINATHAN, M. and SUBRAHMANYAN, V. **Nutritive value of safflower seed cake.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, 3, 158-159.

Extracted safflower (*Carthamus tinctorius*) seed cake had the following percentage composition: moisture 7.6, ash 4.1, protein 32.1, fat 12.0, Ca 0.075, P 0.62, and vitamin B₁ 0.63 mg. per 100 g. [the rest presumably carbohydrate and fibre].

The addition of 10 per cent. of the cake to a poor rice diet greatly stimulated the growth of rats. The biological value of the protein of the cake was fairly high, but below that of casein.

J. S. Thomson.

1017

NJAA, L. R. and BRAEKKAN, O. R. **Foring av rotter med natriumnitrit og sildemel fremstilt av sild konservert med natriumnitrit. [Feeding rats with sodium nitrite and herring meal made from herring preserved with sodium nitrite.]** *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1953, 2, No. 14, pp. 14. English summary.

Literature is reviewed. Rats on a good mixed diet in groups of 2 were given 0.5, 1.0, or 2.0 mg. NaNO₂ by pipette daily for 12 weeks without ill effect; groups of 6 were given 0.1, 0.2, 0.4 or 0.8 per thousand of NaNO₂ mixed in their food, again without ill effect and with a suggestion of better growth with 0.2 per thousand which was not confirmed in a third experiment. In the fourth experiment roughly half of a mixed diet was herring meal prepared from herring preserved with nitrite. The total intake of NaNO₂ over the 70 days of the experiment from one of the samples of herring meal was from 70 to 105 mg.; from the other only 28 to 42 mg. Again growth was

normal and there was no abnormality at post-mortem examination.—I. Leitch.

1018

CARPENTER, K. J., ELLINGER, G. M. and SHRIMPTON, D. H. **The nutritive value of six white fish meals of known origin.** *Proc. Nutrition Soc.*, 1954, 13, xx-xxi. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

1019

FÉVRIER, R., GASNIER, A. and VACHEL, J. P. **Valeur alimentaire du tourteau de soja. Influence du traitement thermique. [Nutritive value of soya bean cake. Effect of heat treatment.]** *Ann. Zootech.*, 1952, 1, No. 4, 11-32. [Stat. Recherches Elevage, C.N.R.Z., Jouyen-Josas.]

Three commercial soya bean cakes differing in both origin and treatment were compared in 2 experiments with 3 groups of 4 pigs, in which each group received all 3 types of cake in successive 2-week periods. The cake was the only source of protein in the second experiment, but 4 per cent. meatmeal was given in the first. The value of the 3 cakes was found to be identical, but consumption and growth were greater with the 2 samples extracted by steam than with that subjected to dry heat. Since these samples were all of different grains a third experiment was made with 2 samples of the same origin but after different treatment. The results indicated that the type of treatment affected palatability more than did the origin of the sample.

The same cakes were compared in experiments with rats. In growth experiments the same sample gave the best result in both pigs and rats, but the order of the other 4 samples was reversed. Reasons for this are discussed. It is not possible to use nitrogen balance experiments in adult rats to predict the value of soya bean cake for growing rats or pigs.—D. Duncan.

1020

CONDON, M. Z., JENSEN, E. A., WATTS, A. B. and POPP, C. W. **Effect of autoclaving in presence and absence of gossypol on solvent extracted cottonseed meal.** *J. Agric. Food Chem.*, 1954, 2, 822-826. [S. Reg. Res. Lab., S. Utilization Res. Branch, U.S. Dept. Agric., New Orleans, La.]

A cottonseed meal was produced from prime quality cottonseed by successive extractions with hexane and butanone until the free gossypol content was 0.02 and total gossypol 0.2 per cent. Samples of this meal were heated in layers 1.5 to 2.0 cm. thick in an autoclave at 120° C. for periods up to 120 min. with and without 1 per cent. added gossypol. Estimations of total N, free and total

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gossypol, water-soluble carbohydrates, browning, N solubility in 0.5 N NaCl and in 0.02 N NaOH, and P were made and the electrophoretic patterns were recorded. The protein quality index was found by 2-week feeding trials on 10-day-old chickens which had previously been fed on rations low in protein. This index decreased as autoclaving time increased, and was paralleled by a decrease in the amount of N soluble in 0.02 N NaOH. There was no direct correlation with any other chemical test. Meals which had gossypol added during autoclaving were equivalent chemically and nutritionally to control meals autoclaved for the same time.—D. H. Shrimpton.

1021

SUBRAHMANYAN, V., RAMA RAO, G., KUPPUSWAMY, S. and SWAMINATHAN, M. Nutritive value of water chestnut (*Singhara*). *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, **3**, 134-135.

Dried water-chestnut (*Trapa bispinosa*) flour had the following composition : moisture 10.6 g., ash 2.6 g., ether extract 0.56 g., protein 8.0 g., Ca 69 mg., P 343 mg., Fe 2.8 mg. and vitamin B₁ 440 µg. per cent. Rats on a poor vegetarian diet based mainly on water-chestnut flour made substantially better growth than rats on similar poor diets based on wheat, rice, *ragi* or *jowar*. The biological value of the protein of water chestnut was higher than that of wheat.—J. S. Thomson.

1022

DASLER, W. Observations on odoratism (sweet pea lathyrism) in the rat. *J. Nutrition*, 1954, **53**, 105-113. [Dept. Biochem., Chicago Med. Sch., Ill.]

Serum alkaline phosphatase and Hb were not much different in rats fed on a diet containing 50 per cent. sweet pea (*Lathyrus odoratus*) meal and rats fed on a 50 per cent. edible pea meal diet. Adrenal weight was significantly above the control level in male rats but not in females. A gain in adrenal weight per unit bodyweight was significant in both males and females.

The fragility of the skin, the fall in skin weight, the malformation of bones and the haemorrhagic condition of the corium, bones and periosteal tissues found in odoratism suggest a disturbance in collagen metabolism.—A. Hepburn.

1023

LAL, S. B. Effect of argemone oil on monkeys. *Indian Med. Gaz.*, 1954, **89**, 71-74. [Pub. Health Labs., Patna 4, Bihar.]

Eight healthy rhesus monkeys were used. A female weighing 12 lb. given 5 ml. pure argemone oil by stomach tube on 2 successive days showed apathy and failure of appetite after 24 hr. and

died 3 days from the outset. Six males given 5 or 10 ml. daily of mixtures of argemone oil and mustard oil in different proportions showed after about 3 weeks apathy, loss of weight, anaemia, oedema and other signs resembling those of epidemic dropsy, and 3 died; haemorrhagic points were found in the lungs and digestive tract at post mortem. A control given mustard oil remained healthy. There was some evidence that tolerance developed in the survivors and that up to 3 per cent. of argemone oil in the mixture was not lethal.—W. M. Deans.

1024

ROINE, P., GYLLENBERG, H., ROSSANDER, M. and VUOKILA, R. The rat as a test animal in evaluating artificial human milk for infants. *Nature*, 1954, **174**, 519. [Dept. Nutrit. Chem., Univ. Helsinki.]

The pH of faeces of rats fed on cow's milk was 7 and over and of rats fed on human milk between 5 and 6. Cow's milk was modified in different ways in an attempt to reduce the pH of the faeces. Decreasing the Ca content of the milk and simultaneously adding lactose were successful.

F. C. Aitken.

1025

TRIBE, D. E. The self-selection of purified food constituents by the rat during growth, pregnancy and lactation. *J. Physiol.*, 1954, **124**, 64P. [Sch. Vet. Sci., Univ. Bristol.]

1026

SOULAIRAC, A. and SOULAIRAC, M. L. Effets du groupement sur le comportement alimentaire du rat. [Effect of grouping on feeding behaviour in the rat.] *C.R. Soc. Biol.*, 1954, **143**, 304-307. [Lab. Psychophysiol., Sorbonne.]

Adult male rats were caged individually for 26 days, then in pairs for 58 days and finally in threes for 65 days. They received a standard diet, a 10 per cent. glucose solution and water to appetite.

When the rats were placed in pairs total food consumption and energy intake increased and glucose consumption fell, but the differences became significant only after 20 days. Grouping in threes further increased food consumption and decreased that of glucose, but energy intake did not increase; the changes were greatest in the first 27 days. The weight of the rats reflected the changes in intake of stock diet.—D. Duncan.

1027

RUEGAMER, W. R., BERNSTEIN, L. and BENJAMIN, J. D. Growth, food utilization, and thyroid activity in the albino rat as a function of extra handling. *Science*, 1954, **120**, 184-185. [Veterans Admin. Hosp., Denver, Colo.]

Of 42 weanling male albino rats fed on the same diet, half were petted and handled individually for about 10 min. daily, the others were touched as little as possible. After 5 weeks the rats were injected intraperitoneally with 50 μ C. of ^{131}I and 24 hr. later were killed.

There was no statistically significant difference between the amounts of food consumed by the 2 groups, but the handled animals showed a mean weight gain of 122.8 g., compared with 108.1 g. for the unhandled group, a difference statistically significant at the 0.001 level of confidence. The food consumed per g. weight gain was on the average 4.82 g. for the handled group and 5.49 g. for the unhandled, again significant at the 0.001 level. There was no significant difference in body composition or in organ weights. The unhandled rats excreted more faecal pellets than the handled ones. Subsequent experiments confirmed that early handling resulted in greater weight, increased skeletal length and better food utilisation. The thyroids of unhandled rats were more active than those of handled rats. It is suggested that this greater thyroid activity may be partly responsible for poorer growth and food utilisation.

B. W. Simpson.

1028

ENDERS, A. Die Wachstumsfähigkeit von Ratten nach calorischer Unterernährung und bei chronischen Vergiftungen. [Growth capacity of rats after caloric underfeeding and chronic poisoning.] *Arch. exp. Pathol. Pharmacol.*, 1954, 222, 555-561. [Pharmakol. Inst., Univ. Freiburg i. B.]

Verzár (*Helv. med. Acta*, 1940-41, 7, Suppl. VI) by restricting the allowance of food kept rats at an average weight of 50 g. for 5 months. Thereafter when food was not restricted the rats grew to weights of 450 g. (males) and 250 g. (females), designated giant growth. This experiment was repeated with albino or brown and white rats from the mixed stock colony of the Institute. The diet was oat flakes 500 g., cod liver oil 15 g., dried yeast 30 g., dried milk 100 g., McCollum salt mixture 15 g. and water 1 litre; mixed and heated to boiling-point. Once or twice a week lettuce or dandelion leaves were given. The rats were weighed daily and the allowance of food was adjusted to maintain weight at 50 g. Of 20 males and 20 females, 9 females and 6 males survived for 6 months. They were then given food to appetite and 6 months later weighed on the average females 202 and males 315 g. Controls averaged 205 and 303 g.

Later, 6 males and 6 females survived to 12 months and 3 females and 4 males to 15 months. They were then fed to appetite for 8 months and weighed after 12 months' underfeeding 194 and 298 g., and after 15 months' underfeeding 178

and 319 g. Three of the females from the 12-month lot were mated with normal males and produced normal litters.

In a further experiment 12 female rats were given 15 g. food daily for a year and then the 9 survivors weighed on the average 114 g., and after 8 months' unrestricted feeding 211 g. In another, rats were castrated at 4 to 5 weeks of age and similarly treated. There was no impairment of growth capacity and no giant growth. Nor did chronic poisoning with Hg, colchicine or ethylurethane, with characteristic pathological changes, interfere with growth.—I. Leitch.

1029

WILHELMJ, C. M., MILANI, D. P., MEYERS, V. W., GUNDERSON, D. E., SHUPUT, D., RACHER, E. M. and MCCARTHY, H. H. An analysis of the stress of realimentation with carbohydrate or protein following prolonged fasting. *J. Lab. Clin. Med.*, 1954, 43, 888-896. [Dept. Physiol., Sch. Med., Creighton Univ., Omaha, Nebr.]

Of 9 dogs which had been fasted 5 were given a high-protein diet of raw horsemeat and 4 a high-carbohydrate diet of biscuit meal or rice. The group of 5 animals were again fasted and were then given the high carbohydrate diet followed by an isocaloric high-protein diet; 3 new dogs were added to the experiment during this part. Stress was estimated from capillary resistance, eosinophil and total leucocyte counts.

During fasting there was a rise in capillary resistance and a decrease in circulating eosinophils. The high-carbohydrate diet maintained these fasting effects; the high-protein diet caused a rapid return to normal values when given either to the fasting animal or after the high-carbohydrate diet. The effect of the high-carbohydrate diet persisted for 71 days in one animal, but 3 animals showed a slow spontaneous return to normal while on the high-carbohydrate diet in 50 to 60 days; after spontaneous recovery cortisone and ACTH caused, respectively, complete and partial return of the capillary resistance and eosinophil levels to the high-carbohydrate values. Systolic blood pressure and pulse rate showed similar reactions during spontaneous recovery and administration of cortisone, suggesting that spontaneous recovery may be associated with depletion of the pituitary-adrenal hormones. It is also suggested that the stress engendered in fasting animals by re-alimentation with high-carbohydrate diets is associated with hyperactivity of the pituitary-adrenal system, which is counteracted by isocaloric high-protein diets.—G. F. Garton.

1030

KÖHN, K. Experimentelle Untersuchungen an Ratten zur Frage der Beeinflussbarkeit des

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Lymphgewebes durch die Art der Nahrung sowie durch Hunger. [Experimental investigation with rats of the possibility of influencing the lymphoid tissue through the kind of food or through starvation.] *Ztschr. ges. inn. Med.*, 1954, 9, 195-199. [Pathol. Inst., Berlin-Spandau.]

Of 60 rats weighing from 160 to 260 g., 12 received a normal diet; 18 received an "acid" diet of oats and brown bread with a solution of HCl to drink, and half of these received once or twice a day 1 ml. of 2 per cent. NH_4Cl solution; 15 received an "alkaline" diet of carrots, peelings, white bread and milk, and 10 of these received once or twice daily 1 ml. NaHCO_3 solution; 15 were starved with plenty of water, and 8 of them were given NaHCO_3 . At intervals the pH of the urine and the blood picture were recorded, and at the end the alkali reserve of the blood was measured. After 2 to 3 weeks the rats were killed and the spleen and lymph nodes were examined histologically.

The rats on normal diet maintained weight, those on acid and alkaline diet lost a little, and the starved animals lost 45 per cent. of their weight. The pH of the urine was from 6.5 to 7.5 with normal diet, from 5 to 6 with acid diet, from 7 to 8 with alkaline diet and prolonged treatment with carbonate, from 5.5 to 6.5 with starvation, and from 6.5 to 8 with starvation and alkali. The alkali reserve was reduced in the rats with acid diet and with starvation, unchanged with starvation and alkali, and slightly raised with alkaline diet. With acid diet and starvation without alkali the leucocytes in the blood increased at the cost of the lymphocytes; with other treatments there was no change. Such changes as appeared in the histology of the spleen and lymph nodes were the same with acid and alkaline diets. The spleen and lymph nodes lost weight under starvation more severely than the rest of the body.

E. M. Hume.

1031

SEARLE, A. G. Genetical studies on the skeleton of the mouse. 11. The influence of diet on variation within pure lines. *J. Genetics*, 1954, 52, 413-424. [University Coll., London.]

Differences in diet exerted some influence on the frequency and extent of the skeletal polymorphism discovered by Grüneberg (*J. Genetics*, 1950, 50, 112-141) in the inbred mouse strains A and C57BL.

The skeletal anomalies are considered to be remote effects of gene action and interaction and much influenced by prenatal and postnatal environment.—D. Duncan.

1032

CLARK, H., GRAHAM, P. and MUIRHEAD, E. E. Effect of diets on the anemia, azotemia and

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survival of bilaterally nephrectomized rabbits. *J. Lab. Clin. Med.*, 1954, 43, 113-118. [Dept. Pathol., Southwestern Med. Sch., Univ. Texas, Dallas.]

The techniques of nephrectomy and of estimation of blood volume, haematocrit and blood urea were described by Muirhead *et al.* (*J. Lab. Clin. Med.*, 1952, 39, 505). Different fluid diets were given after the removal of the second kidney, namely, a high-protein high-carbohydrate mixture, a fat emulsion, glucose solutions supplying 2.8 or 30 Cal. per kg. daily, and water only. Unoperated control rabbits received either the fat emulsion or stock diet. All received a vitamin mixture.

The mean haematocrit fell in all rabbits after kidney removal; the greatest falls were in the groups receiving fat emulsion or high-glucose diets, and the smallest in those receiving protein. Total blood volume fell slightly in all after kidney removal and considerably in those receiving fat emulsion. Plasma volume was unchanged or fell slightly. Plasma chloride concentration fell, except in the rabbits receiving protein. Red blood cell volume fell, especially in the operated group receiving fat emulsion, and it also fell in unoperated rabbits on this diet. Blood urea concentration rose steeply in all operated rabbits, but least on the high glucose intake. Rabbits fed on protein survived only an average of 3.8 days; those on glucose survived longest, 6.7 days on the high intake and 7.1 days on the low.

It is concluded that a high protein intake was detrimental and that glucose exerted some protective effect against the uraemia.—D. Duncan.

1033

CHRISTENSEN, F. and DAM, H. Alimentary production of gallstones in hamsters. 3. *Acta physiol. scand.*, 1954, 31, 75-82. [Dept. Biochem., Polytech. Inst., Copenhagen.]

For earlier work see Abstr. 4874, Vol. 23.

The basal diet was the synthetic one already described. A large number of cereal and legume seeds and a type of yeast as well as some extracts of these were tested for their ability, as additions to or as replacements of part or all of the sucrose, to prevent gallstone formation. Soya beans and yeast were particularly active, hempseed less.

Two other diets, one a commercial chicken mash and the other a similar synthetic diet with crude casein 25, sucrose 63.1, salt mixture 4.0, vitamin mixture 0.5, choline chloride 0.4 and lard 7.0 per cent., did not cause gallstone formation. It is thought that these may contain a protective organic substance insoluble in fat. The study is being continued.—D. Harvey.

1034

MUNRO, H. N. The influence of the protein and energy content of the diet on the liver. *Proc.*

Nutrition Soc., 1954, **13**, 115-120. [Dept. Biochem., Univ. Glasgow.]

1035

NAFTALIN, J. M. The influence of diet, environment and other factors on experimental liver necrosis in the rat. *Proc. Nutrition Soc.*, 1954, **13**, 120-125. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

1036

NAFTALIN, J. M. Weaning age and dietary liver necrosis in the rat. *J. Pathol. Bacteriol.*, 1954, **67**, 335-339. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Young rats received from their 38th day of age a low-protein diet containing either casein 8 and brewer's yeast 3 per cent. or brewer's yeast 18 per cent. as source of protein. Littermates were weaned at different ages, i.e., 17, 19 or 20 and 25 days.

The difference in survival time between rats weaned at 17 and those at 19 days was not significant, but rats weaned at 25 days survived significantly longer. The incidence of liver necrosis in the last group was significantly lower in 2 out of 3 experiments.

Differences in the capacity of several breeds of casein to produce liver necrosis are reported.

D. Duncan.

1037

SMITH, D. E. and TYREE, E. B. Influence of X-irradiation upon body weight and food consumption of the rat. *Amer. J. Physiol.*, 1954, **177**, 251-260. [Div. Biol. Med. Res., Argonne Nat. Lab., Lemont, Ill.]

In groups of from 6 to 19 rats total body exposure to X-rays in single doses of between 25 and 10,000 r resulted in immediate anorexia and weight loss, the magnitude and duration of which were dependent on the intensity of radiation. Recovery from the weight loss due to anorexia was also a function of the dose. The rates of weight loss of the young rats were similar to those of the older rats. Exposure of almost any portion of the body was also immediately followed by anorexia and loss of weight; the duration and degree of the changes depended on the part of the body exposed. The parts in order of increasing response to 800 r were hind legs and tail; head, chest, stomach and spleen; abdomen, intestine and entire body except head.—G. F. Garton.

1038

KIMELDORF, D. J. and BAUM, S. J. Alterations in organ and body growth of rats following daily exhaustive exercise, x-irradiation, and post-irradiation exercise. *Growth*, 1954, **18**, 79-96. [Div. Biol. Med. Sci., U.S. Naval Radiol. Defense Lab., San Francisco 24, Calif.]

1039

PAGET, G. E. Exudative hepatitis in guinea-pigs. *J. Pathol. Bacteriol.*, 1954, **67**, 393-400. [Dept. Pathol., Univ. Manchester.]

Outbreaks of disease occurred in 1951 in 2 large colonies of guinea-pigs in the Manchester area; each colony contained about 300 animals, of which about half died. There was no transfer of staff or stock between the colonies and the only common feature was that both used a commercial form of the diet described by Bruce and Parkes (Abst. 138. Vol. 17). When the diet was abandoned the disease disappeared. Rabbits were not affected. Only certain batches of the commercial diet appeared to be implicated.

The animals became sluggish and had rough coats and sometimes patchy loss of hair. There was a characteristic pad of oedematous tissue on the abdominal wall, and sometimes ascites. Death occurred in a few hours. Antibiotics were of no value. At post mortem over 80 per cent. of the animals had oedema or serous effusions. About 75 per cent. had greatly enlarged mesenteric lymph nodes, white and fleshy, especially the ileocaecal group. The spleen was slightly enlarged and red. The liver was pale but appeared little altered macroscopically, though histologically there was gross abnormality; the portal tracts and parenchyma were infiltrated with plasma cells and lymphocytes, the portal tract lymphatics were dilated, and there was striking dilatation of the liver-cell columns, sometimes giving a honeycomb appearance to the tissue. There was no jaundice or increase in serum bilirubin.

It was not possible to reproduce the disorder in other guinea-pigs fed on the commercial diet. A deficiency is postulated, but the etiology of the disorder is unknown.—D. Duncan.

1040

MAYER, J., MARSHALL, N. B., VITALE, J. J., CHRISTENSEN, J. H., MASHAYEKHI, M. B. and STARE, F. J. Exercise, food intake and body weight in normal rats and genetically obese adult mice. *Amer. J. Physiol.*, 1954, **177**, 544-548. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

A treadmill is described which is suitable for exercising rats and mice.

When mature, normal rats were exercised for 20, 40 or 60 min. daily they consistently consumed less food than when they were not exercised, and their weight decreased correspondingly. With daily exercise lasting 2 hr. or more, food intake increased linearly above the initial amount with duration of exercise, though bodyweight was maintained slightly below that reached after 60 min. exercise daily. When exercise exceeded 6 hr. the results were complicated by extreme fatigue.

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The mice were adult, genetically obese animals weighing on the average 52 g. and non-obese controls weighing 22 g. Half the mice were exercised for 1 hr. daily, divided between morning and afternoon. Exercise increased the food intake of non-obese mice slightly and they maintained their weight. Obese mice without exercise ate on the average 4.5 g. food daily and gained in 45 days 14.7 g., while those made to exercise increased their food intake to 7.0 g. daily, but gained only 9.2 g. in bodyweight during the experiment.

D. Duncan.

1041

PARSON, W., CAMP, J. L. (III) and CRISPELL, K. R. Dietary dilution studies in mice with gold thioglucose-induced obesity and in mice with the hereditary obesity-diabetes syndrome. *Metabolism*, 1954, 3, 351-356. [Dept. Int. Med., Sch. Med., Univ. Virginia, Charlottesville.] See also Title 955, Vol. 24.

1042

TALBERT, G. B. and HAMILTON, J. B. Failure to produce obesity in the rat following gold thioglucose injection. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 376-378. [Dept. Anat., Coll. Med., State Univ. New York, Brooklyn.]

Although mice became obese after a single injection of gold thioglucose, rats did not become obese after one or two injections, and those which survived the LD₅₀ lost weight. The explanation appears to lie in genetic differences.—D. Duncan.

1043

SOGNNAES, R. F. and SHAW, J. H. Experimental rat caries. 4. Effect of a natural salt mixture on the caries-conduciveness of an otherwise purified diet.

SHAW, J. H. and SOGNNAES, R. F. 5. Effect of fluorine on the caries-conduciveness of a purified ration. *J. Nutrition*, 1954, 53, 195-206; 207-214. [Harvard Sch. Dent. Med., Boston, Mass.]

For earlier work in this series see Title 3429, Vol. 18 and Absts. 5297, Vol. 19 and 4759, Vol. 18.

4. The diets given to 239 rats were the basal caries-producing ration of purified foods used by Shaw (Abst. 2317, Vol. 17) and the same ration with the mineral mixture component replaced by an equivalent amount of the ash derived from Purina laboratory chow. The animals were in 2 main groups of 139 from which all major salivary glands had been removed at weaning and 100 untreated normal rats. Feeding was arranged so that during pregnancies and lactations up to their fourth, dams received either the basal or the experimental diets only or a combination of these, the change from basal to experimental being made at the time of birth or of weaning of the litter. Except for the fourth litters which received the

experimental diet, all litters were given the basal ration. At 7 months of age the young were killed and their teeth were examined.

No significant difference was found in the rate of growth of rats on the 2 diets. Although it contained all known essentials the purified ration gave rise, in the normal animals, to a greater incidence of caries than did the one with the ash of laboratory chow. The protection which that ash conferred may have resulted from the presence of trace elements. In the desalivated rats changing the type of mineral mixture had no effect on the incidence of caries.

5. In experiments on a similar plan the same caries-producing diet was used and the effects were studied of adding to it 6 or 25 p.p.m. F as NaF. There was little protective effect against caries, nor could the absence of caries in earlier work with natural diets be attributed to their F content. While the influence of F cannot be gainsaid, the evidence is taken to support the view that it is minerals other than F, or the ratios existing between them, which determine differences in the incidence of caries.—D. Harvey.

1044

NIKITIN, S. A. and BUGAEVA, M. G. Eksperimental'nyi karies u belykh krysy. [Experimental dental caries in white rats.] *Stomatologiya*, 1954, No. 1, 9-17. [Dept. Pathophysiol., Sci. Res. Inst. Stomatol., Odessa.]

In the first experiment 47 mice weighing 10 to 12 g. were fed on a carbohydrate-rich diet of whole rice 55, sucrose 24, dried powdered milk 15, sunflower oil 5 and salt 1 per cent. There were 50 controls fed on bread, oats and milk. The experiment lasted 100 days. In the second experiment 12 white rats were on a "caries-producing" diet of wheat 50, sugar 32, vegetable oil 15 and salt 3 per cent. The 13 controls had bread, milk, oats, a small amount of cooked meat and cod liver oil. In neither experiment did the animals show any trace of dental caries.

In the third experiment rats received a diet containing all the necessary organic and inorganic elements, but in an unusual form for these particular animals. The diet consisted of curds washed in tap water and dried 24, sugar 67, sunflower oil 5, salt mixture 4 per cent., bread, as an appetiser, 2 or 3 g. per rat and 1 polyvite tablet per week for the whole group. Caries of the enamel and dentine occurred in rats fed on this diet during the last days of pregnancy and continued during lactation and after. Rats brought up on this diet and continued on it for 3 to 10 months developed surface caries. The second generation of rats, bred from rats brought up on a "caries" diet and continued on this diet, developed caries of all the molars at from 3 to 4 months. When this second generation

and the mother were fed on a normal diet immediately after birth, no caries developed during the same time. On the other hand, keeping the female rat on normal food during most of pregnancy did not affect the onset of 100 per cent. caries in her progeny when they and the mother were fed on a caries-producing diet, the pregnant rat being started on it 1 or 2 days before parturition.

H. Scherbatoff.

1045

SHAW, J. H. The effect of carbohydrate-free and carbohydrate-low diets on the incidence of dental caries in white rats. *J. Nutrition*, 1954, 53, 151-162. [Harvard Sch. Dent. Med., Boston, Mass.]

In 4 experiments 19 groups of rats were given one or more of 5 diets. The basal caries-producing diet was a mixture of sucrose 67, casein 24, maize oil 5, salts 4, and liver 2 parts with vitamins added. Two variants were, except for traces, free from carbohydrate, sucrose replaced in one mostly by casein and in the other mostly by lard; in the third, ground maize starch was substituted for sucrose and in the fourth all but about 6 per cent. of the sucrose was replaced by casein or lard. In 3 of the 4 experiments the rats were desalivated.

On the 2 carbohydrate-free and on the low-carbohydrate diets caries did not develop even after desalivation of the rats and after as long as 2 years. Transfer of the animals to or from the basal diet resulted in corresponding appearance or arrest of lesions. It is concluded that a source of carbohydrate is necessary both for the initiation and for continued development of caries.

D. Harvey.

1046

KESSLER, R. F., HUNT, H. R. and HOPPERT, C. A. Dental caries in caries-susceptible and caries-resistant albino rats (*Rattus norvegicus*) in the absence of secretions of the parotid gland. *J. Dent. Res.*, 1954, 33, 558-560. [Dept. Zool., Michigan State Coll., East Lansing.]

1047

MUHLER, J. C. and SHAFER, W. G. Experimental dental caries. 2. Effect of desalivation on dental caries and castration and desalivation on fluorine storage in the rat. *J. Dent. Res.*, 1954, 33, 346-356. [Dept. Chem., Indiana Univ., Bloomington.]

In 8 groups of rats, 4 of each sex, the treatments were (1) desalivation, i.e., removal of submaxillary and sublingual glands and of at least three-quarters of the parotids, (2) desalivation and giving, as stannous fluoride, 25 μ g. F per ml. drinking water, (3) control and (4) control with F in the same form as in (2). Operations were at ages between 30 and 36 days and all animals were given a caries-producing diet until the age of 140 days, when they were killed.

Desalivation resulted in an increase in the incidence of caries which was relatively greater in females than in males; the inclusion of F diminished this effect in both sexes. The effect on growth was as already reported (Abst. 4890, Vol. 24) and F did not alter it. Desalivation did not influence the weight of testes, but did reduce the weight of the uterus by producing generalised atrophy. Changes in adrenals were not consistent except for a thickening of the zona glomerulosa which occurred in females. There was no histological change in thyroid, pancreas or epiphyses of long bones.

The giving of F greatly increased the amount stored in the skeleton, but did not affect the process of calcification as judged by the ratio of Ca : P in the femurs.—D. Harvey.

1048

MUHLER, J. C. and SHAFER, W. G. Experimental dental caries. 4. The effect of feeding desiccated thyroid and thiouracil on dental caries in rats. *Science*, 1954, 119, 687-689. [Dept. Chem., Univ. Indiana, Bloomington.]

About 175 Sprague Dawley rats on a stock cariogenic diet (Muhler *et al.*, *J. Amer. Dent. Assoc.*, 1953, 46, 290) were divided into 6 groups, which were given desiccated thyroid, from 10 to 60 mg. daily, with or without 20 μ g. F as NaF per ml. in their drinking water, or 0.1 per cent. thiouracil in the diet, with or without 20 μ g. F per ml. water, or the F alone, or no supplement. After 145 days they were killed, caries was evaluated, and F, Ca and P were estimated in femurs.

Growth was not affected by thyroid or F, but was depressed by thiouracil. None of the supplements affected calcification of the skeleton. The concentration, but not the absolute amount, of F was greatest in those given thiouracil and F; thyroid had little effect on either. Thyroid was as effective as F in reducing dental caries and the 2 combined had a greater effect than either singly. Thiouracil increased caries and the further addition of F was without effect, confirming that there is some connection between thyroid activity and caries in the rat.—W. M. Deans.

1049

CONSTANT, M. A., SIEVERT, H. W., PHILLIPS, P. H. and ELVEHJEM, C. A. Dental caries in the cotton rat. 14. Further studies of caries production by natural diets with especial reference to the role of minerals, fat, and the stage of refinement of cereals. 15. The effect of tooth maturity and minerals on caries production by semi-synthetic diets. *J. Nutrition*, 1954, 53, 17-27; 29-41. [Dept. Biochem., Univ. Wisconsin, Madison.]

14. For earlier work see Absts. 4619, Vol. 16; 2663, Vol. 22. In all, 34 sets of data, evaluated

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by the methods originally described (Abst. 3499, Vol. 14), are reported.

The basal diets were one of finely ground oatmeal 50, dried whole milk powder 32, and sucrose 18 per cent. and 3 variants in which the amount of oatmeal was unaltered but which contained cereal and dextrin (CD), cereal, dextrin and sucrose (CDS) and cereal, dextrin, sucrose and fat (CDSF). In weanling cotton rats the incidence of caries was lowest on the first and highest on the fourth diet; substitution of casein and dextrin for milk powder resulted in severe tooth decay; the inclusion of maize oil afforded no protection. Addition of CaCO_3 or Na_2HPO_4 to the CDSF diet greatly reduced the incidence and extent of caries; without Ca a mixture of basic salts also diminished the incidence, but with Ca the effect was much greater. When the CDSF diet was not given until 1 month after weaning tooth decay was greatly reduced.

For study of the effects of varying the source of fat a diet of equal parts of oatmeal and dried whole milk powder and containing 14 per cent. fat was compared with others in which dried skimmed milk and fats replaced the dried whole milk. Although the first of these contained no sucrose the incidence of caries was moderate when it was given. With maize oil 7 per cent. and dried skimmed milk powder there was good protection against caries.

The influence of processing the oatmeal was examined in experiments with diets containing whole oats, groats before or after steaming, rolled oats and mixtures of groats with hulls or with the ash of hulls. The incidence of caries was greatest after removal of the hulls. The addition of ash had no effect on the production of caries.

15. Experiments were made over several years and 52 sets of data were obtained. The basal diet contained casein 24, sucrose 67, salt mixture 4 and maize oil 5 per cent. with vitamins added. The experiments are in 3 groups.

In the first set a decrease in Ca content increased the incidence of caries. Delay in introducing the cariogenic diet until the cotton rats were 8 weeks old reduced both incidence and severity. In the second set mixtures of basic or acidic organic salts and of acidic inorganic salts had no protective action against caries; only mixtures of basic inorganic salts prevented tooth decay. In the third set attempts were made to modify the effects of the low-Ca, high-sucrose diet. Addition of maize oil to give 15 per cent. fat or reduction of the sucrose to 20 per cent. by replacing it with dextrin made no change. Addition of lysine or tryptophan or a combination of these did not reduce the incidence, but the source of protein had some effect. Incidence of caries was slightly less with albumin and considerably less with fibrin instead of casein.—D. Harvey.

GENERAL METABOLISM AND FEEDING HABITS OF ANIMALS OTHER THAN MAMMALS AND BIRDS

1050

SEAGRAN, H. L., MOREY, D. E. and DASSOW, J. A. The amino acid content of roe at different stages of maturity from the five species of Pacific salmon. *J. Nutrition*, 1954, 53, 139-149. [Fish. Prod. Lab., U.S. Fish and Wildlife Serv., Ketchikan, Alaska.]

There was little variation, either between individuals or between species, in the essential amino-acid content of salmon roe at the same stage of maturity; very immature roe contained more threonine and less histidine, isoleucine, leucine, lysine, methionine, phenylalanine and valine than mature. Average values for mature salmon roe, expressed as per cent. of protein calculated to 16 per cent. N, were arginine 7.2, histidine 2.7, isoleucine 7.2, leucine 9.9, lysine 8.8, methionine 2.9, phenylalanine 4.8, threonine 5.9, tryptophan 0.9 and valine 7.2.—C. Warner.

1051

BONDI, A. and SPANDORF, A. The action of the digestive enzymes of the carp. *Brit. J. Vol. 25, No. 1*

Nutrition, 1954, 8, 240-246. [Lab. Animal Nutrit., Agric. Res. Stat., Rehovoth, Israel.]

To investigate the digestive activity of the carp, which lacks a stomach, extracts from the pancreas and intestine were incubated with purified casein, peptone, meat, fish, soya bean and groundnut meals, starch, maltose and wheat bran. Protein and carbohydrate digestion were measured by the production of amino-acids and reducing sugar, respectively.

The digestion of casein by the pancreatic extract reached 50 per cent. at 38° C. and pH 7.0. The meal preparations were digested to a similar extent. Intestinal extract digested only 12 per cent. of casein, but in the presence of pancreatic extract 82 per cent. Peptone digestion was 62 per cent. with intestinal extract and only 26 per cent. with pancreatic extract; the extracts together increased the initial rate of digestion, but 62 per cent. was the maximum obtained.

More than 90 per cent. of starch was digested by pancreatic extracts, and digestion of maltose was quicker. Bran was digested to the same extent

over a longer time. Intestinal extracts did not liberate reducing sugars from starch, and maltose was only 30 per cent. digested after 3 days. The intestine had evidently a smaller maltose activity than the pancreas, the opposite being true in mammals.—A. Hepburn.

1052

- MAGIS, N. Nutrition comparée des *Tribolium*. 2. Importance du cholestérol et des facteurs de la levure dans la nutrition des larves de *Tribolium confusum* Duv., *T. castaneum* Herbst et *T. destructor* Uytt. (Insecta, Coléoptères.) [Comparative nutrition of *Tribolium*. 2. Importance of cholesterol and yeast factors in the nutrition of larvae of *Tribolium confusum*, Duv., *T. castaneum*, Herbst and *T. destructor*, Uytt. (Insecta, Coleoptera.)] *Bull. Soc. Chim. biol.*, 1954, **36**, 681-690. [Lab. Biochem., Univ. Liège.]

The first paper in this series appeared in *Bull. et Ann. Soc. entom. Belgique*, 1954, **90**, 49.

The basic diet was that found suitable for *T. confusum* by Lemonde and Bernard (*Canad. J. Zool.* 1951, **29**, 71); its composition and preparation are described. It proved to be suitable also for *T. castaneum* and *T. destructor*, but in all 3 species development was somewhat slower than on the natural diet. When yeast was omitted all 3 species showed delayed development and characteristic malformations in the adult stage. When cholesterol was omitted these effects were more pronounced.—D. Duncan.

1053

- LECLERCQ, J., MAGIS, N. and REY, C. Sur les besoins nutritifs du *Gnathocerus cornutus* F. (Coléoptère, Ténébrionide). Recherche de l'optimum glucidique et de l'optimum protéidique dans un régime alimentaire artificiel. [Nutritive requirements of *Gnathocerus cornutus*, F. (Coleoptera, Tenebrionidae). Carbohydrate and protein optima in an artificial diet.] *Arch. internat. Physiol.*, 1954, **62**, 264-271. [Inst. Léon Fredericq, Univ. Liège.]

Larvae of the broad-horned flour beetle *Gnathocerus cornutus* were reared in groups of 20 in containers with 20 g. diet at 30°C. and 60 to 70 per cent. relative humidity. The 7 diets tested included whole wheat flour with a water content of 12 to 14 per cent.; dried baker's yeast; and 5 combinations of casein, glucose and yeast with 6 to 8 per cent. water content.

Larval mortality was least on wheat flour and greatest on diets rich in glucose and poor in protein. Development was quickest on wheat flour and on yeast and slowest on low-protein diets, and the variation in time was least on the 2 natural media. The mean weight of nymphs was greater

on wheat flour than on the other diets. There was not much difference in value between the synthetic diet containing no casein and those with 15 or 45 per cent.

Gnathocerus cornutus has a high protein tolerance and a low sugar tolerance and differs in these respects from other Tenebrionidae so far studied.

D. Duncan.

1054

- SEDER, D. J. W. Qualitative amino acid requirements of larvae of *Calliphora erythrocephala* (Meigen). *Acta physiol. pharmacol. neerl.*, 1954, **3**, 262-269. [Lab. Comp. Physiol., Univ. Utrecht.] French and German summaries.

1055

- LINDNER, M. J. Estimation of growth rate in animals by marking experiments. *U.S. Dept. Interior, Fish and Wildlife Serv. Fish. Bull.* No. 78, 1953, 65-69.

The method described by Walford (Abst. 2009, Vol. 16) was applied to the study of growth of the shrimp *Penaeus setiferus*, specimens of which were measured at the times of tagging and of subsequent recapture.—D. Harvey.

1056

- IDLER, D. R. and FAGERLUND, U. H. M. Steam-volatile fatty acids from a marine tube worm. *J. Amer. Chem. Soc.*, 1954, **76**, 3594-3595. [Pacific Fish. Exp. Stat., Vancouver, B.C.]

Formic, acetic and propionic acid were separated in the proportions of 11.5, 56.5 and 36.5 parts of the total volatile fatty acids from an extract of the marine tube worm *Eudistylia vancouveri*. The worm contains *n*-octyl alcohol, and here an octanoic acid was also obtained in 1.5 per cent. yield, equivalent to a concentration of only 3.4 mg. per kg. worm. The behaviour of the acid on column and paper chromatograms was identical with that of *n*-octanoic acid.—A. Hepburn.

1057

- KAMEOKA, K., TAKAHASHI, S. and MORIMOTO, H. [Studies on the chemical composition of rumen protozoa.] *Bull. Nat. Inst. Agric. Sci., Japan* [G], 1954, **8**, 75-81. In Japanese: English summary.

Protozoa were separated from the rumen contents of goats on a diet of hay and concentrates. Protein and starch [? carbohydrate] each accounted for about 40 per cent. of their composition. All the essential amino-acids were found except methionine. Of the monosaccharides only glucose was found. A considerable number of starch-like granules appeared to be stored in the protozoa.

J. S. Thomson.

See also Absts. 425, 493, 506.

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5. HUMAN DIET IN RELATION TO HEALTH AND DISEASE

DIET

REQUIREMENTS

1058

- ALMQUIST, H. J. A fallacy in the analysis of nutritional requirement data. *Arch. Biochem. Biophys.*, 1954, **50**, 503. [The Grange Company, Modesto, Calif.]

In many examples of the analysis of nutritional requirement data, the law of diminishing returns is closely adhered to. This implies that in these cases biological response increases linearly with the logarithm of the level of some nutritional factor. For this reason it is incorrect to compare the response corresponding to a given change in the factor at different levels of that factor. One should compare the response corresponding to a given percentage change in level of the nutritional factor in order to obtain a uniform test at all levels.—A. W. Boyne.

1059

- LEVERTON, R. M. The amino acid requirements of man. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 8*, 1954, 55-74. [Coll. Agric., Univ. Nebraska, Lincoln.]

This paper reviews and discusses other published work and elaborates and extends Titles 2693, Vol. 22; 4905, Vol. 23. Young women were adjusted to a purified diet that supported N equilibrium, and the amino-acid to be tested was reduced in amount until the N balance became negative. In this way the minimum requirement of the amino-acid for N equilibrium was estimated; it was found to be for threonine about 2 mg., for valine 550 mg. and for tryptophan 150 mg. daily.

C. Warner.

FEEDING OF INFANTS AND CHILDREN

1060

- MASTENBROEK, G. G. A. Die Frauenmilchzentrale des niederländischen Roten Kreuzes. [The human milk bank of the Netherlands Red Cross.] *Öst. Ztschr. Kinderheilk.*, 1953-54, **9**, 281-284. [Cliostraat 12, Amsterdam.]

See Abst. 168, Vol. 22.

1061

- OSSOING, K. Über Stillergebnisse an Neugeborenenstationen. [Lactation results in wards for newborn infants.] *Öst. Ztschr. Kinderheilk.*, 1953-54, **9**, 405-410. [Geburtshilf.-Gynäkol. Abt., A. Ö. Krankenhaus, St. Pölten.]

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An improvement in lactation performance of women in the first week after parturition was attained during the 5 years from 1947 to 1951 at the St. Pölten Hospital. On discharge from hospital 70 per cent. of mothers had enough or more than enough milk, 28 per cent. had insufficient milk, and 2 per cent. could not feed their infants. Excess milk was collected by breast pump for infants who could not be breast fed wholly or in part by their mothers. Problems of breast milk supply for newborn infants are discussed with reference to modern methods of handling.—A. M. Copping.

1062

- PLATT, B. S. Infant-feeding practices. Breast feeding and the prevention of infant malnutrition. *Proc. Nutrition Soc.*, 1954, **13**, 94-105. [Human Nutrit. Res. Unit, Med. Res. Council Labs., Holly Hill, London, N.W.3.]

1063

- HYTTE, F. E. Artificial milk mixtures prepared by the mothers of young babies. *Proc. Nutrition Soc.*, 1954, **13**, iv-v. [Dept. Midwifery, Univ. Aberdeen.]

1064

- CROSSE, V. M., HICKMANS, E. M., HOWARTH, B. E. and AUBREY, J. The value of human milk compared with other feeds for premature infants. *Arch. Dis. Childhood*, 1954, **29**, 178-195. [Premature Baby Unit, Sorrento Maternity Hosp., Birmingham.]

Infants weighing less than 4 lb. at birth were grouped according to birthweight and in each group babies were allocated in rotation to the five test diets: 1 human milk; 2 low-protein evaporated cow's milk mixture; 3 high-protein dried half-skimmed cow's milk mixture; 4 human milk with sweetened casein hydrolysate and 5 evaporated cow's milk with sweetened casein hydrolysate. Fat content was kept at 1.6 per cent. in the cow's milk mixtures. The energy values of all the diets were adjusted to 20 Cal. per fluid oz. by varying the amount of sugar in the cow's milk mixtures and by slight dilution of human milk before addition of casein hydrolysate. All diets were given diluted for the first 7 to 10 days. Supplements of vitamins, Ca, P and Fe were given to all babies.

In all weight groups infants given diet 3 regained birthweight in the shortest time. Except for the

babies in the 2 to 2½ lb. group, infants in the groups given diet 5 regained birthweight in approximately the same time as the corresponding groups given diet 3. The groups given diet 1 took somewhat longer than did those on diet 3 and the slowest progress was in infants on feeds 2 and 4, especially the smaller ones. Infants on diet 3 also made the most rapid gains subsequently, but because of the occurrence of oedema their superior gains as compared with group 1 were attributed in part to greater retention of water.

As judged by Hb values diet 2 was inferior to the other diets. During stay in hospital the least infection occurred in infants given diet 1, followed closely by those given diet 3.

Curves for serum proteins were not affected by diet except that in the smallest babies the lowest values for total proteins were found in those given diets 2 and 5; the lowest albumin values were in those on diet 2.

Some observations on the incidence of rickets and retrolental fibroplasia are made.

From 4½ lb. weight, which was the stage of discharge from hospital, there were 3 feeding groups, breast milk or low-protein full-cream dried milk or high-protein half-skimmed dried milk mixtures. At the end of 6 months the highest average weight was for the 12 in the first group and no major infection or death had occurred; there were 3 cases of infections and no death among 30 infants in the second, and 14 cases of infections and 5 deaths among 110 in the third. At 1 year of age all breast-fed infants were alive but 1 in the second and 9 in the third group had died.

In the opinion of the authors human milk is the best food for premature babies.—F. C. Aitken.

1065

SYDOW, G. v. and FAXÉN, N. **Breast or cow's milk as infant food. Discussion on the methods of comparison.** *Acta paediat.*, 1954, 43, 362-367. [Child Dept., Länslasarett, Sundsvall, Sweden.] French, German and Spanish summaries.

In comparative studies of breast milk and cow's milk as food for infants the groups should be identical in all respects other than feeding and the supply of food should be equally free or equally limited to both. Such a comparison may be made most easily in a children's home. A small investigation of 48 infants is described to illustrate the method. Alternate infants were given collected, sterilised breast milk or cow's milk and all were nursed together under equal risks of infection. The number of days with a rise in infant temperature was higher in the cow's milk than in the breast milk group.—F. C. Aitken.

1066

PEHRSON, M. **The consumption rate of infants upon various milk formulas.** *Acta paediat.*, 1954, 43, 396 (with discussion 396). *Proc.*

1067

SEYMOUR, C. F., TAYLOR, G. and WELSH, R. C. **Substitution of vinegar for lactic acid as bactericidal agent in infant milk mixtures.** *Amer. J. Dis. Child.*, 1954, 88, 62-66. [Dept. Paediat., Sch. Med., Duke Univ., Durham, N.C.]

1068

ALLÚE DE HORNA, A., IBARZ, A. and MONNE, R. **Leche entera acidificada. La absorcion de grasa y su influencia en los procesos inmunarios. [Acidified whole milk. Fat absorption and its influence on the processes of immunisation.]** *Rev. española Pediat.*, 1954, 10, 327-354. [Plaza de Prim., 3, Tarragona.] French, English and German summaries.

In 5 more or less healthy infants fed on acidified whole milk with 17 per cent. fat the coefficient of absorption of fat was always more than 80 per cent. and in 50 per cent. of analyses more than 90 per cent. The intake varied from 13.6 to 35.7 g. fat and on only one occasion was more than 4 g. excreted. In 6 sick children the absorption of fat was poorer, but it improved steadily as they recovered. Nearly all the children in both groups had major or minor infections at intervals before they received the experimental diet, and it is considered that a high coefficient of fat absorption was closely related to resistance to infection.

D. Duncan.

1069

SUÁREZ, M. and VELASCO, J. A. **Estudios sobre absorcion de grasa en el lactante. 1. Comunicacion. Absorcion de grasa en la alimentacion con la leche en polvo acidificada. [Studies on fat absorption in the infant. 1. Fat absorption in feeding with acidified powdered milk.]** *Rev. española Pediat.*, 1954, 10, 355-368. [Cat. Paediat. Puericolt., Univ. Santiago de Compostela.] French, English and German summaries.

In 8 infants aged from 4 to 12 months, some with digestive disorders, acidified whole milk powder (Pelargon) gave better fat absorption than fresh or condensed milk. The coefficient of fat absorption was very low in infants with diarrhoea, but rose progressively during recovery. The powdered milk preparation also provided a higher protein intake than condensed milk and about twice as much as human milk. Its high nutritive value is considered to maintain a high resistance to infection.—D. Duncan.

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1070

DEISHER, R. W. and GOERS, S. S. **A study of early and later introduction of solids into the infant diet.** *J. Pediatr.*, 1954, **45**, 191-199. [Child Health Centre, Univ. Washington, Seattle.]

The 85 infants studied were enrolled at the well-baby clinic at the age of 1 to 4 weeks and were under observation for at least 6 months. They were allocated to 2 groups according as solids were introduced during the first 4 weeks or during the ninth to twelfth week of life. Each month infants were given a physical examination, Hb and red cell count were estimated and height and weight were measured.

No significant difference was found between the groups in Hb, red cell count, growth as evaluated by Wetzell grid, or general wellbeing.

F. C. Aitken.

1071

WELBURN, H. **The danger period during weaning among Baganda children.** *East African Med. J.*, 1954, **31**, 147-154. [Child Welfare Clin., Mengo District, Uganda.]

Baganda babies are weaned at about 14 or 15 months, but from about 6 months the lactation is insufficient and the only supplement is cooked plantain. Heights and weights were recorded for Baganda children, most of whom lived in villages. Of those aged from 6 months to 3 years, 30 per cent. had chronic respiratory infections and 46 per cent. had signs of kwashiorkor. Heights have as yet been recorded continuously only for 8 months. Weights from 1 to 18 months were recorded for 102 children, of whom 14 had well educated parents. Of the 14, rate of weight increase was good throughout in 7, good at first but less good after 6 months in 6, and poor throughout in 1. For the 88 from ordinary homes, the corresponding figures were 12, 64 and 12. Forty-nine of those who did well at first were followed for 2 years; 9 had infections and their weight increase continued to be unsatisfactory; 7 gained well and made up lost ground, and the remaining 33 continued to gain but always at a level below the normal. Infections had a worse effect on the weight increase of children already gaining badly because of malnutrition, and such children were more liable to infections. Severe whooping-cough often appeared in the case history of patients with kwashiorkor.—E. M. Hume.

1072

BRANSBY, E. R. and FOTHERGILL, J. E. **The diets of young children.** *Brit. J. Nutrition*, 1954, **8**, 195-204. [Minist. Health, Savile Row, London, W.1.]

The diets of 461 children aged between 6 months and 5 years and living in 10 localities in England were surveyed in April 1951. A record of food

consumption was kept by the mother for 1 week; the method was similar to that described by Widdowson (Abst. 3858, Vol. 6) and Beltram and Bransby (Abst. 4041, Vol. 20). During the week of the diet survey a social survey was made also.

The average consumption of all principal foods except milk, sugar, green and other vegetables, soup and gravy increased with age. The average daily energy intake rose from 1080 Cal. for children under 1 to 1730 Cal. for children aged 4; for nutrients corresponding values were protein 38 and 51 g., fat 46 and 76 g., Ca 0.97 and 0.76 g., Fe 6.7 and 9.0 mg., vitamin A 2160 and 2380 I.U., vitamin B₁ 0.58 and 0.77, nicotinic acid 2.7 and 6.6, riboflavin 1.18 and 1.03 and ascorbic acid 14.2 and 28.2 mg. Boys, children in large families, children whose mothers went out to work and children in lower income groups tended generally to have intakes of energy and nutrients above average; girls, only children and children whose mothers did not go out to work tended to have nutrient intakes below average. The weight of food eaten and the intakes of energy and of all nutrients were either high or low; a high intake of some nutrients was not offset by low intakes of others. The average intakes of energy, Fe, vitamin A, vitamin B₁, riboflavin, and ascorbic acid by children aged 6 to 12 months and 1, 2, 3 and 4 years exceeded the British Medical Association's recommendations.

Other intakes were below those recommended, that of protein by children of 2 to 4 years by 9 to 18 per cent., of Ca by children of 1 to 4 years by about 25 per cent.; that of nicotinic acid for children under 1 year and at 1 year of age by 15 and 5 per cent., respectively.—G. F. Garton.

1073

INTENGAN, C. L., ALEJO, L. G., CONCEPCION, I. and SANTIAGO, L. C. **A biochemical evaluation of the UNICEF school lunch program given to malnourished school children of San Andres elementary school, Manila.** *Acta med. philipp.*, 1952-53, **9**, 181-196. [Foods and Nutrit. Biochem. Div., Inst. Nutrit., Dept. Health, Republic Philippines.]

Hb, protein, ascorbic acid, riboflavin, vitamin A and carotene in the blood, and riboflavin and vitamin B₁ in the urine, were measured in 200 children aged from 7 to 13 years after half of them had received daily for a year a special school lunch which was part of the UNICEF programme. The lunch supplied about one-third of their daily energy needs and included milk and undermilled rice. In the children having the lunch higher values were found for Hb, protein and riboflavin in the blood and for riboflavin in the urine. Vitamin B₁ in the urine was considered to be low and was only 10 per cent. higher in those having the

lunch. Serum vitamin A and carotene values were low in all the subjects and were not higher with the school lunch. All vitamin C values were satisfactory. The chief deficiency in the diet appeared to be of vitamin A, and increased use of milk and green and yellow vegetables is recommended.—A. M. Copping.

1074

KERPEL-FRONIUS, E., VARGA, F. and KUN, K. Pathogenese der Dekomposition. 2. Die Bedeutung der Anoxie, Hypothermie und Hypoglykaemie im Endzustand der Säuglings-atrophie. [Pathogenesis of marasmus. 2. Significance of anoxia, low body temperature and low blood sugar in the final stages of marasmus in infants.] *Ann. paediat.*, 1954, **183**, 1-28. [Kinderklin., Univ. Pécs.] English and French summaries.

Sudden loss of weight should be treated with chloramphenicol, against *Bact. coli* infections of the intestine, and by blood transfusion.

Anoxia is precipitated by anhydraemia and low temperature due to short periods of fasting, and the consequent apnoeic respiration can be relieved by giving sugar. Incidence of marasmus has been reduced to a quarter of what it was and mortality in hospital to half.—I. Leitch.

1075

GLASER, K. and FREUNDLICH, E. Use of cortisone in malnourished children: clinical study. *Pediatrics*, 1954, **13**, 439-446. [Dept. Paediat., Hadassah Hebrew Univ. Hosp., Jerusalem.] Spanish summary.

Twenty-five infants who had failed to gain weight in response to treatment with diet, antibiotics, vitamins, liver or iron, were given cortisone. Satisfactory gain began during or after cortisone treatment in 13 infants.—F. C. Aitken.

See also Absts. 108, 204, 732, 983, 1107, 1150, 1261.

DIETARY SURVEYS AND INDIVIDUAL STUDIES

1076

WOOLF, B. Statistical aspects of dietary surveys. *Proc. Nutrition Soc.*, 1954, **13**, 82-94. [Dept. Animal Genetics, Univ. Edinburgh.]

1077

CHURCH, H. N., CLAYTON, M. M., YOUNG, C. M. and FOSTER, W. D. Can different interviewers obtain comparable dietary survey data? *J. Amer. Dietetic Assoc.*, 1954, **30**, 777-779. [New Jersey Agric. Exp. Stat., New Brunswick.]

See Abst. 3391, Vol. 23.

1078

WRIGHT, L. D. Significance of the vitamins in human nutrition. *J. Agric. Food Chem.*, 1954, **2**, 672-678. [Sharp and Dolme, Div. Merck and Co., Inc., West Point, Pa.]

1079

DE SEGURA, R. M. Consumo de leche y derivados en el estudio de la anamnesis alimentaria de 137 embarazadas. [Consumption of milk and milk products in diet histories of 137 pregnant women.] *Rev. Asoc. argent. Dietologia*, 1953, **11**, 143-146.

From a study of their diets 137 pregnant women could be divided into 4 groups on the basis of their intake of milk and cheese, expressed in terms of liquid milk. Twenty-eight per cent. of the women consumed from 0 to 300 ml., 34 from 300 to 600 ml., 15 from 600 to 1000 ml., and only 23 per cent. more than 1000 ml., the quantity considered necessary to ensure a sufficient intake of Ca. A high percentage of pregnant women consumed small quantities of milk irrespective of their standard of education, their economic status, the number of their children, the total energy value of their diet or their consumption of maté, but those who did consume sufficient milk were characterised by their higher standard of education, their better economic status, and the higher total energy value of their diets.—M. B. Richards.

1080

MIRONE, L. Nutrient intake and blood findings of men on a diet devoid of meat. *Amer. J. Clin. Nutr.*, 1954, **2**, 246-251. [Dept. Nutrit., Univ. Georgia, Athens.] Spanish summary.

Six healthy members of a community consuming a diet low in animal protein were studied during a period of 6½ months when total animal protein intake was 10 g. and one of 5½ months when it was 23 g. A 3-day weight record of food intake during each period was kept for each subject. The average intake of energy, animal, vegetable and total protein, fat, carbohydrate, Ca, Fe, vitamins A and B₁, riboflavin, nicotinic acid, ascorbic acid and cholesterol was calculated and fasting blood samples were taken for analysis.

The diets had no apparent bad effect on the health of the 6 subjects and the addition of skimmed milk brought the nutritive values to within accepted standards. The values for cholesterol and cholesterol ester in blood serum were normal despite the low fat and cholesterol contents of the diets; the N.P.N. fractions of the blood were unaffected.—G. F. Garton.

1081

MINISTRY OF FOOD. Domestic food consumption and expenditure, 1952. Annual report of the

N.A. and R., January 1955

National Food Survey Committee. H.M.S.O., London, 1954, pp. 102. Price 4s. net.

The present report is the first for a full year since the Survey made the changes in methods referred to in Abst. 3556, Vol. 24. The report is in 4 main sections which contain 35 tables and it is supplemented by 5 appendixes with as many pages as the report itself and containing 40 more tables.

Some restriction of supplies of foods was associated with the critical state of Britain's balance of payments, but the year 1952 saw a resumption of the trend towards complete decontrol and, at the same time, a steady increase in expenditure on food.

The total value of consumption was 21s. 6d. per head per week; for the last quarter of 1951 it had been 19s. 6d. Expenditures on milk, meat, bacon and eggs increased. Consumption of meat in the last quarter was 11 per cent. greater than in the same period of 1951 and there was an associated downward tendency in fish consumption. The freeing of tea from rationing was not followed by any increase in its use. In terms of energy value and 8 nutrients there was no seasonal change throughout the year. Amounts of animal protein, fat and nicotinic acid were highest in the fourth quarter, findings which were attributable to the increases in amounts of meat and bacon, but the increase in iron accompanying these changes was more than counterbalanced by less use of peas and beans. When compared with the British Medical Association standards, intakes of energy and of the 8 nutrients were adequate.

To extend the study to social classes the same system as was used in earlier reports, of classifying households on the housewife's statement of income, was used. Although understatements were known to have been made the broad relationship between classes was not considered to be seriously in error. On the purchase of food Class A spent under $\frac{1}{4}$, Class B $\frac{1}{3}$, Class C nearly $\frac{2}{3}$, and the Old Age Pensioner (O.A.P.) group more than $\frac{1}{2}$ of their respective net incomes. Consumption and expenditure ranges were widest for fresh fruit. In energy and nutrient intakes Classes B and C were similar, Class A households higher and O.A.P. households lower than these, but it was only for iron in the O.A.P. group that deviation from the B.M.A. standard reached — 10 per cent.

The effects on household diets of family composition are considered more fully than in earlier reports. Households with 2 adults under 55 years of age were found suitable as a basis for the study of the effects of the presence of children. Average expenditure on an adult element was 57s. 3d. and for each additional child 8s. 6d. weekly. The addition of a child appeared not to affect the amount of fresh green vegetables used, and to

make little change to that of fresh fruit but when welfare and school milk were considered such an addition increased consumption of milk by nearly one-third. In households with 3 or more children intakes of protein and Ca were below requirements on the B.M.A. scale by 5 per cent. or more and in households with adolescents and children energy also was below assessed needs.

The 5 appendixes deal with technique and composition of the population, the effect of meals taken outside the home, the incidence of school milk and school meals, expenditure on subsidised foods, tables of consumption, expenditure and prices for 106 foods and the nutrient contributions of different foods. Among the findings are the following: the average uptakes were 78.5 per cent. for school milk and 44.1 per cent. for school meals; families with 1 child made less use of the services than did those with 2 or more children; there was reluctance on the part of adolescents to take school milk; in the nation's diet bread and other cereals were the main sources of energy, vegetable protein, Fe, vitamin B₁ and nicotinic acid; milk and cheese of animal protein, Ca and riboflavin; fats, vegetables and meat of vitamin A; potatoes and fruit of vitamin C and margarine and fats of vitamin D.—D. Harvey.

1082

MUKHERJEE, M. Estimation of national consumption of the United Kingdom from family budget studies. *Sankhyā, Indian J. Statistics*, 1954, 13, 412–416. [Nat. Income Unit, Minist. Finance, New Delhi.]

The official estimates of national consumer expenditure in the United Kingdom based on national income statistics are compared with sample estimates obtained in Britain from 8905 industrial working class families alone or combined with 1491 families of agricultural workers. The data were collected in 1937 and 1938. Food, clothing, rent, rates and water charges, fuel and light form 4 item groups and a fifth refers to 8 other heads of expenditure, tobacco, books and newspapers, entertainment, travel, communication service, drink, household goods and the rest. Estimates for the industrial workers alone are nearer to the official estimates, as was to be expected since agricultural workers were the poorer.

Sample estimates for clothing and rent are close to the official estimate; those for food and fuel and light are considerably higher. For food, sample estimates were uniformly higher than the official ones. The differences may be explained on rational grounds and it is concluded that a properly designed family budget inquiry need not be very large in order to obtain a reasonably accurate measure of national consumption.

D. Harvey.

1083

MULDER, T. Nationaal budgetonderzoek 1951. [National Budget Investigation, 1951.] *Voeding*, 1954, 15, 352-354.

This is the second publication from the Centraal Bureau voor de Statistiek, Utrecht, on the 1951 budget survey and deals with expenditure, including expenditure on 69 groups of foods in 16 classes. For the first report see Ornstein, *Abst.* 2291, Vol. 24.—I. Leitch.

1084

GASNIER, A., LORANGER, M. B. and BROUHA, L. L'alimentation des ouvriers canadiens-français d'une usine de l'Aluminium Company of Canada. [Nutrition of the French Canadian workers at a factory of the Aluminium Company of Canada.] *Rev. canad. Biol.*, 1953, 12, 355-395. [Dept. Nutrit. Indust. Physiol., Inst. Hyg., Fac. Méd., Laval Univ.] English summary.

A survey was made in 1946 of the boxes of food brought to eat at work by French Canadian workers at the Shawinigan Falls factory of the Aluminium Company, which makes cables. There are 3 eight-hour shifts, beginning at midnight on Sunday and ending at midnight on Saturday. What was brought and what was left were weighed for 4 or 5 days in 3 successive weeks between February and July. The number of boxes of food examined was 2668, brought by 110 men. The very varied foods were classified by the method of Berryman and Chatfield (*Abst.* 41, Vol. 13) into 17 groups slightly modified.

No difference could be found in the food brought to be eaten on the 3 shifts. The results for the 3 shifts could, therefore, be considered together. Dietary habits did not vary greatly according to season except as dictated by what was available. The foods preferred were bread, butter, pastries, meat and fruit, with tea to drink; tomatoes were particularly liked. Sandwiches predominated; there was not time for heating up food. From the results, a mean daily menu was constructed, and its nutritive value was calculated for winter and summer from the tables of Berryman and Chatfield (*loc. cit.*). The number of Calories provided by it was about 1300. If the daily requirement is put at 3000, the corresponding contribution of other nutrients, on the basis of their representing 1300/3000ths of the total daily intake, was worked out, and the result was compared with the requirements laid down by the U.S. National Research Council (*Abst.* 3507, Vol. 15). By these criteria, the amounts of animal protein, Ca, vitamin C, riboflavin, and nicotinic acid were too small, and more milk, dairy products, citrus fruits, meat, fish, and raw vegetables such as celery and lettuce should be eaten. The intake varied very greatly between

individuals, and for many of them was much less favourable than is represented by the mean. Examples are given for 2 workers of whom the intake of one was satisfactory in almost every particular, and of the other deficient in everything except energy and fat.—E. M. Hume.

1085

HAMES, P. J. and ROBERTSON, E. C. Nutritive value of low-income families' diets. Suggestions for improvements. *J. Amer. Dietetic Assoc.*, 1954, 30, 766-773. [Dept. Paediat., Univ. Toronto.]

During a period of 2 years 1030 family food records were obtained from 373 families in Toronto. The method of study was the one-week record with inventories at beginning and end. Intakes of Ca, vitamin B₁, riboflavin and ascorbic acid were computed and compared with recommended allowances of the U.S. National Research Council. Approximately 25 per cent. of families met the allowances in Ca and vitamin B₁, 60 per cent. in riboflavin and 40 per cent. in ascorbic acid. Variations in intakes from survey to survey were analysed in the 136 families studied 4 or 5 times. The results indicated that one survey of one week does not usually give a reliable picture of a family's diet. The greatest variation was in ascorbic acid intake. Variations in intakes of other nutrients were attributable to food price changes, but this was not so for ascorbic acid.

Recommendations for diet improvement included greater use of skimmed milk, whole grain or refined cereals, citrus fruits and tomatoes and less use of sweet baked goods, canned soups, potato chips and meat.—F. C. Aitken.

1086

MUSE, M. and JOHNSTON, R. Diets of Vermont farm families. *Vermont Agric. Exp. Stat. Bull.* No. 573, September 1953, pp. 32. [Burlington, Vt.]

Homes in the best farming lands of Vermont were visited between May and August 1948 and data were obtained by the interview method for 365 households. The basis of assessment was a "master food plan at low cost" which gave weekly quantities of food in each of 11 groups for each member of the family. It was found that by the standards selected, 68 families had poor, 228 medium and 69 good diets. The findings showed a slight improvement over those in 1943 by Muse (*Vermont Agric. Exp. Stat. Bull.* No. 530, 1946).

By a series of calculations which are described the diet of the modal class, which contained 56 of the families with medium diets, was arrived at and its nutrients are compared with those for a family of the same average composition calculated from recommended allowances. Of these 56 families 45

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did not use the prescribed amount of green vegetables, 30 of citrus fruits and tomatoes, 37 of dried legumes and nuts and 39 of bread, flour and cereals but the amounts of energy and of 8 nutrients in the representative diet were in excess of recommended allowances by between 36 and 85 per cent. The greatest excess was in protein which suggested that the feeding of these families was more expensive than it need have been.

The households with the best meals were generally favoured since the comparison was with a low-cost diet.

Of the 68 with poor diets the modal group of 20 families had, in general, less than recommended of citrus fruit, green vegetables, eggs, dried legumes and cereals and baked foods. The system of comparison showed that amounts of protein and iron were in excess of recommendations but those of energy, calcium, vitamins A and B₁, riboflavin, nicotinic and ascorbic acids were low or only in slight excess.

The contributions made by milk and enriched foods to these results are indicated. Possible reasons why some families are better fed than others are discussed in relation to their economic status, their tenure of land whether as owner, renter, manager or labourer and to the general managerial attitude of the homemaker.

D. Harvey.

1087

LAL, S. B. Changes in dietary habits and physique of aborigines in Santhal Parganas, a district of Bihar. *Indian J. Med. Res.*, 1954, 42, 167-179. [Pub. Health Labs., Patna-4.]

This report is based on a survey, repeated in 1951-52, of Santhals, Sauripaharis and Malpaharis originally examined in 1938-39 by Mitra (see Abst. 2862, Vol. 10). Seven-hundred and sixteen adults over 18 years, 414 men and 302 women, were weighed and measured of whom 477, 132 and 107 belonged, respectively, to the communities in the above order. The earlier finding that Santhals were taller than the others was not confirmed.

At the time agriculture was not prosperous and prices of foods and of other necessities were from 1½ to 3 times those prevailing during the earlier investigation. No change had occurred in feeding habits.

A diet survey was made of 200 families with 946 persons. Although family incomes had risen increases in consumption were recorded only for cereals and pulses; in general there was a decrease in the use of green vegetables and little change for milk, fruits and nuts, and fats and oils. Intakes of all but cereals were below the recommendations by the Indian Nutrition Advisory Committee. The average daily intakes per consumption unit for nutrients were, protein 67.6 g. (1.8 per cent.

of animal origin), fat 12.8 g., carbohydrate 499 g., calcium 0.24 g., vitamin A 442 I.U., vitamin B₁ 680 I.U. and vitamin C 12.6 mg. 92 per cent. of energy was from cereals.

Weight and height measurements and clinical examinations were made of 2204 children between 3 and 14 years of age. Boys were taller after 7 years and girls after 9 years than were children of the same sex in 1939. Clinically they were in 4 groups, 276 good, 1585 fair, 224 poor and 119 very poor. The earlier survey recognised only 3 groups, good, fair or poor, and the examinations were by medical officers other than those making this later survey. Nevertheless the evidence was that the children in the present were in a better nutritional state than those in the earlier survey. Defects are tabulated under 24 headings for eyes, mouth, hair and skin; the incidence of these signs was generally lower among Santhal than among Pahari children.—D. Harvey.

1088

ADOLPH, W. H. Nutrition in the Near East. *J. Amer. Dietetic Assoc.*, 1954, 30, 753-756. [Dept. Nutrit., American Univ., Beirut, Lebanon.]

This account is based mainly on observations in Lebanon and Syria. Urban diets in general conform to the United States pattern, but rural diets as taken by a large part of the population are widely different. In terms of percentage of total calories from different foods the rural diet consists of cereals and legumes 73, vegetables and fruit 12, sugar 3, fats and oils 7, meat 2 and milk 3. The staple cereal is whole wheat, which is eaten as bread or parboiled and dried. Milk is taken as "leban", the equivalent of yoghurt. Surveys of the rural diet in Lebanon suggest that the diet is low in protein, Ca and possibly riboflavin. There are few data on nutritional status, but observations indicate that malnutrition is widespread. Educational programmes should stress the value of green vegetables and of protective foods generally. Protein intake could be improved by increasing the supply of suitable legumes.—F. C. Aitken.

1089

HOLMES, S. A qualitative study on family meals in Western Samoa with special reference to child nutrition. *Brit. J. Nutrition*, 1954, 8, 223-239. [S. Pacific Health Serv., Headquarters Office, Suva, Fiji.]

A survey of eating habits was made on the Samoan islands of Manono and Upolu in December 1950 and January 1951. Methods were devised for collecting the required information and many surprise visits were paid to individual households, particularly at times when food was being prepared and eaten. Descriptions are given of the social background of the people and of the traditional

methods of preparing and cooking food. Most foods were homegrown but some, e.g. sugar, tinned meat and rice, were imported. Bread-fruit, taro and green banana were the principal sources of energy; no cow's milk is produced on the islands and fish, shellfish and eggs, with small amounts of pork and chicken, supplied most of the animal protein. The diet of the weaning child was the least satisfactory. Breast feeding was often continued for as long as 20 months, after which the diet tended to be deficient in protein; nevertheless, kwashiorkor was not seen. It is believed that a suitable weaning diet, details of which are given, could be prepared were sufficient trouble taken and proper use made of the available foods.—G. F. Garton.

1090

HUENEMANN, R. L. **Nutrition and care of young children in Peru. 1. Purpose, methods and procedures of study.**

HUENEMANN, R. L. and COLLAZON C., C. 2. **San Nicholas, a cotton hacienda, and Carquin, a fishing village, in the coastal plain.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 554-558; 559-569. [Sch. Pub. Health, Univ. California, Berkeley.]

These studies were linked with those described in *Abst.* 2269, Vol. 24.

1. The organisation and aims of the investigations which were made in 5 communities in Peru are described. In the coastal region a cotton plantation in San Nicolás and Carquin, a fishing village, were chosen and in the Southern and Northern Sierras, respectively, a farming community at Chacana and the Vicos plantation were selected. Yurimaguas is a jungle town. Data were collected by field workers who visited the homes once or twice daily for a week. The findings were compared with the U.S. National Research Council recommendations. The precautions required for success in work of this kind are summarised.

2. This report deals with 38 children, 17 boys and 21 girls, of whom 16 were in San Nicolás and 22 in Carquin. Their age distributions were 12 under 1 year, 16 between 1 and 2 and 10 between 2 and 3 years. Findings are tabulated for the nutrients lacking in the family diet at the time of the survey, those thought likely to have been deficient during the pregnancy, the child's past and present diet, its weight, height and dentition and clinical signs possibly related to nutritional deficiencies. There is also an assessment of its general physical condition.

Weaned children were commonly short of calcium but about half of them were not getting the recommended amounts of vitamin A, riboflavin, protein and iron. Clinical signs were seen in 23 of the children.—D. Harvey.

GENERAL STUDIES: DIET PLANNING: EDUCATION

1091

PHILLIPS, P. H. and CONSTANT, M. A. **Nutrition.** *Annu. Rev. Biochem.*, 1954, **23**, 319-344. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

1092

HARRIS, R. and CLEMENTS, F. W. **Nutrition and diet.** *Dent. J. Austral.*, 1954, **26**, 37-44. A discussion.

1093

SEBREL, W. H. (Jr.) **Programas de nutrición en los servicios de salud pública. [Nutrition programmes in the public health services.]** *Bol. Ofic. sanit. panamer.*, 1954, **36**, 269-276. [Inst. Nat. Health, U.S.]

1094

WHITACKER, F. E. **Nutrition in prenatal care.** *J. Amer. Med. Assoc.*, 1954, **155**, 112-114. [Dept. Obstet. Gynaecol., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

A lecture.

1095

RODRIGUEZ MIRANDA, J. V., DE BLANCHET, R. V. and COLOMBO, M. J. **Trabajo de parto y alimentación. [Parturition and diet.]** *Rev. Asoc. argent. Dietología*, 1953, **11**, 94-104.

The diet of 69 women was directed during the last trimester of pregnancy. Women weighing less than 70 kg. at the sixth month were given directions for a diet supplying 2200 Cal. and 77 g. protein daily, those weighing more than 70 kg., 2700 Cal., 115 g. protein and a restricted amount of salt. The diets are fully described.

All gave birth to healthy infants; one woman required forceps for delivery of the first of twins, and one had caesarean section for occlusive placenta praevia and pelvic presentation. It is considered that the controlled regimens were conducive to brief and normal labour, a normal puerperium, healthy infants and good lactation. The dietary requirement in late pregnancy is estimated at 2500 Cal. daily.—D. Duncan.

1096

ESTOPAN, M. E. **Alimentación de la embarazada normal y gestosica. [Diet in normal and abnormal pregnancy.]** *Rev. Asoc. argent. Dietología*, 1953, **11**, 123-138.

In this lecture the author considers the dietary requirements of a normal man and woman, works out the energy, protein, mineral and vitamin requirements of a woman in the 4th and 7th months of a normal pregnancy, and gives a table of the quantities of different foods necessary at 7

months for a pregnant woman performing domestic duties. The dietetic treatment of abnormal pregnancy, described in an earlier work, has been applied with success to patients in the Maternity Hospital at Cordoba, in simple oedema, glomerulonephritis of pregnancy, eclampsia and chronic glomerulonephritis exacerbated by pregnancy. A case history is given for each type of disorder. Four dietary regimens are used successively, with the general aim of giving sufficient energy and tending to excess of protein with a high proportion of animal origin, to low Cl and to a high K : Na ratio.—M. B. Richards.

1097

Discussions técnicas sobre nutrición. [Technical discussions on nutrition.] *Bol. Ofic. sanit. panamer.*, 1954, **36**, 251-268.

Discussion of goitre, multiple deficiencies in infancy, methods of study, national problems of nutrition and the place of nutrition in programmes of public health.

1098

MIRONE, L. and HARVEY, L. G. A new menu pattern is tested. *J. Amer. Dietetic Assoc.*, 1954, **30**, 757-761. [Dept. Nutrit., Univ. Georgia, Athens.]

Under the National School Lunch Programme in the United States of America lunches must meet minimum nutritional requirements. Type A lunch was based on the needs of a child of 10 to 12 years of age, but a number of surveys (see Absts. 2187, Vol. 16, 4067, Vol. 20 and 5264, Vol. 21) have indicated that school lunches may be inadequate. The menu pattern was re-examined (*Guide for Planning Menus to Meet the Tentative School Lunch Food Requirements and Guide for Quantities of Food to Meet Tentative School Lunch Requirements*, U.S. Dept. Agric. Bureau of Human Nutrition, 1952). The new pattern has been tested and is considered to be superior to the earlier plan.—F. C. Aitken.

1099

VIGLIANI, E. C. Dieta e bevande per i lavoratori delle industrie tessili durante la stagione calda. [Diet and beverages for workers in the textile industry during the hot season.] *Med. del Lavoro*, 1954, **45**, 277-285. [Clin. Lavoro "Luigi Devoto", Univ. Milan.]

In textile factories in Italy in hot weather, the conditions are such that workers may lose as much as 6 litres of water a day as sweat. The workers' diet is not rich in NaCl, and it is recommended that there should be available for them a powder containing NaCl like that recommended by Stewart (*Brit. J. Indust. Med.*, 1945, **2**, 102) and easily made into an effervescent, palatable drink.

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Work is usually in two 8-hr. shifts, from 6 a.m. to 2 p.m. and from 2 p.m. to 10 p.m., with a half-hour break for meals, which is considered insufficient for the kind of meal considered necessary in view of the distribution of the shift times over the day.—E. M. Hume.

1100

PILLE, G. Le problème de l'alimentation Outre-Mer (Afrique Noire Française). Aspects biologiques et scientifiques. [The problem of nutrition in France Overseas (French black Africa): biological and scientific aspects.] *Méd. trop.*, 1954, **14**, 1-34. [Corps de Santé Colonial.]

The paper makes a general survey. It reviews quantitative and qualitative needs for food in the tropics. The diet is sketched of the different communities, nomadic herdsmen, fishermen, small cultivators, urban working class and small salaried workers; examples of their diets are given. Insufficiency in quantity and quality, particularly of protein, is severe. The problem of increasing industrialisation and urbanisation is recognised, and recommendations are made, based on cultivation of groundnuts and rice and importation of more rice, in spite of the dangers of increasing the cultivation of rice in country infested with bilharzia, and of substituting rice for millet. To provide more animal protein, dried and defatted fishmeal is suggested, especially for regions where the tsetse fly makes the keeping of cattle impossible. An ample supply of crude sea salt, furnishing iodine as well as NaCl would, it is believed, transform the men and animals far from the sea in French Africa. Exclusion of alcoholic drinks is desirable.—E. M. Hume.

1101

XAVIER DIAS, A. N. Sugestões para a melhoria da alimentação dos indígenas nos Trópicos. [Suggestions for the improvement of the diet of natives in the tropics.] *An. Inst. Med. trop.*, 1953, **10**, 1445-1446. *Proc. English summary.*

1102

PEDROSO FERREIRA, A. Sobre o problema alimentar dos trabalhadores negros. [Problem of the diet of negro workers.] *An. Inst. Med. trop.*, 1953, **10**, 1439-1444. *Proc. English summary.*

1103

ROBINSON, C. H. The bland diet. *J. Clin. Nutrit.*, 1954, **2**, 206-210. [Dept. Food Nutrit., Coll. Home Econ., Drexel Inst. Technol., Philadelphia, Pa.]

A basic plan for achieving a bland diet is described. The nutritive value of foods on a basic list is given with a suggested meal pattern and sample menu.—F. C. Aitken.

1104

APPLEYARD, O. B. *Slimming without tears. Practitioner*, 1954, 173, 298–299. [Scarborough.]

Nine of 12 middle-aged obese women lost weight when they were put on an orthodox low-energy diet until 4 p.m. but allowed to eat as they liked in the evening, when the metabolic rate is higher.

W. M. Deans.

1105

RYER, R. (III), GROSSMAN, M. I., FRIEDEMANN, T. E., BEST, W. R., CONSOLAZIO, C. F., KUHL, W. J., INSULL, W. (Jr.) and HATCH, F. T. The effect of vitamin supplementation on soldiers residing in a cold environment. 2. Psychological, biochemical and other measurements. *J. Clin. Nutr.*, 1954, 2, 179–194. [U.S. Army Med. Nutr. Lab., Denver, Colo.] Spanish summary.

The organisation of the study was fully described in the first part (Abst. 5115, Vol. 24).

The subjects were given diets providing daily intakes ranging from 4138 to 2056 Cal. The ascorbic acid content of the basal diet ranged from 36.0 to 43.3 mg. daily. Half the subjects received 4 times a day a capsule containing B vitamins and 300 mg. ascorbic acid. The other half received a capsule containing 6 mg. ascorbic acid only.

None of the 6 psychological tests revealed a significant difference between the groups. There was no statistically significant difference between the groups in excretion of N, creatinine or 17-ketosteroids in the urine, in blood sugar or in Hb. Ascorbic acid in blood and urine was higher in those having the high vitamin supplement. In both groups exposure to cold caused a statistically significant increase in excretion of oxidised ascorbic acid. There was a fall in eosinophil count during forced marches, and a loss of bodyweight during the experiment, both significantly greater in those having the high supplement. There was no significant difference in morbidity records. Neither group showed any sign attributable to vitamin deficiency or underfeeding.—F. C. Aitken.

1106

FRAGNER, J. Možnosti obohacené výživy. [Possibilities of enriched diet.] *Sborn. pathofys. tráv.*, 1954, 8, 20–26. [Res. Inst. Food Technol.] English and Russian summaries.

The probabilities are reviewed of improving the nutrition of as many consumers as possible by supplementing foods with amino-acids, vitamins or minerals.—A. Jančařík (Czechoslovakia).

1107

TUTTLE, W. W., DAUM, K., LARSEN, R., SALZANO, J. and ROLOFF, L. Effect on school boys of omitting breakfast. Physiologic responses, attitudes, and scholastic attainments. *J. Amer. Dietetic Assoc.*, 1954, 30, 674–677. [Dept. Physiol., Coll. Med., State Univ. Iowa, Iowa City.]

Twenty-five boys aged 12 to 14 years were studied. The physiological responses were measured as in previous studies of adults (Absts. 2112, Vol. 20; 771, Vol. 22). Neuromuscular tremor, choice reaction time, grip strength and grip strength endurance were unaffected by omission of breakfast. Maximum work rate and output in the late morning were significantly less when breakfast was omitted than when breakfast was eaten. Reports of teachers on attitudes and attainments of boys were more favourable during the periods when breakfast was eaten.

F. C. Aitken.

1108

Milk and its products. Facts for consumer education. *U.S. Dept. Agric., Agric. Inform. Bull.* No. 125, May 1954, pp. 31. [Washington, D.C.]

1109

TRÉMOLIÈRES, J. and CLAUDIAN, J. L'importance des oeufs et des oiseaux de basse-cour en alimentation humaine. [The importance of barnyard eggs and poultry in human nutrition.] *Ann. Nutr. Alimentation*, 1954, 8, 425–473 (with discussion 473–478). [Sect. Nutr., Inst. Nat. Hyg.]

1110

RAYAULT, P. P., TRAEGER, J. and CARRAZ, M. L'oeuf en pathologie et en diététique humaine. [The egg in human pathology and dietetics.] *Ann. Nutr. Alimentation*, 1954, 8, 479–500 (with discussion 500–501). [Dept. Clin., Méd. Fac., Lyons.]

1111

CUVELIER, B. V. J. Grafische studie over voedings-behoeften en samenstelling van grondstoffen. 1. De voedingswaarde van groenten. [Graphic study of nutritional requirements and the composition of staple foods. 1. Feeding value of vegetables.] 2. De voedingswaarde van fruit. [2. Nutritive value of fruit.] *Voeding*, 1954, 15, 245–259; 325–342. [Lab. Levensmiddelen-onderzoek, Rijksuniv., Ghent.]

1112

DE WIJN, J. F., DONATH, W. F. and VAN DER MEULEN-VAN EYSBERGEN, H. C. A study of the effects of completely vegetarian diets on

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human subjects. *Proc. Nutrition Soc.*, 1954, 13, xiv-xv. [Dutch Inst. Prevent. Med., Leyden.]

1113

SUBRAHMANYAN, V., BHATIA, D. S., SWAMINATHAN, M. and BAINS, G. S. Rice substitutes. *Nature*, 1954, 174, 190-201. [Central Food Technol. Res. Inst., Mysore.]

1114

BROWNE, E. M. A palatability trial on rice from British Guiana. *Med. J. Malaya*, 1954, 8, 260-262. [Dept. Social Med. Pub. Health, Univ. Malaya.]

Most of the rice supplied to Singapore comes from Siam. Six institutions with a population numbering 822 and with a wide age range from 7 to over 40 years co-operated in the test. More care was needed in cooking the Guianese than the Siamese rice, especially if lumping was to be prevented, its grains were blue in colour and soft and, most important, about 10 per cent. more of the Guianese than Siamese was required to produce the accustomed bulk of food.—D. Harvey.

1115

Enquête sur la place du vin dans l'alimentation. [The place of wine in nutrition.] *Bull. Soc. sci. Hyg. aliment.*, 1954, 42, 39-55. A symposium.

1116

FLANZY, M. Le vin dans l'alimentation. [Wine in nutrition.] *Bull. Soc. sci. Hyg. aliment.*, 1954, 42, 77-83.

1117

FLANZY, M., CAUSERET, J. and HUGOT, D. État présent de nos connaissances sur l'intérêt alimentaire du vin. [Present state of knowledge of the food value of wine.] *Bull. Soc. sci. Hyg. aliment.*, 1954, 42, 84-112.

1118

XANDRI TAGÜENA, J. M. El consumo del vino en el mundo. (Medidas para incrementar el consumo y regularizar los precios de los productos vínicos en España.) [World consumption of wine. Methods to increase consumption and control the prices of wines in Spain.] *Bol. Inst. nac. Invest. agronom., Madrid*, 1954, 14, 1-32. [Madrid.]

1119

VASCONCELOS PINTO COELHO, A. Águas minero-medicinais de Angola e Moçambique. Importância do seu estudo e valorização. [Mineral waters in Angola and Mozambique. Importance of their study and evaluation.] *An. Inst. Med. trop.*, 1953, 10, 1649-1653. *Proc.*

1120

DEBRAY, C. and CORNET, A. Les eaux minérales naturelles en diététique. Leur emploi chez l'adulte. [Natural mineral waters in dietetics. Their use by adults.] *Bull. Soc. sci. Hyg. aliment.*, 1954, 42, 31-38. [Fac. Méd., Paris.] A review.

FOOD ECONOMICS AND STATISTICS

1121

JUNG, A. Individual- und Volksernährung. [Feeding the individual and the people.] *Internat. Ztschr. Vitaminforsch.*, 1954, 25, 305-310. *Proc.* [Zürich.]

1122

CLEMENTS, F. W. The influence of nutritional findings on the utilization of the world's food resources. *J. Austral. Inst. Agric. Sci.*, 1954, 20, 89-96. [Inst. Child Health, Sydney.]

1123

CHANDRASEKHAR, S. Population growth, socio-economic development and living standards. *Internat. Labour Rev.*, 1954, 69, 527-546. [London Sch. Econ.]

An Indian economist examines the growth of population in relation to production. He would replace political and economic domination in

colonial territories by compulsory control of population and regards universal birth control as the essential way to raise or preserve standards of living. It will be helped by planned migration and, within limits, by industrial development. Yields per acre must be improved by provision of fertilisers where there are none, improved techniques and reformed land tenure. The aim should be "one baby in the place of three or more" and "two or more ears of corn where one or none grew before". (See also Absts. 1044 and 3593, Vol. 24.)—I. Leitch.

1124

SCHULZ, T. A 'human needs'; diet: spring 1954. *Bull. Inst. Statistics Oxford*, 1954, 16, 130-136. This, the last survey before the end of rationing, was made in Easter week, but the holiday did not affect the prices of the foods concerned, though certain other foods did rise in price. The cost of

the "human needs" diet was 63s. 7d., about 1 per cent. higher than in autumn 1953 (Abst. 5114, Vol. 24) if a special allowance of 2s. 3d. then made for the housewife's inexperience of a partly de-controlled market is disregarded. The "simple" diet (loc. cit.) cost 56s. 8½d. The intakes of nutrients more than met the recommendations of the British Medical Association except for Ca (0.7 g. daily instead of 0.8 g.); there was no change from the previous autumn except for the considerable seasonal fall in vitamin C.—W. M. Deans.

1125

DE SANT'ANA, H. and VILHENA, C. Algumas considerações sobre o abastecimento de leite aos núcleos populacionais das sedes das circunscrições do Sul do Save. [Supply of milk to centres of population in the several districts of Sul do Save.] *An. Inst. Med. trop.*, 1953, 10, 1605-1636. *Proc.* English summary.

1126

KERN, A. Utilisation du lait de brebis en Israël. [Use of ewe's milk in Israel.] *Lait*, 1954, 34, 408-422.

Present-day milk products in Israel differ considerably from the original Bedouin ones, of which descriptions are quoted, and most of the cheeses are imitations of European types developed by and for Jewish immigrants.

"Brinsen" cheese is the one most closely resembling the indigenous Arab products. At first it was very variable in composition but later a uniform cheese was produced, by a method described, from pasteurised ewe's milk, two-thirds whole and one-third skimmed, with fat 36.5, water 50 and salt 4.5 per cent.; yield about 25 kg. from 100 litres. At present, however, owing to the shortage of liquid milk, "Brinsen" is produced all the year round from a mixture of 90 per cent. re-constituted dried milk (imported) and 10 per cent. fresh milk and vegetable fat.

A cheese of Roquefort type is also made, and ewe's milk is mingled with cow's milk in the manufacture of other European types of cheese. Considerable amounts of kashkaval cheese are made by Balkan immigrants.

Last year's production of cheese of all sorts in Israel in metric tons was: 4730 of soft white cheese, mostly from dried skimmed milk; 1500 of white "cream" cheese, from dried skimmed milk and vegetable fat; 910 of processed cheese, from imported cheese and dried milk, and 1528 of "Brinsen", "Safed" (similar to "Brinsen"), Roquefort, Edam and the like. The yearly consumption is high, 7 kg. per head.

The Jewish dairy industry does not deal in

liquid ewe's milk or ewe's milk butter, owing mainly to difficulties arising from the high viscosity and frequent bacterial contamination of ewe's milk or admixture with goat's milk.

Yoghourt, whether made from ewe's milk or cow's milk, has not been a commercial success in Israel. "Lebben", an acid milk imitated from the Arab product, but made from cow's milk, and now from dried skimmed milk and vegetable fat, was more popular, but is being rapidly superseded by "lebberia", originally a mixture of leben and soft white cheese, now a product with 15 per cent. solids of which 11 are dried skimmed milk and 4 vegetable fat; 20 million litres of this were produced last year.

As immigration slows down and home milk production rises, problems of utilisation of ewe's milk will return to prominence. Cow's milk is paid for on a basis of fat content, 3.5 per cent. being regarded as standard; for ewe's milk, the method of payment has fluctuated, sometimes to the advantage and sometimes to the disadvantage of producers. The difficulty will probably be got over by having separate creameries for ewe's milk, or rigorously separating the milks in the present creameries. See Abst. 261, Vol. 25.

W. M. Deans.

1127

FOX, F. W. The agricultural foundation of nutrition. 6. Wheat. 7. Pastoral production: meat. *S. African Med. J.*, 1954, 28, 542-546; 649-653. [*S. African Inst. Med. Res.*]

For earlier studies see Absts. 3594 and 5556, Vol. 24.

6. Production of wheat as measured by sales to the Wheat Industry Control Board was 7109 thousand bags in the year 1951-52; for the period 1938 to 1947 average annual production was 3869 thousand bags. The proportion of the crop originating in Orange Free State has risen steadily and is now 45 per cent. of the total. Yields are low, about 6 bags or 1200 lb. per morgen (2.116 acres). Consumption has risen steadily since 1920 and for 1956-57 has been estimated as likely to be 10½ million bags. Of the 2 principal producing areas, Western Province and Orange Free State, the first is unlikely to be able to increase output because of climatic conditions and disease but in the second the outlook is more promising. It is, nevertheless, unlikely that South Africa will ever be able to meet her needs from local sources; at present about 40 per cent. of supplies are imported. The question is raised whether it is advisable to continue to subsidise wheat consumers, at a rate which at present is £7 million annually, in preference to promoting, by similar subsidies, the greater production and consumption of maize.

7. Data are presented to show the area of land

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available for grazing and the livestock population and numbers slaughtered over about 40 years. From the data of Alvord (*Thesis*, in the press) the natural veld is concluded to be the mainstay of the South African livestock industry, supplying 90 per cent. of digestible protein and 86 per cent. of total digestible nutrients. Total meat production has, from abattoir records, risen steadily since 1920, largely because of the increase in beef production.

Problems in connection with restoration of the veld by improving management or by fertilising and with the reduction of losses caused either by death or by underfeeding in the dry months are briefly considered.—D. Harvey.

DIET IN ETIOLOGY OF DISEASE

METHODS OF ASSESSING STATE OF HEALTH

1129

PASSMORE, R. The interpretation of the clinical stigmata of nutritional deficiency. *Proc. Nutrition Soc.*, 1954, **13**, 105-111. [Dept. Physiol., Univ. Edinburgh.]

See also Abst. 199.

GENERAL STUDIES

1130

SEN, M. and MATHEN, K. K. Inquiry into the vital losses of pregnancy and infancy in a rural population. *Indian J. Med. Res.*, 1954, **42**, 267-278. [Dept. Maternity, All-India Inst. Hyg. Pub. Health, Calcutta.]

The inquiry was made in the period April 1949 to March 1950 in 68 villages in the Singur area near Calcutta, which has a population of about 63,000. The sample studied was not completely representative and the findings are based largely on reports by health visitors from their observations during routine antenatal visits.

Abortion and stillbirth rates were about 50 and 45 per 1000 pregnancies and total births, respectively. Among mothers recorded as free from disease throughout pregnancy the still- and premature-birth rates were considerably lower than among those in whom signs of disease had been noted. Dysentery and diarrhoea were associated with high rates; deficiency diseases in the mothers did not noticeably affect these rates.

Causes of deaths of infants were diagnosed from histories provided by parents or relatives, since very few children had been attended by doctors during their illnesses. Of 418 deaths recorded for infants under 1 year, prematurity, in 152 cases, was the commonest cause; malnutrition was ascribed in only 10 cases.—D. Harvey.

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1128

DE MIRANDA, H. and BROEKHUIZEN, S. Het probleem van de bakkwaliteit van inlandse tarwe. [The problem of the baking quality of homegrown wheat.] *Centraal Inst. Voedingsonderzoek T.N.O.*, 1953, No. 58, pp. 20.

Dutch wheats have not so far been suitable for bread and 1 to 1.3 million tons of wheat are imported annually. Recent experiments in plant breeding have shown that imported wheats that combine high yield with good baking quality, as well as stiff straw and resistance to disease, can be grown in Holland and so the need to import may be avoided.—I. Leitch.

See also Abst. 236.

1131

BROWNE, E. M. A survey in Singapore of low income level housing in relation to health of infants. *Med. J. Malaya*, 1954, **8**, 222-239. [Dept. Social Med. Pub. Health, Univ. Malaya.]

A detailed analysis is given, with illustrations, of the housing conditions of 114 Southern Indian and 103 Chinese infants who had been born in a maternity hospital in Singapore. The basis of assessment of these conditions is described and they were grouped as satisfactory, fair or bad. The weights of the children were taken at monthly intervals, clinical examinations were made at birth and shortly before first birthdays, and records of illnesses were kept during the year.

The differences in housing conditions of the 3 groups were not related to any difference in percentage increase of weight between the groups. The incidence of infection was high among the infants, occurring in about 20 per cent. of the Indians any time after age 2 months and in about 40 per cent. of the Chinese in the second half of the year.—D. Harvey.

1132

GÓMEZ, F., VÁZQUEZ SANTABILLA, J., RAMOS GALVÁN, R., CRAVIOTO, J. and FRENK, S. Studies on the undernourished child. 12. Anemia in malnourished children.

GÓMEZ, F., RAMOS GALVÁN, R., CRAVIOTO, J. and FRENK, S. 13. Treatment of third-degree malnutrition without commercial vitamins. *Amer. J. Dis. Child.*, 1954, **87**, 673-683; 684-693. [Dept. Nutrit., Hosp. Infantil, Mexico, D.F.]

12. Red cell count, haematocrit and Hb estimations in 51 children aged from 9 months to 7 years revealed anaemia in 39. Morphologically the commonest types of anaemia were normocytic.

normochromic in 17 and normocytic hypochromic in 10.

Blood volume was estimated and total circulating Hb and red cells were computed. The data indicated that much of the anaemia revealed by routine methods may be more apparent than real because of the increase in blood volume.

13. A preliminary report is presented of the successful results of treating 373 children, mean age 31 months, with full diet and blood or plasma transfusions as required. Success in treatment was judged by improvement in appetite, satisfactory weight gain, disappearance of oedema, healing of skin lesions, return to normal levels of serum proteins and general signs of wellbeing. The data presented in tables and charts relate to mean values for the group.—F. C. Aitken.

1133

BLUM-GAYET, J. Problèmes sanitaires de l'enfance martiniquaise. [Health problems of children in Martinique.] *Presse méd.*, 1954, 62, 1060. [Fort-de-France.]

1134

BRAS, G., JELLIFFE, D. B. and STUART, K. L. Histological observations on hepatic disease in Jamaican infants and children. *Doc. Med. geogr. trop.*, 1954, 6, 43-60. [Dept. Pathol. Med., Univ. Coll. W. Indies, Jamaica.]

On 93 children of predominantly African descent, 148 liver biopsies and 12 autopsies were made. Diet from the age of weaning at from 7 to 9 months is chiefly carbohydrate with many bush teas. Deficiency of protein, Fe and elements of the vitamin B complex is common.

Of the 93 children, 39 were classified as suffering from kwashiorkor-marasmus, within which group 3 subgroups were recognised. Twelve were diagnosed as having veno-occlusive disease affecting the hepatic veins and, in the chronic form, producing cirrhosis of the liver. The children were less undernourished than those with kwashiorkor, and the disease was thought not to be wholly nutritional in origin. Toxic substances in bush teas are possibly implicated. Eight patients had cirrhosis of the liver which was advanced, but in some a relation to the liver conditions in the 2 foregoing groups could be traced. Thirty-four children were examined as a control group. Half of them were thin and undernourished but not ill, and half had other non-hepatic diseases such as sickle cell anaemia. The liver biopsies showed no unexpected pathological change.—E. M. Hume.

1135

GRÖRGY, P. Nutrition in liver disease. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium* Ser. No. 6, 1953, 139-147 (with discussion

147-149). [Hosp. Univ. Pennsylvania, Philadelphia.]

Dietary nutrients which prevent liver cirrhosis and necrosis in rats are listed. Those which prevent cirrhosis have in common that they are sources of lipotropic substances or possess choline-sparing effect. Dietary cirrhosis would appear to be in the main a deficiency disease. The dietary substances which prevent necrosis are as widely different as sulphur amino-acids and vitamin B₁₂, and it is suggested that this condition is not the result of a pure deficiency. The necrosis-delaying effect of antibiotics is cited in favour of a toxic etiology. Observations are presented which suggest that the antibiotics exert an antimicrobial effect on the intestinal flora rather than a direct metabolic effect.

The possible application of the results of experimental work to the prophylaxis and treatment of liver disorders in man is discussed.—F. C. Aitken.

1136

MINER, R. W. (Ed.) Nutritional factors and liver diseases. *Ann. New York Acad. Sci.*, 1954, 57, 615-962.

1137

WATERLOW, J. Disorders of the liver in tropical nutritional diseases. *Proc. Nutrition Soc.*, 1954, 13, 135-139. [Dept. Physiol., Univ. Coll. W. Indies, Jamaica.]

1138

HULSHOFF, A. A. Medical examination of repatriated Dutch nationals from Indonesia, 1946-1951. *Doc. Med. geogr. trop.*, 1954, 6, 131-141 (with discussion 141-143). [Harbour Hosp., Rotterdam.]

In the period 1946-51, 1663 persons returned from Indonesia were examined in the out-patient department of the Harbour Hospital. They included former internees, prisoners of war and other ex-service men. Nutritional disease was mentioned as part of their case history by 1530, including oedema 517, beriberi 236, pellagra 235, and oral distress 107, but only 129 still had signs. The majority were already in quite good condition on arrival in Holland. Hypotension was present in 253. The liver was enlarged in 313, often through amoebic dysentery or malaria, but malnutrition may have played some part though not a large one; cirrhosis was not found. Fatigue was complained of more frequently after deficiency disease than after the other non-nutritional diseases.

E. M. Hume.

1139

ROBINSON, E. Medical aspects of the Domasi development area, Nyasaland. *J. Trop. Med. Hyg.*, 1954, 57, 131-137.

The Domasi development area covers about 100 sq. miles of which roughly one-half is inhabited by 14,000 people. A medical survey was made in which 22 villages, about one-fifth of the total, were visited in each of which about the same proportion of the population was seen. Data are given for the incidence of schistosomiasis, malaria, liver and spleen enlargement, leg ulcers and blindness and for Hb and Kahn reaction and sensitivity to tuberculin.

The one clinical sign looked for which had direct nutritional significance was skin manifestation of pellagra. Positive evidence was seen in 8 of 328 subjects under 5 years, 21 of 229 between 5 and 18 and 42 of 581 over 18 years of age. Females appeared to suffer more than males and the impression was gained that they received less of the protein and protective foods.—D. Harvey.

1140

DE LANGEN, C. D. Sodium chloride in geographical pathology and its influence on the capillary system. *Acta med. scand.*, 1954, 149, 75-81. [Utrecht.]

This discursive article gives the author's conclusions regarding the relation of intake of salt to the physiology of the peripheral circulatory system and to the occurrence of 9 groups of diseases which are not infectious, parasitic or deficiency in nature.—D. Harvey.

1141

MCDONOUGH, J. and WILHELMJ, C. M. The effect of excess salt intake on human blood pressure. *Amer. J. Digest. Dis.*, 1954, 21, 180-181. [Dept. Physiol., Sch. Med., Creighton Univ., Omaha, Nebr.]

In a healthy young man consumption of 865 g. salt in 23 days, in addition to the salt taken at meals, was accompanied by increases in systolic and diastolic blood pressure and in bodyweight. Plasma volume was slightly increased. When salt was discontinued blood pressure and bodyweight returned to normal.—F. C. Aitken.

1142

BROSIN, H. W. The psychology of overeating. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 6*, 1953, 52-69 (with discussion 70-72). [W. Psychiat. Inst. Clin., Pittsburgh, Pa.]

1143

KEYS, A. Obesity measurement and the composition of the body. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 6*, 1953, 13-35. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

The limitations of height-weight-age tables for the evaluation of relative obesity are discussed.

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Three methods of estimating body fat, by measurement of body sp. gr., of body water or of subcutaneous fat, are appraised.

Summarised results of studies of body fat made at Minnesota show that, in clinically healthy men of normal weight for height and age, there is a large progressive increase of body fat with age. In prolonged undernutrition there is a progressive loss of both fat and active tissue, with little or no change in extracellular fluid. In experimental obesity weight gain is roughly 80 per cent. pure fat and 20 per cent. water, with little or no change in active tissue. Data obtained indicate that most of the age and sex differences in B.M.R. are reflections of differences in the amounts of active tissue.

F. C. Aitken.

1144

HUNT, E. E. (Jr.), PECKOS, P. S. and FRY, P. C. Factors in human obesity. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 6*, 1953, 73-87 (with discussion 87-89). [Forsyth Dent. Infirmary Child., Boston, Mass.]

Of 79 healthy white American children 35 had fat pads in at least 2 of the 3 regions, dorsal, abdominal and trochanteric. The others served as non-obese controls. The groups did not differ significantly in degree of resemblance to their mothers' body build, ethnic ancestry or family disorganisation. The fat pad group were relatively advanced in dental emergence and ossification of wrists and hands. A questionnaire study of the diets of these and other groups of children classified morphologically indicated no significant dependence of energy intake on body build in boys. Fat girls tended to eat less than other girls. There was no significant difference in protein intake between fat and control children.

A further study of children's body build in relation to that of their mothers was made on Micronesians of Yap and from published data on white Americans. There was some tendency for sons, but not daughters, to resemble mothers in body build, but the results were not statistically significant.

In the discussion the validity of the findings of questionnaire diet studies was doubted.

F. C. Aitken.

1145

MALMROS, H., SWAHN, B. and TRUEDSSON, E. Essential hyperlipaemia. *Acta med. scand.*, 1954, 149, 91-108. [Dept. Med., Univ. Hosp., Lund.]

A report on 10 patients with impaired fat metabolism; 4 were of one family and 2 of another. The milky serum and in one patient the accompanying angina pectoris were controlled by a low-fat diet. The skin xanthomata in one also subsided on this diet, but persisted in 4 others.—D. Duncan.

1146

WAHL, K. Appendicitis und Ernährung. [Appendicitis and nutrition.] *Münch. med. Wochenschr.*, 1954, **96**, 489-490. [Engels-Stift, (22c) Nümbrecht, Cologne.]

During the years from 1944 to 1947 no case of acute appendicitis came for operation in a Russian prison camp of from 8000 to 10,000 men having a very meagre diet of bread, cabbage soup and porridge with almost no animal protein or fat. After 1947 the food was improved and 3 patients were operated on in 1948 and 3 in 1949. It is suggested that improvement in the diet affected peristalsis and the gut flora, and favoured the occurrence of irritation and inflammation in the appendix.—A. M. Copping.

1147

LOWENSTEIN, F. W. Some epidemiologic aspects of blood pressure and its relationship to diet and constitution with particular consideration of the Chinese: a review of the pertinent literature of the past 40 years. *Amer. Heart J.*, 1954, **47**, 874-886. [Flushing, N.Y.]

The scanty data on blood pressure in the Chinese are discussed and compared with U.S. data. It is concluded that in spite of differences in technique, the lower values found in Chinese people represent a real difference, not wholly accounted for by differences in body build or endocrine constitution, and it is suggested that differences in diet may play a part directly, as well as indirectly through their effect on bodyweight. There are 62 references, of which about 10 relate to China.

W. M. Deans.

1148

VIDEBÆK, A. and MOSBECH, J. The aetiology of gastric carcinoma elucidated by a study of 302 pedigrees. *Acta med. scand.*, 1954, **149**, 137-159. [Inst. Human Genetics, Univ. Copenhagen.]

Cancer of the stomach was roughly 4 times as frequent in relatives of patients with cancer of the stomach as in relatives of a control series. In patients with cancer of the stomach pernicious anaemia occurs 3 times as often as in people over 60 in general, and vice versa.—I. Leitch.

See also Abst. 743.

DEFICIENCY DISEASES

General

1149

PICK, W. Malnutrition of the newborn secondary to placental abnormalities. *New Engl. J. Med.*, 1954, **250**, 905-907. [Burbank Hosp., Fitchburg, Mass.]

Three infants, 2 born at term and one born 2 weeks after term, are described. Their weights at

birth were 1.6, 1.8 and 2.2 kg. and their crown-heel lengths 48.3, 48.3 and 53.3 cm.; they all looked emaciated.

The infants lost little weight after birth and then gained very rapidly, so that they were "indistinguishable from full term infants at the age of four to six months". The low birthweight of the babies is attributed to malnutrition due to abnormal placentae, which were all small and appeared degenerate. Two were examined microscopically and showed proliferate endarteritis of the umbilical arteries and areas of hyalinisation.

F. E. Hytten.

1150

KAHN, E. A neurological syndrome in infants recovering from malnutrition. *Arch. Dis. Childhood*, 1954, **29**, 256-261. [Baragwanath Hosp., Johannesburg]

The syndrome, which occurred in 8 out of 1000 cases of malnutrition, appeared when the nutritional state was responding to diet treatment. It is suggested that the therapeutic diet was not balanced.—F. C. Aitken.

1151

WILLIAMS, C. D. Kwashiorkor. *J. Amer. Med. Assoc.*, 1953, **153**, 1280-1285. [Mona, Jamaica, B.W.I.]

A review.

1152

JELLIFFE, D. B., BRAS, G. and STUART, K. I. Kwashiorkor and marasmus in Jamaican infants. *West Indian Med. J.*, 1954, **3**, 43-55.

The feeding of infants in Jamaica after weaning is briefly described. Thirty-one malnourished children aged from 6 to 31 months were studied between September 1952 and July 1953; clinical and haematological examinations and serological tests for syphilis and Mantoux tuberculin tests were made, liver function was measured by 6 different tests and serum proteins were estimated. On a clinical basis 18 were classified as suffering from kwashiorkor, 9 from marasmic kwashiorkor and 4 from marasmus, but the classification is admittedly rough and without clear-cut boundaries.

The physical signs are described with illustrations. The biochemical data showed no difference between the groups; when combined they showed low averages, 5.1 g. for total protein and 2.7 g. for albumin, and a normal level, 2.4 g., for globulin per 100 ml. serum and an albumin:globulin ratio of 1.1:1. Abnormalities in these were not as great as have been reported from elsewhere. Hb was also low. From biopsy material there was evidence that liver fat was greater in the kwashiorkor group than in the 2 other groups and that it was least in amount in the marasmus group.

Treatment was with increasing amounts of

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skimmed milk in the diet, with attention to intercurrent infections. Those with kwashiorkor, in contrast to African patients, responded readily to the treatment; those with marasmic kwashiorkor were the most difficult to treat.—D. Harvey.

1153

THOMPSON, M. D. Protein shortage in African children: some causes and effects. *East African Med. J.*, 1954, **31**, 127-142.

The clinical data were from 164 children aged from 1 to 6 years and admitted to Mulago Hospital, Kampala with established kwashiorkor. In those patients where examination was made, values for serum protein and for pancreatic enzymes obtained by intubation were low. Routine treatment in hospital was with high-protein diet. Examples are given of failure when high intake of protein could not be secured. From questioning, it appeared probable that very few of the patients had been offered as much as 20 g. protein daily, and that 80 or 90 per cent. of the children without kwashiorkor got no more than that. Other circumstances which tend to reduce protein intake and to increase protein requirement are discussed. Almost all the kwashiorkor patients had a history of some infection.—E. M. Hume.

1154

OOMEN, H. A. P. C. Het uitwendig patroon van wanvoeding bij kleuters te Djakarta. [The external pattern of malnutrition in children in Djakarta.] *Nederlandsche Tijdschr. Geneesk.*, 1954, **98**, 1686-1696. [Inst. Volksvoeding, Djakarta.] English summary.

The diet, the economic background and the selection and examination of the children, who were from 1 to 6 years of age, have already been described (Abst. 3608, Vol. 24). The clinical pattern is referable to underfeeding, lack of protein and deficiency of vitamin A. The children are short for their age and light for their height. The skin is dry and scaly, sometimes with patchy exfoliation, giving "crazy pavement dermatosis". This dermatosis affects certain areas, e.g., the napkin area, which differentiates it from pellagra. It is characteristic of kwashiorkor and suggests fatty degeneration of the liver. The normal child has black hair and a coffee-coloured skin; the sick child is depigmented. Other abnormalities are: rhagades, superficial ulcers, angular stomatitis, overgrown lanugo and folliculosis. There is considerable atrophy of muscle and there may be oedema of any grade up to ascites and anasarca. At this stage xerophthalmia and keratomalacia are found, and, of less diagnostic value, cheilosis, atrophic glossitis and gingivitis. The liver is enlarged. The children are apathetic or defensive. Mortality is 80 per cent. in those not treated.

A malnutrition index assesses the state of the

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individual child. The age distribution of 124 sick children aged 1 to 6 years is shown in a diagram. Those with xerophthalmia, two-thirds of the whole number, are on the average older than those without. The reason is not obvious.

Liver biopsy of 42 patients confirmed that the enlargement is referable chiefly to fatty degeneration. There is no relation between enlargement of the liver and either oedema or xerophthalmia. (See also Abst. 2304, Vol. 24).—I. Leitch.

See also Absts. 664, 1163.

1155

CORCOS, A., CORCOS-ZARKA, S. and COHEN, V. Oedème aigu nutritionnel et desquamation pellagroïde chez les enfants tunisiens. [Acute nutritional oedema and pellagrous desquamation in Tunisian children.] *Nourisson*, 1954, **42**, 62-70.

At the end of summer and in autumn many children aged from 6 months to 3 years are brought to hospital with severe oedema and red pigmented areas of skin, following usually on prolonged diarrhoea, errors of diet and often very sudden weaning. The clinical picture is described and 11 case histories are given. The condition is recognised as kwashiorkor and as a protein deficiency, often accompanied by vitamin deficiencies, treatment being with a high-protein diet and vitamins.

E. M. Hume.

1156

USBORNE, V. M. Hypochromotrichia on Ukara Island. *East African Med. J.*, 1954, **31**, 55-57. [E. African Med. Survey.]

On Ukara Island in Lake Victoria, depigmentation at the roots of the hair is seen among babies and toddlers of the Wakara but is much more common among the older children, especially the boys, whereas on the mainland, among the Wasukuma of Kwimba, it is most frequent in children under one year. In a survey of a small number of boys the percentage incidences in the 2 tribes on the island and mainland, respectively, were under 1 year 10 and 50, from 1 to 4 years 7.6 and 27, from 5 to 9 years 10 and 20, and from 10 to 14 years 30 and 10. No definite kwashiorkor was seen in either district. Both tribes have a small protein intake. Staples for the Wakara are cassava and millet with occasional fish and, for the Wasukuma, maize and millet with occasional meat. It is suggested that failure of pigmentation may not here be nutritional in origin.—E. M. Hume.

1157

PLATT, B. S. and NAGCHAUDHURI, J. Malnutrition and hair pigmentation. *Proc. Nutrition Soc.*, 1954, **13**, ix-x. [Human Nutrit. Res. Unit, Med. Res. Coun. Labs., Holly Hill, London, N.W.3.]

1158

- BAKWIN, H. Psychologic aspects of dietary deficiency states. *J. Pediat.*, 1954, 45, 110-114. [Dept. Paediat., Coll. Med., New York Univ.-Bellevue Med. Centre, New York.]

1159

- DE WET, J. S. DU T. The association of under-nutrition and psychosis. *S. African J. Clin. Sci.*, 1954, 5, 97-107. [Tower Hosp., Fort Beaufort.]

In 12 months 142 non-European women were admitted to this mental hospital and 52 of them had signs of undernutrition. Full data are tabulated giving age, marital state and origin, whether rural or urban, of each patient and the duration of psychosis. Degrees were rated of wasting, oedema, bradycardia, hypotension, pellagrous desquamation, prurynoderma, dry skin, purpura, cracked lips, glossitis, increased tendon reflexes, nocturia, and polyuria, and the sum of these was translated into an undernutrition rating. Similarly, from degrees of confusion, emotional instability and visual hallucinations a rating for the organic-reaction syndrome was deduced. The extent of the increase in red blood cell sedimentation rate was also classified.

Wasting, dry skin and increase in red cell sedimentation rate were the commonest clinical findings. There was a high correlation between degree of undernutrition and the degree to which mental signs of organic-reaction type of psychosis were present, but, as both conditions in most patients were only mild, the correlation may not have much significance. The incidence was much greater among urban than among rural women. Psychoses likely to be attributable to vitamin deficiencies were thought to be the cause of less than 9 per cent. of the total admissions.—D. Harvey.

1160

- MACAULAY, D. and WATSON, G. H. Tetany following cation-exchange resin therapy. *Lancet*, 1954, 267, 70-71. [Dept. Child Health, Univ. Manchester.]

Three cases are reported of tetany occurring in children after prolonged treatment with Kationium. The tetany, which was associated with low serum Ca levels, responded to parenteral administration of Ca. There was evidence of osteoporosis in all 3 children.—F. C. Aitken.

See also Abst. 1540.

Vitamin A

1161

- KACAN, B. M. Vitamin A in health and disease. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 7*, 1953, 31-45. [Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

The absorption of vitamin A by infants and children was studied by giving 6000 I.U. per lb. in different forms, and estimating the level in the blood 3, 6 and 24 hr. later. Related experiments were made on animals.

In 3 groups of normal children aged 1 to 5 months, 6 to 12 months, and over 12 months, the efficiency of absorption of aqueous suspensions of either vitamin A alcohol or its palmitate increased with rising age. In the two younger groups, but not in the oldest, vitamin A alcohol was absorbed better than the palmitate. In a 7-month-old infant with cystic fibrosis of the pancreas an aqueous dispersion of vitamin A alcohol was absorbed much better than a dispersion of the palmitate, which was in turn better absorbed than natural esters from oily solution; with all forms of the vitamin the absorption was much below normal.

In dogs with ligated pancreatic ducts the defective absorption of vitamin A was improved, but not restored to normal, by the simultaneous administration of whole pancreas. Absorption of vitamin A palmitate or natural esters was not improved by pancreas.

In children with the nephrotic syndrome, in which the resting levels of vitamin A and of fat in the blood are high, all forms of vitamin A caused large increases which persisted after 24 hr. In specimens of liver obtained from such children at autopsy, high reserves of vitamin A were found. Similar high responses in the vitamin A level in the blood were observed in children suffering from excess of vitamin A, but no abnormality could be detected in the bones of nephrotic children.

In guinea-pigs in which reticulo-endothelial cells were blocked by injections of thorotrast and trypan red, the rise in blood vitamin A was greatly increased. The liver reserves, however, were lower than in normal animals which had been similarly treated. When abscesses were induced in rats by injections of turpentine or sweet almond oil, vitamin A decreased in the blood, but not in the liver. The absorption of vitamin A by rats was normal during 24 hr. after removal of both kidneys.—T. Moore.

1162

- CORCOS, A., KORTOBI, M., and ZARKA-CORCOS, S. Xérophthalmie et kératomalacie chez les enfants en Tunisie. [Xerophthalmia and keratomalacia in children in Tunisia.] *Nourrison*, 1954, 42, 19-22. [Serv. Méd. Ophthalmol., Hôp. Sadiki.]

Every year, usually at the end of the summer, patients under 2 years of age are seen with severe signs of vitamin A deficiency in the eyes, and the condition makes a serious contribution to blindness in Tunisia. The children are usually cachectic

and dehydrated after repeated attacks of diarrhoea. Treatment is by intramuscular injection of vitamin A, 100,000 "units" or more daily, and instillation of the vitamin into the eyes. Antibiotics or antiseptics are not put into the eyes unless the indication for them is overwhelming. Prophylactic administration of vitamin A with other vitamins is recommended for the small child severely affected by diarrhoea.—E. M. Hume.

1163

OOMEN, H. A. P. C. **Xerophthalmia in the presence of kwashiorkor.** *Brit. J. Nutrition*, 1954, 8, 307-318. [Stella Maris Hosp., Macassar, Indonesia.]

In a hospital ward 44 Indonesian children, aged 7 months to 7 years, were selected as showing signs of advanced malnutrition. Xerophthalmia and keratomalacia, mostly severe, were present in 29 of them. The eye lesions were usually associated with retarded growth, and the other clinical findings often included respiratory infections, dysentery, oedema and lesions of the skin. Most of the livers were enlarged, and fatty infiltration, often with fibrosis, was found in specimens obtained by biopsy. Much the same picture was seen in specimens of liver taken from malnourished children without xerophthalmia. The diet of the children had consisted mainly of rice, with some green vegetables. Children from the Chinese community, who were better fed, did not have eye lesions. The eyes could usually be saved, even in children who later died from infection, by giving frequent doses of cod liver oil with a diet containing liver and green vegetables.—T. Moore.

1164

BERGER, S. Wyniki badań nad zapasami akseroftolu (witaminy A), β -karotenu i sumy karotenoidów w wątrobie człowieka. [Results of some studies on the reserves of axerophthol (vitamin A), β -carotene and total carotenoids in human liver.] *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 207-213. Russian and English summaries.

Estimations were made on the livers of 10 men and 4 women in normal health who had been killed in accidents. The average values in μ g. per g. fresh liver were for vitamin A 70.7, for β -carotene 1.2 and for total carotenoids 3.4. The range for total vitamin A activity was from 55.1 to 446.6 I.U. per g. The results are tabulated in full. (From English summary.)—D. Harvey.

1165

JACOBS, A. L., LEITNER, Z. A., MOORE, T. and SHARMAN, I. M. **Vitamin A in rheumatic fever.** *J. Clin. Nutrit.*, 1954, 2, 155-161. [Whittington Hosp., London.] Spanish summary.

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Serial estimations were made of vitamin A and carotenoids in the blood plasma of patients with rheumatic fever and of patients with certain other diseases to serve as controls. Temperature and erythrocyte sedimentation rate were recorded. The patients were of both sexes and aged from 5 to 60 years. When the values for vitamin A and carotenoids were grouped according to body temperature the values for vitamin A were low at temperatures between 98.9° and 100° F., and still lower in patients with acute rheumatism at temperatures above 100° F. Carotenoid values, though always lower than those found in health, were affected only at temperatures above 98.9° F. in rheumatoid arthritis and erythema nodosum, and above 100° F. in acute rheumatism. For arbitrary ranges of the vitamin A values the corresponding mean erythrocyte sedimentation rates were calculated. For each disease, the vitamin A value fell with increasing sedimentation rate. When data for the rheumatic subjects were classified, according to the time since the inception of the disease, it was found that the vitamin A value returned to normal after about 4 weeks and the sedimentation rate after about 6 weeks. The temperature returned to normal after from 2 to 3 weeks and was subsequently subnormal. Re-investigation of results previously reported showed that the mean vitamin A reserve in the liver of children who died from heart disease, chiefly rheumatic, was 28 I.U. per g. compared with 129 I.U. for children who died from accident.—R. J. Ward.

1166

WANG, P., GLASS, H. L., GOLDENBERG, L., STEARNS, G., KELLY, H. G. and JACKSON, R. L. (with CHEN, J. Y. and DIMMITT, N. J.) **Serum vitamin A and carotene levels in children with rheumatic fever.** *Amer. J. Dis. Child.*, 1954, 87, 659-672. [Dept. Paediat., Coll. Med., State Univ. Iowa.]

Carotene and vitamin A were estimated in the fasting serum of 98 children, aged from 5 to 16 years, with rheumatic fever and associated disorders. Glycerol dichlorohydrin was used for estimating vitamin A. Patients were examined during the acute stage of the illness, during convalescence which was prolonged, and when the disease had become inactive after discharge from hospital. Low values for vitamin A, mean 32.1 μ g. per 100 ml. serum, were found in patients in the early, acute stage of rheumatic fever. The values rose steadily during the late acute and sub-acute stages and reached an average of 72.5 when the disease had recently become inactive. Corresponding mean carotene values rose from 58.2 to 179 μ g. per 100 ml. at the subacute stage and afterwards fell to 128. Low values for vitamin A, mean 32.0, were found also in the blood of patients

with advanced cardiac decompensation and enlargement of the liver; in patients with severe cardiac damage with enlargement of the liver, the mean value was 39.3; in patients with upper respiratory infections and in others with acute exacerbations of the rheumatic process the vitamin A value was low.

Daily administration of corticotropin to 14 children produced a small increase in the serum vitamin A value. Larger increases occurred after 5 days of treatment, the highest values observed being 145, 188 and 210; the average vitamin A value was 92.6, which was 20 μ g. higher than the average value for patients in whom the disease had recently become quiescent. The rise induced by corticotropin was observed at all stages of the disease.

In absorption tests vitamin A equivalent to 6000 I.U. per lb. bodyweight was given in oil or as an aqueous preparation to 46 children. Four hours later, 19 of 28 values for patients receiving the aqueous preparation were above 400 μ g. per 100 ml.; only 6 of 23 values for those receiving the oily preparation were above that level.

It is recommended that the diet of children with rheumatic fever should be supplemented with from 3000 to 5000 I.U. vitamin A daily.—I. M. Sharman.

1167

LEITNER, Z. A., MOORE, T. and SHARMAN, I. M.
The effect of the vegetable ration on carotene and vitamin A in the blood of chronic hospital patients. *Proc. Nutrition Soc.*, 1954, 13, xi-xii.
[Claybury Hosp., Woodford Bridge, Essex.]

1168

MENDELOFF, A. I. **The effects of eating and of sham feeding upon the absorption of vitamin A palmitate in man.** *J. Clin. Invest.*, 1954, 33, 1015-1021. [Nutrit. Res. Lab., Dept. Prevent. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

Of 16 normal fasting subjects, 5 showed no appreciable rise in the value for vitamin A in the serum during the 8-hr. period after an oral test dose of 100,000 μ g. vitamin A palmitate dissolved in maize oil, but when a meal was taken 2 hr. after the test dose a marked rise occurred in all the subjects. Blood specimens, collected before and 2, 2½, 3 and 4 hr. after the test dose showed average values, for 14 of the subjects, of 43, 126, 241, 442 and 402 μ g. per 100 ml. serum.

In a second group of 16 normal subjects, and 32 hospital patients whose illness was unlikely to affect fat absorption, similarly investigated, an appreciable rise began in the serum value for vitamin A after a meal which was taken 2 hr. after the test dose. When vitamin A was administered by stomach tube into the duodenum of 6 normal

subjects only a small rise in the serum value occurred during the ensuing 4 hr. if the subjects fasted, but when they were allowed to eat immediately after the dose a significant increase resulted. Further studies with 3 totally gastrectomised subjects showed that the presence of the stomach, and presumably of its acid and peptic secretions, was not necessary for the effect. It is suggested that "the lacteals may be activated in some way by eating to expel their contained vitamin A into the bloodstream". Another experiment, in which 5 subjects thoroughly masticated and expectorated an attractive meal, showed that sham feeding was almost as effective as normal eating in activating the mechanism. To study the effect of an anticholinergic agent, 1.0 mg. atropine sulphate was given by intramuscular injection to 4 subjects 100 min. after the dose of vitamin A. They ate their breakfast 20 min. after administration of atropine, but the rise of vitamin A in the blood was delayed until 4 hr. after the dose of vitamin A had been given.—I. M. Sharman.

1169

MARIE, J. and SÉE, G. **Acute hypervitaminosis A of the infant. Its clinical manifestation with benign acute hydrocephalus and pronounced bulge of the fontanel; a clinical and biologic study.** *Amer. J. Dis. Child.*, 1954, 87, 731-736. [Hôp. Enfants-Malades, Paris 15.]

In 3 infants, aged 3, 3½ and 7½ months, the occurrence of vomiting and a mushroom-like protuberance of the anterior fontanelle was found to be associated with the ingestion of 350,000 I.U. vitamin A and 300,000 I.U. vitamin D during the preceding 12 to 24 hr. The swelling was temporary, and the infants soon recovered. In several other infants, aged from 24 days to 15 months, sickness and hydrocephalus could usually be produced by large doses of natural vitamin A without vitamin D; the severity of the disorders was not related to the degree of bulging of the fontanelle. Synthetic vitamin A apparently did not cause hydrocephalus. Estimation of vitamin A in the blood plasma at intervals showed that the highest values were not associated with the most bulging fontanelles. Cerebrospinal pressure was raised slightly during hydrocephalus, and the fluid was clear and devoid of vitamin A.

Acute hydrocephalus was produced also in a 4-month-old puppy which was given a single oral dose of 350,000 I.U. vitamin A.—T. Moore.

1170

GERBER, A., RAAB, A. P. and SOBEL, A. E. **Vitamin A poisoning in adults. With description of a case.** *Amer. J. Med.*, 1954, 16, 729-745. [Dept. Med., Jewish Hosp., Brooklyn, N.Y.]

For over 8 years a 28-year-old white woman

N.A. and R., January 1955

continued to take 500,000 I.U. vitamin A daily as treatment for ichthyosis. During the period she was admitted to hospital ten times, usually complaining of headaches, diplopia, arthritis and pruritus. Many diagnoses were made, including brain tumour, serous meningitis, virus radiculonephalitis, psychoneurosis and generalised infectious arthritis. X-ray examinations showed disturbances of calcification, including calcification of the intrapatellar ligaments. Finally estimation of vitamin A in the blood plasma gave a value of 2000 μg . per 100 ml., believed to be the highest value ever recorded. Poisoning from excess of vitamin A was diagnosed, and treatment with it was stopped. The value for vitamin A in the plasma fell slowly, but was still above the normal range after 3 months. At the same time, clinical improvement in the neurological, skeletal and skin manifestations proceeded rapidly and the patient became fit for discharge from hospital.—T. Moore.

1171

KLEINE, H. O. and HUBER, L. Zur Frage der Hypervitaminisierung mit Vitamin A und Vitamin C bei inoperablen Karzinomen nach v. Wendt. [On the treatment of inoperable carcinoma with excess of vitamin A and vitamin C as suggested by v. Wendt.] *Münch. med. Wochenschr.*, 1954, **96**, 367-370. [Frauenklinik, Städt. Krankenhaus, Ludwigshafen am Rhein.]

The literature is reviewed, and von Wendt's claims (*Ztschr. ges. inn. Med.*, 1949, **4**, 267; 1950, **5**, 255; 1951, **6**, 255) of the benefits derived in inoperable carcinoma from daily doses of 300,000 I.U. vitamin A and 2 g. vitamin C are criticised.

E. M. Hume.

Vitamin D

1172

OSTER, H. Beeinflussen unsere Massnahmen gegen die Rachitis den Durchbruch der Milch- und der bleibenden Zähne und den Fontanellschluss? [Do the antirachitic measures which we take affect the appearance of the milk or permanent teeth, or the closure of the fontanelle?] *Ztschr. Kinderheilk.*, 1954, **74**, 582-592. [Gesundheitsamt Stadt Nürnberg.]

In Nürnberg, the age in months of the appearance of the 1st, 2nd, 3rd, 4th, 6th, 8th, 12th, 19th, and 20th milk tooth was noted for groups of from 97 to 462, in all about 2000, children in 1938, and for comparable numbers, in all about 2500, in 1950, when it was considered that prophylaxis of rickets had been much more effective. There was no difference between the years in the earliest, latest or average date for the appearance of any of the teeth except the lower median incisors, which appeared on the average 1 month earlier in 1950.

Comparison of the date of closure of the [grosse: anterior] fontanelle of 543 children before institution of intensive rickets prophylaxis, and of 583 after it, showed a range of dates from the 5th to the 26th month for the first group, and from the 3rd to the 26th month for the second, with larger percentages at earlier, intermediate dates in the second group. The age at which the "six-year" molars were present was determined for 620 boys and 462 girls in Nürnberg in 1953, and compared with results of observations in Frankfurt a.M. by Bauer (*Inaugural Dissertation*, Frankfurt, 1927) in 1927 and by Franz (*Inaugural Dissertation*, Frankfurt, 1938) in 1938. The average dates were very appreciably earlier in 1938 than in 1927. In Nürnberg in 1950 they were intermediate; the date for girls was earlier than for boys. Dates were established for the appearance of other permanent teeth in boys and girls in Nürnberg in 1950.—E. M. Hume.

1173

BACH, U. Das Verhalten der alkalischen Serum-Phosphatase bei Frühgeborenen, Rachitikern und Spasmophilen. [Alkaline serum phosphatase in premature infants and infants with rickets and spasmophilia.] *Ztschr. Kinderheilk.*, 1954, **74**, 593-609. [Kinderkrankenhaus Bethel, bei Bielefeld.]

Estimation of alkaline serum phosphatase was used as criterion for assessing the antirachitic efficacy of Vigorsan, which is a water-soluble preparation of vitamin D₂ adsorbed on milk protein. The method used was that described by Hövels and Laun (Abst. 1318, Vol. 23). Of the units used in expressing the results, 3.5 equalled 1 Bodansky unit.

The average value from 400 estimations on 40 children without rickets in 1953 was 28.6 for January to March, and 21.6 for April to June.

For 22 children with rickets in the same period the mean value was 55.5. All of them were given a dose of 5 mg. vitamin D₂ as Vigorsan on 3 successive days. The phosphatase values decreased slowly, the mean value being 48 after about 10 days, and 39.5 after about 25 days. Six babies with spasmophilia as well as rickets had values ranging from 135 to 500; on treatment the values decreased rapidly and after 10 days ranged from 39 to 165.

The mean value for 20 premature infants born in the first half of 1953 and aged about 5 weeks was 55.1. The children were given small daily doses of 0.025 mg. vitamin D₂ as Vigorsan, and the phosphatase value slowly fell to a mean value of 47 at about 3 months of age. Prevention of rickets, including craniotabes, was best obtained in premature infants with a single dose of 5 mg. vitamin D₂ as Vigorsan followed by the small daily

doses. The results were much more satisfactory than those obtained in previous years with Vigantol.

The vitamin was not easily separated from the milk protein to which it was attached, even by repeated shaking with ether.—E. M. Hume.

1174

JONXIS, J. H. P. and HUISMAN, T. H. J. **The renal element in rachitic amino-aciduria.** *Lancet*, 1954, **267**, 513-516. [Kinderklin., Acad. Ziekenhuis, Groningen.]

Individual amino-acids were estimated by ion-exchange chromatography with Dowex 50 in the plasma and urine of 2 children aged about 8 and 4 years with resistant rickets, of 1 aged 1 year with florid rickets, and of 3 normal children, before and after intravenous infusion of histidine, 404 or 267 mg., and arginine, 416 or 275 mg. No vitamin D was given till later. The percentage excreted of the histidine was 33, 25 and 16 by the rachitic children, and 3.6, 5.0 and 2.1 by the normal children. The high excretion by the rachitic children was not due to a higher concentration in the blood, and is ascribed to a disturbance of tubular re-absorption. There was no difference in the amounts of arginine excreted, but the rachitic children had lower values for blood arginine both before and during infusion. The amino-acids threonine, serine, lysine and glycine, and in one child tyrosine, were somewhat increased in the urine of the children with resistant rickets after administration of arginine and histidine. The first 4 are among those whose amount was previously found to be increased in the urine of children with rickets (Abst. 1137, Vol. 24). It is considered probable that increased tubular re-absorption of histidine interferes with the re-absorption of these other amino-acids.

E. M. Hume.

1175

WINBERG, J., BERGSTRAND, C. G., ENGFELDT, B. and ZETTERSTRÖM, R. **Primary vitamin D refractory rickets. I. Report of two cases treated with high doses of vitamin D.** *Acta paediat.*, 1954, **43**, 347-361. [Paediat. Clin., Karolinska Sjukhus, Stockholm.] French, German and Spanish summaries.

The two patients were boys of 3 and 6 years. The disease eventually yielded to very large amounts, many million I.U., of vitamin D. The disease is called primary vitamin D refractory rickets because its cause remains obscure and no evidence was found of excessive loss of P in the urine through failure of tubular re-absorption by the kidneys, such as is reported for another type of vitamin-D-resistant rickets.—E. M. Hume.

1176

RUPP, W. and SWOBODA, W. **Untersuchungen des PO_4 -Stoffwechsels bei vitamin-D-resistenter Rachitis ("Phosphat-Diabetes").** 1. [Phosphate metabolism in rickets resistant to vitamin D, "phosphate diabetes". 1.] *Helv. paediat. Acta*, 1954, **9**, 249-257. [Kinderklin., Univ. Vienna.] French, Italian and English summaries.

In 5 children aged from 5 to 11 years with resistant rickets, 1 with deficiency rickets, and some without rickets, estimation was made of inorganic P and Ca in the blood serum and urine, of the clearance of inorganic P, and of the extent of glomerular re-absorption, with and without previous intravenous administration of a mixture of mono- and disodiumphosphate. All the findings supported the interpretation of resistant rickets as due to failure in tubular re-absorption of P by the kidney. It is considered that the defect may be in the tubules themselves, or in an abnormal increase in the response of the parathyroid gland to counteract the high level of P in the serum.—E. M. Hume.

1177

SEIDEL, M. **Ein Beitrag zu renal bedingten Knochenveränderungen im Kindesalter (sog. renale Rachitis). [Bone changes of renal origin in childhood (so-called renal rickets).]** *Frankfurter Ztschr. Pathol.*, 1954, **65**, 259-270. [Pathol.-Bacteriol.-Serol. Inst., Städt. Krankenhaus, Karlsruhe.]

Bone changes resistant to Ca and Vigantol in a boy of 5 are discussed in conjunction with the literature on renal rickets. It is suggested that this misleading term be dropped and replaced by "infantile renal osteodystrophy".—W. M. Deans.

1178

KYLE, L. H., MERONEY, W. H. and FREEMAN, M. E. **Study of the mechanism of bone disease in hypophosphatemic glycosuric osteomalacia.** *J. Clin. Endocrinol.*, 1954, **14**, 365-377. [Dept. Med., Sch. Med., Georgetown Univ., Washington, D.C.]

1179

LOWE, K. G., HENDERSON, J. L., PARK, W. W. and MCGREAL, D. A. **The idiopathic hypercalcaemic syndromes of infancy.** *Lancet*, 1954, **267**, 101-110. [Dept. Med., Univ. St. Andrews.]

It is considered that there may be 2 similar syndromes of idiopathic hypercalcaemia in infancy. Detailed descriptions are given of a child ill from 4, and severely ill from 10, months when first seen and since dead, and of 6 infants less ill and all fully or partly recovered. The typical onset was with vomiting, constipation, anorexia and arrest of

growth. The children became hypotonic and apathetic. Blood Ca and urea were high; there was sometimes renal and other infection such as colds, bronchitis, tonsillitis, and otitis. Biopsy of the kidney of the severely ill child did not suggest chronic nephritis but there were deposits of Fe and Ca. The biopsy findings were confirmed at autopsy; no abnormality of the parathyroid glands was found. Bone was sclerotic.

All but one of the children had been fed on National Dried Milk and the exception too was artificially fed. All but one had had additional cod liver oil and all but one had been given magnesium intermittently or regularly. Treatment was with unfortified milk, without other source of vitamin D and without alkali. Clinical improvement was rapid but biochemical recovery was still incomplete in 4 at the most recent examination.

It is suggested that the syndrome may be caused by over-absorption of Ca from cow's milk fortified, and sometimes further supplemented, with vitamin D, possibly in association with an oversensitivity to vitamin D.—I. Leitch.

1180

CRIBERY, R. D. G. and NEILL, D. W. **Idiopathic hypercalcaemia in infants with failure to thrive.** *Lancet*, 1954, **267**, 110-114. [Royal Hosp. Sick Child., Belfast.]

Clinical and biochemical data are described for 16 infants in whom the syndrome was as described in the preceding Abst. All were fed on cow's milk; 15 on dried milk fortified with vitamin D. Two infants had no additional vitamin D; the others had additions of from 400 to 1600 I.U. daily so that, in all, 2 had about 700, 6 had from 1100 to 1600, 7 had from 1800 to 2400 and 1 had 3200 I.U. daily. Only 7 had alkali or magnesium.

At first examination blood Ca was above normal, and up to 17 mg. per 100 ml. Blood urea was almost always high, and the mean was 54 mg. per 100 ml. Inorganic P was within the normal range. The urine was sterile in only 4 of the children. X-ray photographs of the bone were normal in 3 and showed abnormal density in 12.

Treatment was with unfortified milk or a low-Ca diet of soya flour, glucose, peanut oil and arrow-root. On re-examination after intervals of from 1 to 18 months only 4 had regained a normal rate of growth; 8 remained small and 4 of them continued to show high blood urea; 4 were still in the same characteristic abnormal state.

The syndrome is attributed to over-absorption of Ca. Balance studies were attempted but, on account of vomiting, were successful with 2 infants only. Without added vitamin D, retentions were 57 and 56.7 per cent. of intake. It is considered that unnecessarily large amounts of vitamin D should be discouraged.—I. Leitch.

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1181

MAROLDA, C. I. **Influencia de la vitamina D en la absorcion rectal del calcio. [Effect of vitamin D on absorption of calcium from the rectum.]** *Rev. Asoc. méd. argent.*, 1954, **68**, 171-173.

Ca was estimated in the blood of 3 groups of from 7 to 10 patients before, and 2.4 or 8 hr. after, administration of a suppository containing 0.75 g. Ca gluconate, 0.25 g. Ca ascorbate and 5000 I.U. vitamin D. The serum values in mg. per cent. ranged before treatment from 8.5 to 12.6 and after treatment from 8.8 to 13.2. In 2 patients there was no change, in 3 there was a small decrease, and in the remainder there was a small rise ranging in amount from 0.2 to 3.2 mg. per cent. The extent of the increase did not depend on the initial value.—E. M. Hume.

Vitamin E

1182

RABOCH, J. and ZÁHOŠ, Z. **Význam výživy pro mužskou plodnost. (2. Shlediska biopsií varlat.) [Importance of nutrition for male fertility. 2. From the point of view of biopsy of the testicles.]** *Čas. Lék. čes.*, 1954, **93**, 406-412. [Sexol. Inst., Karl's Univ., Prague.] English and Russian summaries.

For part 1 see Abst. 2609, Vol. 21.

Of 240 biopsies of human testicles, 33 were selected as being from subjects with a history of disturbed fertility where the man was the last or last but one of a large family. The most frequent histological findings were that the seminiferous ducts contained only Sertoli cells, and that the diameter of the tubules was less than normal. Possible causes are discussed, among which malnutrition during development is considered important. (From summary).—E. M. Hume.

1183

DARWISH, M., EL-ETRYBY, A. and EL-SHEBINTI, A. **The treatment of male sterility by low dose pituitary irradiation with reference to the value of vitamins A and E.** *J. Egypt. Med. Assoc.*, 1954, **37**, 124-127. [Kasr El Einī Fac. Med., Cairo.]

Treatment of 16 patients by irradiation [presumably with X-rays] of the pituitary gland, with vitamins A and E, and with hormones, separately or together, gave no conclusive result. There was a slight suggestion that the vitamins were helpful.

E. M. Hume.

1184

OVERMAN, R. S., MCNEELY, J. M., TODD, M. E. and WRIGHT, I. S. **Effects of vitamin E preparations on plasma tocopherol levels.** *J. Clin. Nutrit.*, 1954, **2**, 168-178. [Dept. Med., Cornell Univ. Med. Coll., New York.] Spanish summary.

Tocopherol was estimated spectroscopically in the plasma of 23 active adults, aged from 26 to 36 years, before and after taking *dl*- α -tocopheryl acetate orally as one of 2 aqueous emulsions containing 100 mg. per ml., or as capsules or tablets containing 100 mg. In studies before treatment estimations were made on 10 successive days at 9.30 a.m. and at other times on the same day. The mean tocopherol concentration of 50 plasma samples taken at 9.30 a.m. was 1.002 mg. per cent. with range from 0.46 to 1.77. Analysis of variance of the results at 9.30 and 11.30 a.m., and 1.30 and 3.30 p.m., showed that the variation was not significantly greater than would be expected on the basis of variation of the values at each point of time.

In single-dose studies plasma tocopherol was estimated at intervals up to 72 hr. after giving 100, 200, 400 or 500 mg. A significant increase in the value for free tocopherol in the plasma was found after 6 hr. with all the doses except sometimes the smallest. In further studies tocopherol values were estimated after prolonged treatment with the different preparations of tocopherol. Repeated daily doses resulted in a larger maximum increase than was found after a single dose of the same order; thus, with doses of 400 mg. tocopherol in capsule form mean values of 1.19 and 1.83 mg. per cent. were found after 1 and 12 days, respectively.

When *dl*- α -tocopherol as the free alcohol or as the monosodium phosphate was administered parenterally to 15 convalescent hospital patients of ages from 40 to 60 years there was no apparent increase of free tocopherol in the blood plasma, whether oil or water was used as the vehicle for injection.

I. M. Sharman.

1185

PAUL, R. M., LEWIS, J. A. and DELUCA, H. A.
The lack of effect of vitamin E on the blood clotting mechanism. *Canad. J. Biochem. Physiol.*, 1954, **32**, 347-353. [Westminster Hosp., London, Ont.]

Eleven male patients who had no illness or treatment likely to affect the blood clotting mechanism were studied for a period of 10 days. On each of the first 3 days blood was taken, and clotting and prothrombin times, platelet counts, fibrinogen and vitamin E content were estimated; the clotting times were estimated in duplicate in glass and silicone-treated tubes. During the following 7 days, 6 of the patients were given 600 mg. α -tocopheryl acetate daily; the remaining 5 patients received a dummy preparation. Similar examinations of the blood were made on each of the last 3 days. The average value for vitamin E in the blood of the patients given tocopherol rose from 0.87 mg. to 1.55 mg. per cent.; the corresponding values for those given dummies were 0.78

and 0.76 mg. A slight increase in clotting time, as measured in both glass and silicone-treated tubes, was found for the patients receiving dummies. A similar but smaller increase occurred in the patients given vitamin E, but on statistical analysis the difference in the presence or absence of vitamin was found not significant. No change in prothrombin time attributable to vitamin E was found. The fibrinogen values ranged from 463 to 482 mg. per cent. and were somewhat above those normally found in healthy subjects, but no change resulted from the administration of vitamin E. A slight rise in the mean platelet count, in thousands per c.mm., from 235.2 to 273.8 occurred in patients given vitamin E, but statistically, the difference, compared with that of the subjects given dummies, was of borderline significance, $P = 0.05$. The amount of vitamin E given was comparable with that usually given for therapeutic purposes, but it was relatively less than that reported in the literature as having been given in similar studies with experimental animals, which yielded different results.—I. M. Sharman.

1186

MACKENZIE, J. B. **Relation between serum tocopherol and hemolysis in hydrogen peroxide of erythrocytes in premature infants.** *Pediatrics*, 1954, **13**, 346-351. [Dept. Paediat., Div. Chem. Embryol., Univ. Colorado Sch. Med., Denver.]

Twenty-one premature infants of gestational age from 23 to 36 weeks, born at or referred to Colorado General Hospital, were reared on powdered, half-skimmed cow's milk. Small blood specimens were collected at intervals during the first 2 months of life from heel prick punctures. The red cells were examined for resistance to haemolysis by H_2O_2 according to György's test, and serum tocopherol was estimated by a micro-method. The results of the tests for haemolysis were compared with those of tests with blood from adult donors and from rats deprived of vitamin E.

Tocopherol values in the infants' sera, which averaged 0.34 mg. per 100 ml. during the first 10 days of life, fell to about half that value, from 0.20 to 0.17, during the remainder of the 2 months' study. Wide fluctuations in the percentage haemolysis, from 9 to 98, were found; the percentage was not related inversely to the tocopherol content. For instance, 2 infants of comparable weight and age showed 17 and 73 per cent. haemolysis though their serum tocopherol values were almost identical, namely, 0.14 and 0.16 mg. per 100 ml. Five of 6 infants given 2.5 or 5.0 mg. α -tocopheryl acetate daily responded with a dramatic rise of the vitamin in the blood to values ranging from 0.5 to 2.3 mg. per 100 ml., and with high resistance of the red cells

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to haemolysis. It was found that liability to haemolysis disappeared almost completely when the serum tocopherol value was above 0.5 mg. per 100 ml., and completely when it was above 1.0 mg. It appears, therefore, that in premature infants the concentration of tocopherol in the serum is of critical importance. It is suggested that infants artificially fed should be given the small amounts of tocopherol necessary to raise the tocopherol in the blood above the critical value.

I. M. Sharman.

1187

BECKMANN, R., FELDMANN, F. and SCHÜMMEL-FEDER, N. Erythroblastose-Probleme. Verhalten von Rh-Antikörpertiter und Serum-Tocopherol-Gehalt sowie deren Beziehungen zu feingeweblichen Plazentaveränderungen bei der fötalen Erythroblastose. Zugleich ein Beitrag zur Erythroblastose-Propylaxe mit Vitamin E. [Erythroblastosis problems. Behaviour of the Rh antibody titre and serum tocopherol content and their relation to histological changes in the placenta in foetal erythroblastosis; a contribution to the prevention of erythroblastosis with vitamin E.] *Deutsch. med. Wochenschr.*, 1954, **79**, 1157-1162. [Kinderklin., Westfäl. Wilhelms Univ., Münster.]

Studies were made of the antibody titre and vitamin E content of the blood during pregnancy, and of the condition and viability of the foetus, in 19 women, mostly Rh-negative, whose offspring were expected to have erythroblastosis. Five of the women were given 100 mg. *dl*- α -tocopheryl acetate daily from the 2nd or 3rd month of pregnancy, and one from the 7th month. The placentas were examined histologically. No relation was found between the severity of erythroblastosis and the concentration of antibody or vitamin E in the blood. The degree of abnormality in the placenta also appeared to be unrelated to the severity of erythroblastosis. It is claimed, however, that the abnormalities in the placenta tended to be slight in the women who had been given tocopherol.—T. Moore.

1188

ROMEO, F. and PARRINELLO, A. Influenza della vitamina E sul ricambio glucidico. [Influence of vitamin E on carbohydrate metabolism.] *Acta vitaminol.*, 1954, **8**, 129-134. [Ist. Patol. Spec. Med., Univ. Messina.] French, English, German and Spanish summaries.

The glucose tolerance curve and the sugar content of the 24-hr. urine were estimated before and after 10 days' oral treatment with 200 mg. vitamin E daily, in 10 normal subjects and 10 subjects with diabetes. In the normal subjects there was no effect. In the diabetic subjects the

glucose tolerance curve was to some extent favourably modified, and glycosuria is reported as diminished.—E. M. Hume.

1189

GOUNELLE, H., MARNAY, C. and RABII, H. L'action hypoglycémiant de la vitamine E chez le sujet normal et diabétique. [The effect of vitamin E in lowering blood sugar in normal and diabetic subjects.] *Presse méd.*, 1954, **62**, 888-890. [Centre Recherches Foch, Paris.]

In human subjects who were given 10 g. olive oil mixed with 10 g. *dl*- α -tocopheryl acetate, an enormous dose, the level of glucose in the blood fell by about 10 per cent. during the next 4 hr. When the tocopherol was given 4 hr. before 200 g. glucose, the rise in blood sugar during the next few hours was much less than in a similar test without tocopherol made at another time. Olive oil, given without tocopherol, raised the blood sugar. In diabetic subjects tocopherol decreased the transitory rise in blood glucose which immediately followed the injection of slow-acting insulin. In rabbits which had been injected with alloxan, subsequent massive oral doses of tocopherol reduced the rise of blood sugar and the toxic effects.—T. Moore.

Vitamin B Complex

1190

LINDGREN, I. M. K metodike ustanovleniya diagnoza nedostatochnosti vitamina B₁. [Method of diagnosing vitamin B₁ deficiency.] *Klin. Med., Mosk.*, 1953, **31**, No. 8, 42-46. [Klin. Kozh. Vener. Bolezni, Moscow.]

Vitamin B₁ in the urine and pyruvic acid in the blood and urine were estimated for 11 normal subjects and 30 patients with psoriasis, before and after a test dose of the vitamin.

In the normal group having a diet deemed adequate in vitamin B₁, the average amount in the urine in 24 hr. was 442 μ g.; pyruvic acid values in blood and urine were 0.5 and 0.54 mg. per cent., respectively. After the test dose, 31 per cent. of the vitamin was excreted in 4 hr. and 36 per cent. in 24 hr.

The 30 patients with psoriasis had a dietary intake of 2700 μ g. vitamin B₁ in 24 hr. and were given repeated intramuscular injections of 10 mg. daily for from 10 to 30 days. Of 19 showing improvement or cure, 7 excreted little vitamin B₁ before the test and retained most of that administered, and 12 had a high rate of urinary excretion before the test and excreted on an average 23 per cent. of that given in 4 hr. and 38 per cent. in 24 hr. They had a high pyruvate value in blood and urine, from 1.18 to 3.0, and from 1.37 to 3.92, mg. per cent., respectively. Of 11 who showed no improvement, 10 had normal values for urinary

excretion of vitamin B₁ and for blood and urine pyruvate. In the 11th case, the pyruvate values were high.

It is concluded that the urinary excretion of vitamin B₁ is not an adequate criterion of deficiency and should be studied in conjunction with pyruvate values in blood and urine and the clinical and biochemical responses of the patient to administration of vitamin B₁.—D. W. Taylor.

1191

DERVIZ, G. V. Diskussionnye zamechaniya k stat'e I. M. Lindgren "K metodike ustanovleniya diagnoza nedostatochnosti vitamina B₁". [Discussion on I. M. Lindgren's article, "Method of diagnosing vitamin B₁ deficiency"] *Klin. Med., Mosk.*, 1953, 31, No. 10, 85-86.

A critical discussion of certain implications of the data mentioned in the preceding Abst.

D. W. Taylor.

1192

AGAPOVA, O. I. Vliyaniye vitamina B₁ na ustoiichivost' zubov k kariesu. [The effect of vitamin B₁ on resistance of teeth to dental caries.] *Stomatologiya*, 1954, No. 1, 17-19. [Moscow Med. Stomatol. Inst.]

Seventy-five children received 2 mg. vitamin B₁ daily with their ordinary food which was calculated to contain from 0.6 to 0.7 mg., and 75 received no addition. At the end of 1½ months 25 children in the group having the vitamin had 59 carious teeth and 28 children not receiving the extra vitamin had 69. After a further 4 months those having the vitamin had only 3 more teeth affected and no other child in the group had developed caries; in the untreated group 5 more teeth were affected and 3 more children had developed caries. Some children were lost to both groups in the course of the observation.—H. Scherbatoft.

1193

RUIZ, M. Los megaorganos digestivos por avitaminosis B₁. [Enlarged digestive organs in vitamin B₁ deficiency.] *Rev. clín. española*, 1954, 53, 182-188. [Madrid.]

The occurrence of enlargement in the oesophagus and intestine, especially in the ascending colon, of patients suffering from deficiency of vitamin B₁, is discussed and illustrated by X-ray photographs from 3 patients. Treatment for several months with very large amounts of vitamin B₁ with other vitamins restored the picture almost to normal. Patients with such intestinal enlargements were not seen after the nutritional condition of the country improved at the end of the civil war.

A. M. Copping.

1194

TRULSON, M. F. FLEMING, R. and STARE, F. J. Vitamin medication in alcoholism. *J. Amer.*

Med. Assoc., 1954, 155, 114-119. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

In addition to such other treatment as might be necessary patients were given a multiple vitamin preparation or a dummy; 82 patients were kept under observation for 6 months, 58 receiving the vitamins and 24 the dummy. The number of patients who became totally abstinent was greater in the group having the dummy, but more patients improved in their drinking habits in the group having vitamins. A change of treatment from dummy to vitamins led to greater improvement than the reverse change. The results did not convincingly suggest benefit from the vitamin treatment but were considered sufficiently encouraging to warrant further trials.

L. Wills.

1195

CAMBIER, J. L'encéphalopathie de Gayet-Wernicke et les encéphalopathies carencielles des alcooliques. [Gayet-Wernicke encephalopathy and deficiency encephalopathies of alcoholics.] *Presse méd.*, 1954, 62, 859-861.

1196

MOSSBERG, H. O. Infantil aerodyn. [Infantile acrodynia.] *Nord. Med.*, 1954, 52, 1117-1119. [Barnsjukhuset Samariten, Stockholm.] English summary.

The history, age distribution and signs of infantile acrodynia are discussed. In the past 12 years there have been 5 cases in Stockholm, which are described. In all of them there was a preceding virus infection. Pyruvic acid in the blood was high and responded to vitamin B₁.—I. Leitch.

1197

MALLOU LABRADOR, A. La anorexia idiopática y su permanente actualidad. [Idiopathic anorexia and its lasting importance.] *Medicamenta*, 1954, 22, 58-64. [Saragossa.]

A review, concerned chiefly with children, which discusses the stimulation of appetite by meat, meat extracts and B vitamins.—I. Leitch.

1198

RAMUNNI, M. Influenza del salicilato di sodio sulla eliminazione urinaria di aneurina. [Influence of sodium salicylate on urinary excretion of vitamin B₁.] *Acta vitaminol.*, 1954, 8, 164-166. [Ist. Clin. Med., Univ. Bari.] French, English, German and Spanish summaries.

Vitamin B₁ was estimated in the urine of 12 adults for 2 days before, and for 3 days during, oral administration of 8 g. sodium salicylate. There was no significant effect.—E. M. Hume.

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1199

BARBIERI, L. L., MARZOCCHI, G., RUMPIANESI, G. and BRUNELLI, M. A. Röntgenstimolazione della tiroide ed eliminazione urinaria della tiamina, della riboflavina, della niacina, dell'acido ascorbico e dei 17-ketosteroidi. [X-ray stimulation of the thyroid gland and excretion in the urine of vitamin B₁, riboflavin, nicotinic acid, ascorbic acid and 17-ketosteroids.] *Internat. Ztschr. Vitaminforsch.*, 1954, 25, 261-274. [Ist. Clin. Med. Gen., Univ. Bologna.] German, French and English summaries.

Of 15 patients of both sexes, aged from 20 to 34 years, convalescent from illnesses not involving the endocrine glands, 10 were given X-ray irradiation of the thyroid gland and 5 of the thigh. Certain substances were estimated in the 24-hr. urine on the day before irradiation and for the next 2 days.

After irradiation of the thyroid gland, the amount in the urine of vitamin B₁, ascorbic acid and 17-ketosteroids was increased, that of riboflavin and nicotinic acid was reduced. After irradiation of the thigh there was no constant change.—E. M. Hume.

1200

HORWITT, M. K. Report of Elgin Project No 3 with emphasis on liver dysfunction. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 7*, 1953, 67-83. [Biochem. Res. Lab., Elgin State Hosp., Ill.]

Elgin Project No. 3 is a study of man's needs for nicotinic acid and tryptophan in diets adequate or deficient in riboflavin. In this partial report attention is given mostly to changes which occur in liver function as a consequence of dietary deficiency which is probably not associated with nicotinic acid but which, like kwashiorkor, responds to treatment with liberal amounts of animal protein.

The basal experimental diet supplied 2300 Cal., 6.5 g. protein N, 93 g. fat, 5.8 mg. nicotinic acid, 265 mg. tryptophan and 414 µg. riboflavin. The diet will be described in detail elsewhere but it is stated that maize meal was not included and sources of protein mentioned are zein, flour [kind not stated] and gelatine. Supplements of vitamins A, B₁, B₆, B₁₂, C and D, Ca pantothenate, folic acid, biotin, dicalcium phosphate and ferrous sulphate were given. No supplement of vitamin E was given but the basal diet contained 40 g. margarine. Forty subjects were divided into 5 groups. Four of these groups received the basal diet with one of the following supplements daily: 0.1 mg. riboflavin; 2 mg. riboflavin; 2 mg. riboflavin and 10 mg. nicotinic acid; 2 mg. riboflavin and 50 mg. L-tryptophan increased to 100 mg. after 10 weeks. The fifth group had hospital diet to appetite.

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There was no sign of pellagra; signs of riboflavin deficiency were seen in 6 of the 8 subjects receiving only 0.5 mg. riboflavin daily.

When the experimental diet supplemented with tryptophan and riboflavin was given to weanling rats, growth was retarded and livers showed intense fatty infiltration. These effects were counteracted by the addition of lactalbumin to the diet.

In the study of the human subjects all persons on the experimental diets showed raised levels of blood lactic and pyruvic acids after 7 weeks. Clinical evidence of liver enlargement was found in some of the subjects after 5 months. A number of liver function tests were made with negative results but the bromosulphalein retention test indicated abnormal function in some of the subjects.

During the second year of the experiment supplements such as methionine, choline and lactalbumin (30 g. daily) were given or the subjects were given hospital diet. Of these treatments only hospital diet reduced liver size and the levels of lactic and pyruvic acids in blood. Both 30 g. lactalbumin and hospital diet caused improvement in bromosulphalein retention time.—F. C. Aitken.

1201

FABIAN, G. and LINKE, H. Beitrag zur Klinik der sekundären Pellagra. [Diagnosis of secondary pellagra.] *Münch. med. Wochenschr.*, 1954, 96, 781-784. [Städt. Med. Klin., Gustav-Ricker-Krankenhaus, Magdeburg.]

The causes of secondary pellagra are reviewed. Cases are described secondary to gastro-intestinal disease.—E. M. Hume.

1202

LORENZINI, R. and BOSCHI, S. L'escrezione urinaria dei derivati piridinici N₁-metilati in epatopazienti. [Urine excretion of N¹-methylated pyridine derivatives in patients with liver diseases.] *Acta vitaminol.*, 1954, 8, 121-127. [Ist. Clin. Med. Gen., Univ. Modena.] French, English, German and Spanish summaries.

Trigonellin was estimated by the method of Roggen (Abst. 1033, Vol. 17) in the urine of 34 patients with liver disease, of both sexes, aged from 17 to 71 years, before, during and after intramuscular injection of 10 mg. vitamin B₁ and 500 mg. methionine daily on 3 successive days. The values for the patients varied widely but did not differ from the normal before administration of the test doses, or in the extent of the subsequent increase.—E. M. Hume.

1203

ALESHIRE, I. Delusion of parasitosis: report of successful care with antipellagrous treatment. *J. Amer. Med. Assoc.*, 1954, 155, 15-17. [Iowa City.]

1204

KOKIL, S. Über Dermatitis seborrhoides. [Seborrhoe dermatitis.] *Ann. paediat.*, 1954, 183, 28-32. [Kinderabt., Zentralkrankenhaus d. Arbeiter-Krankenkasse, Afula, Israel.] English and French summaries.

Dermatitis seborrhoides of the young infant is a characteristic disease, occurring in the first 3 months of life. It has no relation to allergic eczema of infants, or to *dermatitis seborrhoides* of older children and adults. It occurs in the months from November to April, and is thought probably due to diminution in the amount of biotin in human and cow's milk at that season, so that the infant's biotin intake is not sufficient to ensure normal keratinisation of the epidermis. Biotin is reported to be a specific cure in an amount of 5 mg. daily given orally or parenterally. Whether the dermatitis was recent or of longer standing, cure was achieved in from 2 to 3 weeks, but biotin was without effect in similar affections of older children.—M. B. Richards.

1205

WACHSTEIN, M. and LOBEL, S. Abnormal tryptophan metabolites in human pregnancy and their relation to deranged vitamin B₆ metabolism. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 624-627. [Div. Labs., St. Catherine's Hosp., Brooklyn, N.Y.]

When a dose of 10 g. *dl*-tryptophan was given to 4 non-pregnant women and to 11 women on the first or second day after delivery, the average excretion of xanthurenic acid in mg. during the next 24 hr. was 16 in the first group and 183 in the second. Paper chromatography of samples of urine showed that the non-pregnant women excreted kynurenine, kynurenic acid and *N*- α -acetylkynurenine; in the urine of the women just after delivery many other tryptophan metabolites appeared, including 3-hydroxykynurenine, which formed a pattern similar to that found in rats deprived of vitamin B₆; administration of 50 mg. pyridoxine hydrochloride somewhat reduced the amounts excreted. It is suggested that deficiency of vitamin B₆ may be induced in pregnancy by the demands of the foetus for the vitamin.

A. M. Copping.

1206

FINKB, H. Über die Behandlung des Parkinsonschen Syndroms mit hohen Dosen Vitamin B₆. [Treatment of the Parkinsonian syndrome with large doses of vitamin B₆.] *Münch. med. Wochenschr.*, 1954, 96, 637-639. [Kölnische Strasse 76, Kassel.]

Twenty patients with Parkinson's disease, 6 of them post-encephalitic cases, were treated with from 600 to 1400 mg. pyridoxine (Benadon) daily, given orally and parenterally. Of the 6 attacked

after encephalitis, 1 was greatly benefited by the treatment, 2 moderately and 3 scarcely at all. Of the 14 with true Parkinson's disease, 9 showed good objective improvement, 3 somewhat less and 2 none. Specimens of handwriting are reproduced in support of the claims. Prospects were better the earlier the treatment was begun.—E. M. Hume.

1207

HAEHNLER, E. and LUDS, H. Der perorale Folsäurestoss-Test und seine differential-diagnostische Bedeutung für die Klinik 1. 2. 3. [The test with a single oral dose of folic acid and its significance in differential diagnosis 1. 2. 3.] *Münch. med. Wochenschr.*, 1954, 96, 477-479; 582-584; 784-785. [Med. Klin., Univ. Cologne.]

1. A method is described of estimating folic acid in the urine by paper chromatography with recognition of folic acid as a black spot in ultraviolet light, and comparison with a standard scale.

The method was used to estimate folic acid in the urine after an oral test dose of 100 mg. Urine was collected after 2, 5, 9, 13 and 24 hr. The peak of excretion in 50 normal subjects occurred after from 5 to 9 hr., and the total amount excreted in the 24 hr. was from 35 to 50 mg. When 50 mg. were given orally, daily for 10 days just before the test dose, the response was greater, up to 80 mg. in the 24 hr.

2. When the test was applied to 8 patients with pernicious anaemia, whether treated or not, the response was much less, ranging from 8.7 to 22.3 mg. in the 24 hr. The test is considered to have diagnostic value.

3. The test was applied in other diseases, and results for a small number of cases are reported. In tuberculosis the result appeared to be normal. In 8 patients with carcinoma in different sites, it was abnormally low, ranging from 10.7 to 24.5 mg. in the 24 hr. The results were indistinguishable from those in pernicious anaemia. A case of Hodgkin's disease and one of myeloblastic anaemia also gave a very low response. Use of the test for differential diagnosis between tuberculosis and carcinoma in certain states of lung infiltration is suggested.—E. M. Hume.

1208

SANSONE, G. Pathomorphosis of acute infantile leukaemia treated with modern therapeutic agents; "meningoleukaemia" and Frölich's obesity. *Ann. paediat.*, 1954, 183, 33-42. [Dept. Paediat., Univ. Genoa.] German and French summaries.

During 3 years, 24 children were treated with aminopterin, alone or with cortisone or adrenocorticotrophic hormone, with apparent complete remission. In the 2 that had the longest remission,

treated with aminopterin or aminopterin and cortisone, severe complications arose going on to blindness, loss of tendon reflexes, loss of muscle strength and obesity. Leucaemic infiltration of the meninges, round the small vessels, and of the pituitary, chiasma, optic tract and olfactory bulb were found. Intrathecal injection of aminopterin reduced the number of cells in the cerebrospinal fluid but produced no clinical improvement.

I. Leitch.

1209

DARBY, W. J. **Folic acid and citrovorum factor in human nutrition.** *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 7, 1953, 85-99.* [Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

1210

OJI, K., WADA, M. and YOSHIDA, T. **Some aspects of the metabolism of the "citrovorum factor" in humans with liver disease.** *Med. J. Osaka Univ., 1954, 5, 177-185.* [I. Dept. Int. Med., Med. Sch., Univ. Osaka.]

Citrovorum factor, estimated in urine with *Leuconostoc citrovorum* 8081, was much less in patients with liver diseases than in normal adults. The urinary excretion of citrovorum factor in response to administration of folic acid or leucovorin also was low in the patients. The excretion in response to a dose of folic acid was slightly improved if ascorbic acid or vitamin B₁₂ was given simultaneously.

No correlation was established between tests of liver function and excretion of citrovorum factor, but excretion was related to the Hb value in patients with infective hepatitis. Most patients with liver disease showed a tendency to macrocytic anaemia which, it was thought, was related to the disturbance in the metabolism of the citrovorum factor.—A. M. Copping.

1211

PEUCHOT, G. and GAMET, A. **Les anémies gravidocarentielles des pays tropicaux. [Deficiency anaemias of pregnancy in tropical countries.]** *Méd. trop., 1954, 14, 57-64.* [Corps de Santé Colonial.]

The diet of the natives in French Somaliland is based on millet and goat's milk curds. Very little meat is eaten, and anaemia is prevalent, a red cell count as high as 4 million being rare. On such a basis is imposed anaemia in pregnancy, becoming severe about the 6th month or after delivery, with a red cell count below a million, hyperchromia and megaloblastosis. Bilirubin values in the blood are, however, normal, and blood protein values are high with the albumin-globulin ratio normal. Gastric acidity is normal. Thirteen case histories

are given. Treatment is with vitamin B₁₂, 60 µg. daily for 4 or 5 days, then 30 µg. daily for 10 days; folic acid is given at the same time.

This anaemia of pregnancy is thought to be distinct from that seen in Europe or the tropical form of Wills.—E. M. Hume.

1212

ZETTERSTRÖM, R. and FRANZÉN, S. **Megaloblastic anaemia in infancy. Megaloblastic anaemia occurring in an infant of a mother suffering from pernicious anaemia of pregnancy.** *Acta paediat., 1954, 43, 379-385.* [Barnklin., Karolinska Sjukhus, Stockholm.] French, German and Spanish summaries.

The infant was breast fed and developed normally until 2 months old. At 4 months he was admitted to hospital with severe anaemia of megaloblastic type. The mother at this time showed blood and bone marrow pictures typical of healing pernicious anaemia. The child recovered after responding dramatically to a single injection of 15 µg. vitamin B₁₂, and subsequent treatment with folic acid elicited no further response.—D. Duncan.

1213

MOLLIN, D. L. and ROSS, G. I. M. **Vitamin B₁₂ deficiency in the megaloblastic anaemias.** *Proc. Roy. Soc. Med., 1954, 47, 428-431.* [Dept. Pathol., Postgraduate Med. Sch., London.]

It is considered that estimation of vitamin B₁₂ in serum may be of value in investigating megaloblastic anaemia, especially in patients who have little or no haematological evidence of deficiency. Serum vitamin B₁₂ concentrations of about 100 µg. per ml. or less are regarded as suggestive of deficiency. For 126 normal subjects the values ranged from 100 to 900, mean 360, µg. per ml. For 190 patients with pernicious anaemia the value was always below 100, and in most of them below 50. After treatment with vitamin B₁₂ the value rose to within normal limits, and remained high for a time. Among patients with other megaloblastic anaemias, most of those with low initial values responded to treatment with vitamin B₁₂, but of patients with such conditions as idiopathic steatorrhoea or megaloblastic anaemia of pregnancy, a considerable number had normal values while still untreated. Most of them did not respond to treatment with vitamin B₁₂, but responded to treatment with folic or folinic acid. The method is considered convenient for determining the specific deficiency in patients with florid megaloblastic anaemia and, used in conjunction with the haematological response to treatment, may reveal a double deficiency of vitamin B₁₂ and folic acid.—M. B. Richards.

1214

UNGCLAUB, W. G., ROSENTHAL, H. L. and GOLD-SMITH, G. A. **Studies of vitamin B₁₂ in serum and urine following oral and parenteral administration.** *J. Lab. Clin. Med.*, 1954, **43**, 143-156. [Div. Nutrit., Dept. Med., Tulane Univ. Sch. Med., New Orleans, La.]

Vitamin B₁₂ was estimated in blood and urine with *Lactobacillus leichmannii*, and lower values were found in the serum but not in the urine of patients with macrocytic anaemia of different types. Doses of 500, 1000 or 3000 µg. vitamin B₁₂ were given by mouth to 10 normal subjects and of 50, 500, 1000 or 3000 µg. to 8 patients with megaloblastic anaemia. Only with 3000 µg. was there a marked rise in serum values in normal subjects. Patients with pernicious anaemia in relapse showed a slight response to 500 µg. and a good response to 3000 µg. The haemopoietic response was suboptimum with less than 3000 µg. When 10, 25, 50 or 100 µg. were given by intramuscular injection to normal subjects there was a rapid increase in serum and urine values, which was in proportion to the dose. The effects of intramuscular injection of the same amount in 2 patients with pernicious anaemia were like those in normal subjects. There was some relation between values for serum and urine after parenteral administration, but the variation in urine values was very wide. After oral administration there was no apparent relation between the amount in the serum and urine.—A. M. Copping.

1215

GLASS, G. B. J., BOYD, L. J., GELLIN, G. A. and STEPHANSON, L. **Uptake of radioactive vitamin B₁₂ by the liver in humans: test for measurement of intestinal absorption of vitamin B₁₂ and intrinsic factor activity.** *Arch. Biochem. Biophys.*, 1954, **51**, 251-257. [Dept. Med., New York Med. Coll., Flower and Fifth Av. Hosps., New York.]

A new method of testing intestinal absorption of vitamin B₁₂ is based on measurement of the liver uptake of radio-active vitamin B₁₂ containing ⁶⁰Co by means of scintillation counts over the area of skin above the liver and lower abdomen. Counts were made between the sixth and tenth days after ingestion of 1 or 2 µg. radio-active vitamin B₁₂ by 10 normal subjects, 6 patients with pernicious anaemia in remission or relapse and 1 patient with sprue. Little vitamin B₁₂ was absorbed by patients with pernicious anaemia unless normal gastric juice was given, and almost none by patients with sprue whether gastric juice was given or not.—A. M. Copping.

1216

GLASS, G. B. J., BOYD, L. J. and STEPHANSON, L. **Intestinal absorption of vitamin B₁₂ in humans**

as studied by isotope technic. *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 522-526. [Dept. Med., New York Med. Coll., Flower and Fifth Av. Hosps., New York.]

With the method of measuring radio-activity in the liver described in the preceding Abstract, tests were made on 20 normal subjects after ingestion of 0.5, 1.0, 2.0, 20 or 50 µg. vitamin B₁₂ containing ⁶⁰Co. Absorption was compared with that of the same doses given by intramuscular injection. With intakes of 0.5 or 1.0 µg. about 90 per cent. of the oral dose was absorbed, but as the size of the dose increased, the efficiency of absorption decreased until it was only 3.0 per cent. of the dose of 50 µg. It is suggested, therefore, that, in addition to Castle's intrinsic factor, there may be in the intestinal wall a vitamin B₁₂-acceptor, which would set a partial mucosal block to the absorption of vitamin B₁₂ from the intestine of normal human subjects, and might thus resemble apoferritin in its relation to the absorption of iron.

A. M. Copping.

1217

GLASS, G. B. J., BOYD, L. J. and STEPHANSON, L. **Intestinal absorption of vitamin B₁₂ in man.** *Science*, 1954, **120**, 74-75. [Dept. Med., New York Med. Coll., Flower and Fifth Av. Hosps., New York.]

See two preceding Absts.

1218

TURNBULL, A. **Experiences with labelled vitamin B₁₂.** *Proc. Roy. Soc. Med.*, 1954, **47**, 424-426. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

When 0.5 µg. vitamin B₁₂ labelled with radio-active ⁶⁰Co was given by mouth to 22 patients with pernicious anaemia, from 80 to 95 per cent. of the radio-activity appeared in the faeces, the mean of 39 observations being 88. When the same amount was given to 10 other patients not having pernicious anaemia, only from 20 to 40 per cent. of the radio-activity appeared in the faeces, the mean of 23 observations being 31. When patients with pernicious anaemia were given intrinsic factor with the labelled vitamin B₁₂ the recovery of radio-activity from the faeces was much reduced. It was concluded that the difference between findings in patients with and without pernicious anaemia was due to the failure of the former to secrete intrinsic factor. Patients who had undergone total gastrectomy gave results like those in pernicious anaemia and again, recovery from the faeces was reduced when a source of intrinsic factor was given. The results support the view that in man the stomach is the only gastro-intestinal source of intrinsic factor. Studies were made also on patients with steatorrhoea or megaloblastic anaemia of pregnancy.

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The technique provides a useful indirect measure for the secretion of intrinsic factor, and should assist in studying the role of vitamin B₁₂ and of intrinsic factor in the megaloblastic anaemias.

M. B. Richards.

1219

BADENOCH, J. The use of labelled vitamin B₁₂ and gastric biopsy in the investigation of anaemia. *Proc. Roy. Soc. Med.*, 1954, **47**, 426-427. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

Specimens of gastric mucosa were obtained by gastric biopsy tube from 130 patients. The histological changes in the stomach mucosa in anaemia were compared with the amount of intrinsic factor as measured by the absorption of orally given radio-active vitamin B₁₂. In pernicious anaemia there was gross atrophy of the specific glandular tissue of the gastric mucosa, and normal chief or parietal cells could not be seen. It is considered that if such cells are found in any numbers, the diagnosis should be reviewed and a search made for other causes of megaloblastic anaemia. The same technique was applied with varying results to patients with hypochromic anaemia and achlorhydria, and also to 2 patients with megaloblastic anaemia of obscure origin.—M. B. Richards.

1220

HALSTED, J. A., GASSTER, M. and DRENIK, E. J. Absorption of radioactive vitamin B₁₂ after total gastrectomy; relation to macrocytic anaemia and to the site of origin of Castle's intrinsic factor. *New Engl. J. Med.*, 1954, **251**, 161-168. [Wadsworth Gen. Hosp., Veterans Admin. Centre, Los Angeles, Calif.]

In continuation of previous observations (Abst. 1122, Vol. 24) 11 patients who had been subjected to total gastrectomy, of whom 4 were the subjects of the previous study, 11 normal subjects, 7 patients with pernicious anaemia in remission, and 3 patients with idiopathic achlorhydria, were given orally 0.5 µg. vitamin B₁₂ containing radio-active Co. Stools were collected for 5 days afterwards and the content of radio-active vitamin B₁₂ was estimated. All except 2 of the gastrectomy patients had received prophylactic treatment against pernicious anaemia from the time of operation.

The percentage recovered from the faeces, of the amount of radio-active vitamin B₁₂ administered, was from 19 to 57, mean 33, for the normal subjects. For the 3 subjects with idiopathic achlorhydria it was from 20 to 51, mean 35, and for the 7 with pernicious anaemia it was from 80 to 100 unless gastric juice also was given, when the mean value was 38. For the patients subjected to gastrectomy the mean percentage in the faeces was 87 unless gastric juice was given, when it was 20.

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The results are taken as clear evidence that the stomach is the only site of secretion of the intrinsic factor. The reason why all patients subjected to total gastrectomy do not develop pernicious anaemia is discussed. Few survive long enough to do so, and many now receive prophylactic treatment.—E. M. Hume.

1221

HEATLEY, N. G., JENNINGS, M. A., FLOREY, H., WATSON, G. M., TURNBULL, A. and WAKISAKA, G. Intrinsic factor in the pyloric and duodenal secretions of the pig. *Lancet*, 1954, **267**, 578-580. [Sir William Dunn Sch. Pathol., Oxford.]

Intrinsic factor activity was tested by oral administration of the preparation at the same time as vitamin B₁₂ labelled with radio-active Co, to patients with pernicious anaemia and measuring the amount of radio-activity which appeared in the faeces. Filtrates of pyloric and duodenal secretions of the pig had activity, but the mucoid residues had little or none. A single test showed activity in a nondialysable residue of duodenal filtrate.—F. C. Aitken.

1222

MASSEY, B. W. and RUBIN, C. E. The stomach in pernicious anaemia: a cytologic study. *Amer. J. Med. Sci.*, 1954, **227**, 481-492. [Frank Billings Med. Clin., Dept. Med., Univ. Chicago, Ill.]

Cells obtained by lavage or abrasion followed by lavage from the stomach of 21 patients with treated pernicious anaemia in remission, and seen in histological studies of parts of the stomach removed by operation from 2 of them, included groups of enlarged cells with abnormal nuclei which might be mistaken for cancer cells and which, it is considered, may be diagnostic of pernicious anaemia. In other tissues of untreated patients with pernicious anaemia, similarly abnormal cells have been reported (Graham and Rheault, *J. Lab. Clin. Med.*, in the press); they return to normal on treatment unlike the gastric cells which remain abnormal after treatment and clinical remission of the disease.—I. Leitch.

1223

SCHELL, R. F., DOCKERTY, M. B. and COMFORT, M. W. Carcinoma of the stomach associated with pernicious anaemia; a clinical and pathologic study. *Surg. Gynecol. Obstet.*, 1954, **98**, 710-720. [Mayo Clin., Rochester, Minn.]

1224

KAIPIAINEN, W. J., NYKOPF, S. and SIURALA, M. The vitamin B₁₂ binding power of gastric juice. *Ann. Med. int. Fenn.*, 1954, **43**, 105-108. [2. Med. Clin., Univ. Helsinki.]

The power of the gastric juice from 50 patients to bind vitamin B₁₂ was studied by adding the juice, sterilised by filtration, to a culture of *Bact. coli* with a known requirement for vitamin B₁₂. No binding power was shown by 32 samples from patients with tapeworm anaemia, gastritis or achlorhydria and from some with apparently normal gastric acidity. One patient whose gastric juice showed power to bind vitamin B₁₂ had pernicious anaemia. No correlation could be demonstrated between power to bind vitamin B₁₂ and gastroscopic or histological findings.

A. M. Copping.

1225

GLAZER, H. S., MUELLER, J. F., JARROLD, T., SAKURAI, K., WILL, J. J. and VILTEE, R. W. The effect of vitamin B₁₂ and folic acid on nucleic acid composition of the bone marrow of patients with megaloblastic anaemia. *J. Lab. Clin. Med.*, 1954, 43, 905-913. [Dept. Int. Med., Coll. Med., Univ. Cincinnati, Ohio.]

Purine and pyrimidine bases were estimated by paper chromatography in aspirated bone marrow from 17 subjects with a normal blood picture, 11 with pernicious anaemia and 1 with sprue. Samples were taken before and after treatment with vitamin B₁₂, folic acid, folic acid or ascorbic acid or combinations of them. In patients with megaloblastic anaemia the concentration of ribonucleic acid and uracil was raised in comparison with that of deoxyribonucleic acid and thymine. The normal ratio between these components was restored after adequate treatment with vitamin B₁₂. Remission of the haematological condition and restoration to normal of the nucleic acid concentration in the bone marrow was obtained in some patients by treatment with folic acid or folic acid combined with ascorbic acid. The findings are discussed with reference to the theory that, in haemopoietic tissues, vitamin B₁₂ and the folic acid and ascorbic acid system produce chemical reactions that favour the formation of thymine and its deoxyribosides, and the depletion of uracil and its nucleotides.—A. M. Copping.

1226

GORDIN, R. Prothrombin in cryptogenic pernicious anaemia and pernicious tapeworm anaemia and its response to treatment. *Acta med. scand.*, 1954, 149, 1-18. [A. Med. Clin., Maria Hosp., Univ. Helsinki.]

Of 47 patients with cryptogenic pernicious anaemia and 42 with pernicious anaemia due to tapeworm infestation, 57.4 and 54.8 per cent., respectively, had prothrombin values below 80 per cent. of normal. In subjects with a Hb value below 60 per cent. or a red cell count below 2.5 million, the incidence of low prothrombin values was, respectively, 78 and 75 per cent. in the group

with cryptogenic anaemia and 54 and 55 per cent. in the group with tapeworm anaemia; the lowest values were usually found in patients with severe anaemia. In 71 patients with secondary anaemia, however, and in 36 with post-haemorrhagic anaemia of severity equal to that of the patients with pernicious anaemia, prothrombin values were seldom low. In those in whom proconvertin was estimated, the values for it followed the prothrombin values. Vitamin B₁₂ was effective for treatment of the anaemia, but had no effect or only a transitory one on the prothrombin value; after treatment with crude liver extract, however, the prothrombin values rose to normal levels and remained high. In both types of patient an extract of tapeworm given by intramuscular injection produced a positive but transitory effect on the prothrombin value. In other cases a worm cure produced a positive and persistent effect. Vitamin K had no effect on the prothrombin value. From the results it is concluded that the low value for prothrombin was due to transient liver damage, which is less likely to be present in the more acute cases of tapeworm infestation.—L. Wills.

1227

BEARD, M. F., PITNEY, W. R. and SANNEMAN, E. H. Serum concentrations of vitamin B₁₂ in patients suffering from leukemia. *Blood, J. Hematol.*, 1954, 9, 789-794. [Sect. Haematol., Dept. Med., Sch. Med., Univ. Louisville, Ky.] Spanish summary.

Vitamin B₁₂ was estimated in blood serum with *Euglena gracilis* according to the technique of Ross (Abst. 386, Vol. 23). The ranges and mean values in $\mu\mu\text{g. per ml.}$ were for 22 normal subjects from 86 to 460 and 184, for 18 patients with chronic lymphatic leukaemia from 40 to 540 and 209, for 12 with chronic myeloid leukaemia from 540 to 6500 and 2732, and for 7 with acute leukaemia from 216 to 1000 and 599. In the patients with chronic myeloid leukaemia there was a correlation between the total white cell count and the vitamin B₁₂ concentration in the serum, and the serum had increased capacity to bind vitamin B₁₂. Electrophoresis of the sera showed that vitamin B₁₂ was bound in the α -globulin fraction. The possibility that the high vitamin B₁₂ concentration in serum from chronic myeloid leukaemia might be the result of decreased erythroid activity is discussed. The vitamin B₁₂ content of the serum in chronic lymphatic leukaemia appeared to be normal; the values in acute leukaemia were variable but above normal.—A. M. Copping.

1228

BEARD, M. F., PITNEY, W. R., SANNEMAN, E. H., SAKOL, M. J. and MOOREHEAD, H. H. Serum

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concentrations of vitamin B₁₂ in acute leukemia. *Ann. Int. Med.*, 1954, 41, 323-327. [Louisville, Ky.]

Vitamin B₁₂ estimated with *Euglena gracilis* in serum from 20 patients with acute leukaemia ranged from 116 to 9200 $\mu\text{g.}$ per ml. In the 11 patients with acute lymphocytic leukaemia the values fell within the normal range; in the 3 with monocytic leukaemia the values were only moderately increased; in the 6 with acute myelocytic leukaemia very high values were obtained. There was no correlation between white cell count and serum concentration of vitamin B₁₂. No successful treatment was achieved for the patients with acute myelocytic leukaemia, so it was not possible to assess the effect of treatment on the value for vitamin B₁₂ in the serum.—A. M. Copping.

1229

DAUR, W. Vitamin B₁₂ in der Therapie der Poliomyelitis. [Vitamin B₁₂ in treatment of poliomyelitis.] *Münch. med. Wochenschr.*, 1954, 96, 729-730. [Inn. Abt., Städt. Krankenhaus, Ravensburg.]

Injection of 3 doses of 30 $\mu\text{g.}$ vitamin B₁₂ as Rubivitan Bayer given to 34 patients with acute poliomyelitis prevented the onset of paralysis in 26 treated in the early stages, and allowed rapid general improvement in 8 with severe paresis or paralysis. The treatment appeared to have a beneficial effect on muscle tone and on neuro-muscular signs. In one patient a disturbed sleep rhythm was restored to normal shortly after injection of vitamin B₁₂. The possible mode of action of the vitamin is discussed with reference to its role in cell metabolism.—A. M. Copping.

1230

ALEXANDER, W. F. Neuropathology in vitamin B₁₂ deficiency. *Nat. Vitamin Found., Inc.*, N.Y., *Nutrit. Symposium Ser.* No. 7, 1953, 47-65. [Univ. Saint Louis Sch. Med., Mo.]

1231

SAUER, H. and DÜSSLER, A. Über das Krankheitsbild der diabetischen Polyneuritis und seine Behandlung mit Vitamin B₁₂. [Signs and symptoms of diabetic polyneuritis and its treatment with vitamin B₁₂.] *Deutsch. med. Wochenschr.*, 1954, 79, 1046-1048. [I. Med. Klin., Univ. Hamburg, Eppendorf.]

After a brief review of the literature a report is given of the results of treatment of 18 diabetic patients with polyneuritis. After a period in which saline solution only was injected, the patients received from 30 to 60 $\mu\text{g.}$ vitamin B₁₂ by intramuscular injection daily for from 1 to 2 weeks; 15 patients showed improvement but in 3 the condition was unchanged, in 2 even after

higher doses of the vitamin. Paraesthesia, hyperaesthesia, hyperalgesia and burning of the feet all decreased but absent reflexes, reduced sensitivity to touch and pain, and abnormal vegetative functioning were not affected. The possible mode of action of vitamin B₁₂ in the condition is discussed.—L. Wills.

1232

SHUMAN, C. R. and GILPIN, S. F. Diabetic neuropathy: controlled therapeutic trials. *Amer. J. Med. Sci.*, 1954, 227, 612-617. [Hosp., Temple Univ., Philadelphia, Pa.]

Control of their diabetes by adequate treatment, including a high-protein diet, produced improvement or complete disappearance of nerve symptoms in 12 of 37 patients studied. The remaining 25, while continuing on the same diet, were given alone or in various combinations vitamin B₁₂ in daily intramuscular doses up to 1000 $\mu\text{g.}$, vitamin B complex, extract of pregnant mammalian liver or adenosine triphosphate with vitamin B₁ or pantothenic acid in adequate doses. Subjective improvement occurred in some of the patients, but in none was there any change in the objective signs.—L. Wills.

1233

LARCOMB, J. W., PERRY, C. S. and PETERMAN, R. A. Dietary supplementation of vitamin B₁₂ in prepuberty school-age children. 1. Growth studies. *J. Pediat.*, 1954, 45, 70-74. [Dept. Paediat., Coll. Med., Ohio State Univ., Columbus.]

From 500 children initially selected in schools for deaf and blind children, 132 were observed for a whole school year. Sixty of them received 20 $\mu\text{g.}$ vitamin B₁₂ daily and 72 had an inactive tablet. The treatment had no effect on the height or weight of normal children but caused a significant increase in the weight of children who were underweight at the beginning of the study. In children who were overweight vitamin B₁₂ appeared to accelerate growth in height.—A. M. Copping.

1234

JOLLIFFE, N., FUNARO, R., FRONTALI, G., MAGGIONI, G., CORBO, S. and LANCIANO, G. Vitamin B₁₂ as a growth factor in Italian children on diets low in animal protein. *Nat. Vitamin Found., Inc.*, N.Y., *Nutrit. Symposium Ser.* No. 7, 1953, 119-132. [Paediat. Clin., Rome.]

The effect of adding vitamin B₁₂ to a diet providing from 20 to 30 per cent. less energy, and from 15 to 40 per cent. less protein, than the allowances recommended by the National Research Council (U.S.) was studied in children at an orphanage in Rome and at an elementary school in a depressed

area at Gaeta. In all, 351 children aged from 6 to 12 years were treated for 7 months. Significant increase in weight gain was associated with administration of vitamin B₁₂, but no difference in gain of height was seen between treated and untreated children. The observations are being continued.—A. M. Copping.

1235

SCRIMSHAW, N. S. and GUZMÁN, M. A. The effect of dietary supplementation and the administration of vitamin B₁₂ and aureomycin on the growth of school children. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 7, 1953, 101-117.* [Inst. Nutrit. Central America and Panama, Guatemala.]

See Abst. 2361, Vol. 24.

1236

CHOW, B. F. The interrelationship between vitamin B₁₂, steroids and protein metabolism. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 8, 1954, 14-25.* [Sch. Hyg. Pub. Health, Johns Hopkins Univ., Baltimore, Md.]

The paper is partly a review and partly a preliminary report of results in the press. It sums up the present knowledge of the part played by vitamin B₁₂ in the metabolism of protein, fat and carbohydrate, and suggests a probable relation of the vitamin to adrenal function.

Observations on diabetic subjects showed that those with retinitis retained less of an injected dose of vitamin B₁₂ than those without. The effect was possibly related to adrenal abnormality, since patients with diabetic retinopathy excreted more free cortisone than normal subjects. The excretion of steroid substances was investigated in response to testosterone and in relation to retention of injected vitamin B₁₂.—A. M. Copping.

1237

KAYE, R., CAUGHEY, R. H. and McCRODY, W. W. (with MURPHY, D. V.) Effects of vitamin B₁₂ and aureomycin on nitrogen retention in infants. *Pediatrics, 1954, 13, 462-475.* [Child Hosp., Philadelphia, Pa.] Spanish summary.

Nitrogen balance studies were made with 3 infants given a liquid diet containing 3.6 per cent. protein, and 3 having only 0.4 per cent. protein. After a preliminary period of from 4 to 6 days, from 30 to 300 µg. vitamin B₁₂ were given for 5 or 6 days, and 2 subjects subsequently received both vitamin B₁₂ and aureomycin. There was no clear evidence that addition of vitamin B₁₂ to a diet of high or low protein content altered nitrogen metabolism. In the infants having low-protein diets nitrogen retention increased slightly when vitamin B₁₂ was given but decreased in those with a high-protein intake. Neither vitamin B₁₂

nor aureomycin had any significant effect on weight gain. Some stimulation of appetite was seen in 2 infants. All subjects remained in positive balance for Na, K and Cl throughout the tests. The diet with 0.4 per cent. protein, which provided about 0.1 g. per kg. bodyweight daily from cow's milk, was apparently close to the minimum nitrogen intake for maintaining equilibrium in infants in the conditions of the study.

A. M. Copping.

Vitamin C

1238

LORENZ, A. J. The conquest of scurvy. *J. Amer. Dietetic Assoc., 1954, 30, 665-670.* [Dept. Nutrit. Res., Sunkist Growers, Los Angeles.]

1239

SNOW, I. Pediatrics at the turn of the century. Eye symptoms of infantile scurvy. *Arch. Pediat., 1954, 71, 153-157.* [Buffalo.]

1240

GORTEN, M. K. and BRADLEY, J. E. The treatment of nutritional anemia in infancy and childhood with oral iron and ascorbic acid. *J. Pediat., 1954, 45, 1-12.* [Sch. Med., Univ. Maryland, Baltimore.]

Two groups of 10 children aged between 8 and 29 months were given a mixture of ferric ammonium citrate, folic acid and vitamin B₁₂; the second received, in addition, amounts of between 500 and 750 mg. ascorbic acid daily. In every child the initial Hb value was below 7 g. per 100 ml. blood. Full haematological investigations were made, with statistical evaluation of the results.

For the groups in order, the average lengths of treatment were 21 and 17 days, and the mean initial Hb values 5.1 and 4.2 g. per 100 ml. blood. The average times taken for the means to reach 11 g. were 29 and 21 days, and mean increases in reticulocyte counts were 11.0 and 23.6 per cent.

It is concluded that with 20 mg. Fe per kg. bodyweight daily the rate of improvement can be bettered if the dose is supplemented with between 500 and 800 [as stated] mg. ascorbic acid daily, and that treatment lasting between 14 and 17 days should suffice to produce good recovery.

D. Harvey.

1241

VORONIN, P. F. Zavisimost' katalaznoi aktivnosti krovi ot obespechnosti organizma vitaminom C. [Dependence of the catalase activity of blood on the supply of vitamin C to the organism.] *Biokhimiya, 1953, 18, 279-283.*

Observations were made of the relation in human blood between ascorbic acid and catalase activity. A study was made also of the seasonal

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variation in the catalase content of blood, and of changes in the catalase activity of the blood of adults transferred from the southern and northern regions of the U.S.S.R. to the Polar regions. A definite and not an accidental link was shown to exist between the two values. The effect of ascorbic acid on catalase depended on the original ascorbic acid state of the organism. Blood catalase activity was subject to seasonal variations. There was a definite change in the catalase activity of the blood of people being acclimatised from their native regions to Polar conditions. People from the south had originally a higher value for ascorbic acid in the blood and correspondingly a higher catalase activity. After a certain time in the Polar regions the ascorbic acid content of the blood of the southern people decreased while that of the northern people increased, and there was a corresponding decrease and increase in catalase activity. After 6 months in the Polar regions, ascorbic acid and catalase activity increased again in the blood of the people from the south.

W. Hughes.

1242

LEBLANC, J., STEWART, M., MARIER, G. and WHILLANS, M. G. Studies on acclimatization and on the effect of ascorbic acid in men exposed to cold. *Canad. J. Biochem. Physiol.* 1954, 32, 407-427. [Defence Res. Med. Labs., Toronto, Ont.]

Twelve airmen were confined in a room maintained at $59^{\circ} \pm 1^{\circ}$ F. for 11 days after an initial period at $79^{\circ} \pm 1^{\circ}$ F. A survival diet of jelly candy was given supplying 550 Cal. daily. Six received 525 mg., and six 25 mg., ascorbic acid daily. A daily record was made of weight, B.M.R., rectal and skin temperature, erythrocyte, leucocyte and eosinophil counts, water consumption, and volume and composition of urine.

The group which received the larger amount of ascorbic acid had a higher skin temperature, a higher eosinophil count and less discomfort from the cold than the others. The mean B.M.R. measured in bed varied widely in the low-vitamin C group and fell in the high-vitamin C group to a level significantly below that in the low-vitamin C group. The small excretion of 17-ketosteroids in both groups was referred to the reduced activity of the adrenal glands on a protein-free diet. At the end of the experiment pain in the feet also was less in the high-vitamin C group. After 5 days in the cold both groups showed a significant increase in skin temperature though the body temperature was unaffected. Diuresis was greatly reduced. Leucocyte and erythrocyte values rose at first but returned to normal and remained steady; during the last days of the experiment the subjects felt warmer and shivered less. The facts suggested definite acclimatisation to cold.

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A similar experiment was performed with the same two supplements of ascorbic acid and a normal diet supplying 3400 Cal. daily. Oxygen consumption rose in the cold. There was an average daily weight gain of 80 g. compared with a loss of 340 g. in the first experiment. On the assumption that loss of 1 g. weight represents 6.6 Cal., with a diet of 3400 Cal. value and a weight gain of 80 g. daily, the true requirement of the men was calculated to be 2870 Cal., and from a loss of weight of 340 g. daily with a diet giving only 550 Cal. the true requirement would be 2800 Cal. Further, if the oxygen consumption rose by 15 per cent. in the cold, the extra heat produced to compensate for a drop in external temperature from 80° to 60° F. was estimated to be 400 Cal. daily; the normal requirement of men in sedentary occupation at 80° F. would then be about 2400 Cal. No significant difference was found between subjects given much or little ascorbic acid. Signs of acclimatisation to cold such as were observed in the first experiment were not seen, but an increase in excretion of 17-ketosteroids suggested that there was some adaptation of the adrenal cortex.—A. Hepburn.

1243

ROSENBERGER, P. Prophylaxe und Frühbehandlung von Grippe und Erkältungskrankheiten in einem Industrieunternehmen während der letzten Jahre. [Prevention and early treatment of influenza and colds in a factory in recent years.] *Deutsch. med. Wochenschr.*, 1954, 79, 1230-1231. [Steubenstrasse 7, Düsseldorf, Reisholz.]

In the 3 weeks reckoned critical for risk of an influenza epidemic, an industrial concern employing 3000 people distributed to them between 50,000 and 60,000 tablets of Aspicorbin (Bayer) containing aspirin 0.1 g., phenacetin 0.1 g., ascorbic acid 0.05 g. and quinine hydrochloride 0.01 g. The workers were instructed to take 1 tablet three times daily, or 2 three times daily if they felt symptoms of infection. Figures obtained from the *Krankenkasse* of the works showed a percentage sickness for the workers in January to March 1951 of from 5.5 to 6.8, compared with from 10 to 13 in neighbouring works, and in 1952 of from 4.4 to 5.5 compared with from 7 to 9. In 1953 the difference was less, other works also having given prophylactic treatment. The duration of illness too was diminished.—E. M. Hume.

1244

CASS, L. J., FREDERIK, W. S. and COHEN, J. D. Chronic disease and vitamin C. *Geriatrics*, 1954, 9, 375-380. [Dept. Hyg., Med. Sch., Harvard Univ.]

In the Long Island hospital for chronic disease,

Boston, a study was made for 5 months of 140 elderly patients, including 39 with arthritis, 25 with diabetes and 12 with multiple sclerosis. The average daily vitamin C intake from the usual hospital diet was 59 mg. and from the diabetic diet 109 mg. The effect of orange juice, ascorbic acid and aspirin on blood vitamin C was studied with 3 similar groups of the patients. Vitamin C was estimated in whole blood, plasma and the white cell layer [method not stated]. Results for eosinophil count, blood sedimentation rate and cholesterol content also are tabulated for the 3 groups during the different treatments. Mean values for those with diabetes and arthritis, and others are tabulated also.

Orange juice and ascorbic acid raised the blood vitamin C value. Aspirin did not reduce it. Large amounts of vitamin C promoted wellbeing in patients with arthritis and multiple sclerosis.

F. C. Aitken.

1245

STRANGWAY, W. E. and STRANGWAY, A. K. Deficiência de ácido ascórbico na doença africana "onyalai". [Deficiency of ascorbic acid in the African disease onyalai.] *An. Inst. Med. trop.*, 1953, 10, 1185-1190. *Proc. English summary.*

1246

ARENDT, E. C. and PATTEE, C. J. Effect of ascorbic acid on insulin-glucose tolerance and lactic-pyruvic acid ratio in obesity. *J. Clin. Endocrinol.*, 1954, 14, 836-837. *Proc. [Queen Mary Veterans Hosp., Montreal.]*

1247

BAUR, H. and STAUB, H. Hepatitistherapie mit Ascorbinsäureinfusionen. [Treatment of hepatitis with transfusions of ascorbic acid.] *Schweiz. med. Wochenschr.*, 1954, 84, 595-597. [Med. Klin., Univ. Basle.] English summary.

Ascorbic acid is considered to have a specific action against viruses. Patients with infective hepatitis were kept in bed with a certain basic treatment. Eleven of them were given for 5 days a daily intravenous transfusion of 1 litre physiological saline containing 10 g. ascorbic acid. The results were compared with those for groups of patients, 195 in all, given 7 other treatments in vogue from 1947 to 1953. The serum bilirubin value fell, and patients were able to leave hospital, more quickly with the ascorbic acid treatment than with any other. Promotion of diuresis and tests for liver function gave very favourable results.—E. M. Hume.

1248

GSELL, O. and KALT, F. Hochdosierte Ascorbinsäurebehandlung der epidemischen Polio-

myelitis. [Treatment of epidemic poliomyelitis with large amounts of ascorbic acid.] *Schweiz. med. Wochenschr.*, 1954, 84, 661-666. [Med. Poliklin., Univ. Basle.]

In view of statements in the literature that ascorbic acid could inactivate the poliomyelitis virus *in vitro* the effect of daily doses of from 0.02 to 0.5 g. per kg. bodyweight was investigated in 125 patients. The treatment was commenced by the third day of illness in 43, by the seventh day in 63, and later in 19, but there was no significant effect on paralysis or mortality rate in comparison with the rates during the previous 15 years. The recovery from paralysis was not influenced by treatment with daily doses of from 5 to 25 g. ascorbic acid as Redoxon.—A. M. Copping.

1249

KÜRTI, V. and HEJNÝ, J. Príspevok k štúdiu vzťahu kyseliny askorbovej ku kyselino para-aminosalicyclovej. [Relation of ascorbic acid to p-aminosalicylic acid.] *Čas. Lék. čes.*, 1954, 93, 251-253. [Lab. Dept. Tuberculosis, Vyšné Hágy.] Russian summary.

Other Vitamins

1250

PLUM, P., DAM, H., DYGGVE, H. and LARSEN, E. H. Administration of vitamin K ante partum. Prophylaxis against haemorrhagic disease of the newborn. *Danish Med. Bull.*, 1954, 1, 21-23. [Dept. Paediat., Rigshosp. Univ., Copenhagen.]

From a short review of the literature, it is concluded that vitamin K should be given as a routine to all mothers just before or during labour. The dosage recommended is 40 mg. of the dicalcium salt of 2-methyl-1:4-naphthohydroquinone diphosphoric ester (Synkavit) given orally from 48 to 4 hr. before delivery, or 10 mg. of the tetrasodium salt of the same compound given intravenously up to 30 min. before delivery. If the mother has received no treatment, the infant should be given from 5 to 10 mg. by intramuscular injection immediately after birth.—E. M. Hume.

1251

PIGEAUD, H., NELKEN, S. and BOHE, H. Taux de prothrombine chez le nouveau-né après injection intra-veineuse chez la mère de vitamine K synthétique au cours de l'accouchement. [Prothrombin value in the newborn infant after intravenous injection of synthetic vitamin K into the mother during labour.] *Presse méd.*, 1954, 62, 1123. [Lyons.]

Prothrombin values in 35 infants whose mothers had been given injections of vitamin K during labour ranged from 39 to 105 per cent. of normal. Average values for infants grouped according to

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the time between injection and birth were 70, 73 and 74, which approximated closely to the accepted average of 75 per cent. for newborn infants of untreated mothers.—F. C. Aitken.

DENTAL DISEASES

1252

NEVIN, R. B. The diet and mastication; their effects on diffusion and on the inception of dental caries. Progress Printing Co. Ltd., Dunedin, N.Z., 1954, pp. 43.

Measurements were made of the diffusion rates of lactic and hydrochloric acids from between glass rods spaced at 0.08 and 0.15 mm. and immersed in buffer solutions and saliva. Movement of glass slides and of closely adapted areas of impression compound simulated mastication and obstruction of the spaces between rods by measured amounts of filter paper simulated the presence of food debris. The experiments indicated that the properties of food alone or mixed with saliva should be evaluated in terms of permeability, adhesiveness, buffer capacity, acidity, and "packing quality". Sugar content and sugar-forming potentialities are also important, but changes in physical properties may be more important than variations in sugar content. Sugar solutions are much less dangerous than sugar incorporated in sticky foods. Inception and development of caries may result from steep gradients in concentrations of sugar and acids in narrow spaces rather than from high concentrations of sugar. In fissures and interproximal areas, caries may be a relatively continuous but fluctuating process; caries of exposed surfaces is intermittent and requires greater sugar concentrations. Local variations in caries incidence are controlled largely by the amount of food debris retained. This is determined by the shape, size and position of the teeth and degree of muscular activity.

R. B. Nevin (New Zealand).

1253

NEVIN, R. B. Experimental observations on the diet and oral hygiene in relation to dental caries. Progress Printing Co. Ltd., Dunedin, N.Z., 1954, pp. 15.

The effects of a mixture of biscuit and saliva on the rate of diffusion of lactic acid from between closely spaced glass rods support the conclusion that changes in the physical properties of food may have a greater effect on caries incidence than have variations in sugar content. Tooth-brushing experiments conducted similarly show that only when there is no restriction to interchange of fluids can the toothbrush effectively free the narrow spaces from sugar and acids. These experiments, and others made with a lower partial denture equipped with removable crowns of natural teeth in correct approximal relation, showed that

sticky foodstuffs are not easily dislodged from narrow spaces even by very vigorous brushing. Insufficient or inefficient brushing tended to force such material further into the space. Impacted or adherent debris may result in prolonged retention of sugar and acids in narrow spaces even when some tooth-brushing is undertaken. Spacing of teeth is important in food retention: slight spacing may have a greater locking effect than tight contact. Beyond a certain critical degree of spacing clearance of debris becomes efficient but further evaluation of toothbrush techniques and their effectiveness is necessary with special reference to different age groups. Suggested intra-oral methods include dentures with removable and adjustable crowns of natural teeth, and the use of 2-part inlays in which the interproximal contact area forms a wedged slide, movable mesiodistally in the main cemented part, and locked by a screw or small wedge.

R. B. Nevin (New Zealand).

1254

STACK, M. V. The independence of caries experience and salivary tryptophane content. *J. Dent. Res.*, 1954, 33, 316-320. [Dept. Dent. Med., Guy's Hosp., London.]

Rate of flow was measured and tryptophan content estimated in samples of saliva obtained from 34 school children and 56 students, who were taken as normal subjects, and from 55 outpatients at a dental hospital. For the outpatients additional information was available on DMF rates and on susceptibility to caries as measured by lactobacillus counts, buffer capacity measurements and modified Fosdick tests (Dewar, *Thesis, London Univ.*, 1953) made on their saliva.

The mean value for tryptophan for the outpatients, 22 $\mu\text{g.}$ per litre, did not differ from the means for the control groups, each 23 $\mu\text{g.}$ per litre. When the data for all subjects were arranged in class intervals of 5 $\mu\text{g.}$ their frequency distribution was abnormal with 39 and 38 subjects, respectively, in the 16 to 20 and 26 to 30 $\mu\text{g.}$ groups and only 23 subjects in the central, 21 to 25 $\mu\text{g.}$, group.

In the group of patients no correlation was found to exist between DMF rates and salivary tryptophan content.—D. Harvey.

1255

SUHER, T., DICKSON, J. P. and HADJIMARKOS, D. M. Caries experience among institutionalized children in the Pacific Northwest. *J. Dent. Res.*, 1954, 33, 552-557. [Dept. Paedodont., Dent. Sch., Univ. Oregon, Portland.]

The incidence of caries was studied in 327 children of between 6 and 14 years of age who were resident in 4 institutions for 9 months in the year. Two institutions were for deaf and one for blind children; the fourth took normal Indian children.

DMF rates for teeth and surfaces are tabulated for each year of age; they ranged from 2.06 and 3.50, respectively, at 6 to 14-95 and 27.30 at 14 years. Comparison is made with findings by Klein and Palmer with schoolchildren in "On the Epidemiology of Dental Caries", 1941, Univ. Pennsylvania Press and with the earlier data of the Oregon workers (Absts. 996, Vol. 20 and 2396, Vol. 24) for children in an institution and in public schools.

The high incidence of caries found in the present investigation does not support the view that children living under institution conditions are affected by caries to a less extent than is the general school population.—D. Harvey.

1256

PIERANGELI, R. E. and DE NARANJO, C. G. El porcentaje de alimentos protectores sobre el valor calorico total de la dieta y la incidencia de caries en los adultos. [Percentage from protective foods of total energy value of the diet and incidence of caries in adults.] *Rev. Assoc. argent. Dietologia*, 1953, 11, 139-142.

For this study the total quantities of food consumed by 50 students during one week were measured and the percentages of total energy derived from protective foods were calculated and correlated with the incidence of caries. The highest incidence of caries occurred when the proportion from protective foods was less than 40 per cent. of the total; the incidence was smaller when the percentage was over 50, and still less when over 60. The action of the protective foods was modified somewhat by the proportion of carbohydrates in the diet. The inhibiting effect on the incidence of caries increased when carbohydrates provided less than 50 per cent. of the total energy value, and diminished when the percentage was over 50. With equal intake of carbohydrates the incidence of caries was less with increased intake of protective foods.—M. B. Richards.

1257

PORTER, K. O. and WOODS, E. Dental caries prevalence in children 15 and 16 years of age in three Idaho communities. *J. Dent. Res.*, 1954, 33, 542-551. [Dept. Home Econ. Res., Univ. Idaho, Moscow.]

A study was made of 215 children in 3 Idaho communities with different amounts of F in their drinking waters; Coeur d'Alene, none; Boise 0.5; Nampa 1.5 p.p.m. DMF rates were recorded by both clinical and X-ray examination. The incidence of caries was noticeably greater in Coeur d'Alene than in the two other towns, its rate of 16.7 DMF teeth being higher than any recorded from elsewhere for comparable children. Comparison of Boise with Nampa children showed that the rate in Nampa was 26 per cent. below that in

Boise, but the difference was not statistically significant.

Data on rainfall and knowledge of type of vegetation linked high rainfall and leaching of soil carrying forest vegetation at Coeur d'Alene with lower Ca, Mg, Fe and F levels in the drinking water than were found at Boise and Nampa with low rainfall, little leaching and desert shrub vegetation. Further studies are needed to establish the relationship between caries susceptibility and the mineral constituents of soil and drinking water.

X-ray examinations are concluded to be unnecessary for school survey work.—D. Harvey.

1258

SYRIST, A. and KARLSEN, K. A five-year report on the effect of topical applications of sodium fluoride on dental caries experience. *Brit. Dent. J.*, 1954, 97, 1-6. [Dept. Paedodont., State Dent. Sch., Malmö.]

Work with 116 volunteer children was started in 1947 and, over 2 years and at intervals of 3 to 4 months, they were given 7 applications of a 2 per cent. solution of sodium fluoride to their incisors, canines and premolars in one quadrant. Untreated quadrants in the same children were controls. Ninety-one children returned for subsequent study at yearly intervals for 3 years. All examinations were made by one observer and decayed and filled surfaces, DF rates, were recorded.

The percentages of DF surfaces in treated and untreated quadrants, respectively, were, before treatment 5.38, 5.44; after 2 years' treatment 9.10, 12.48; in the first post-treatment year 14.26, 17.69; in the second 17.04, 21.69; and in the third 22.81, 27.34. The total number of non-carious surfaces at risk was the same, 1705, in both quadrants at the beginning of the experiment; at the end of the treatment period there had appeared 67 new DF surfaces in the treated and 127 in the untreated group; over the 3 post-treatment years corresponding numbers were 247 and 268. The difference between the mean value for new DF surfaces per child for control and treated quadrants, i.e., the average reduction in DF surfaces per child resulting from treatment, was 0.65 in the treatment period; it was significant. In the 3-year period after treatment it was 0.23 and was not significant. For the whole 5 years it was 0.9 DF surface per child and was highly significant.

The data are thought not to be sufficiently complete for an assessment to be made of the value, as a routine public health measure, of topical applications of a solution of NaF to the teeth.—D. Harvey.

1259

CLARKE, J. H. C. The value of fluoridation of domestic water supplies in prevention of dental
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caries and dental sepsis. *Med. Officer*, 1954, 92, 39-43. [Kesteven, Lincs.]

Samples of water from the Kesteven district were found to have F contents ranging from 0 to 4 p.p.m. Schools were selected in widely separated villages where the amounts were 0, 0.2, 0.7 and 2.5 p.p.m. and in them records were made by a single observer of the DMF rates for those pupils who had resided in the district for the whole of their lives.

For each of 9 age groups the average tended to vary inversely with the F content of the water; for all age groups the average rates in ascending order of F content were 8.14, 8.00, 6.18 and 3.15. Corresponding data for average number of teeth missing per child were 1.57, 1.31, 1.61 and 0.44 and for percentage of children with relatively sound dentition, i.e., 0 to 2 DMF, 3, 5, 17 and 42 per cent. At the schools with the highest F content in drinking water cavities were smallest and caries appeared to be least active.

The subject is discussed and the officially recommended rate of fluoridation, 1.2 to 1.5 p.p.m., is, from the Kesteven evidence, concluded to be a safe one.—D. Harvey.

1260

NEILL, A. H. Aspectos técnicos de la fluoruración. [Technical aspects of adding fluoride to water.] *Bol. Ofic. sanit. panamer.*, 1954, 36, 181-189. [Serv. Sanid. Pub. U.S.A.] English summary.

1261

McCAULEY, H. B. and McCLURE, F. J. Effect of fluoride in drinking water on the osseous development of the hand and wrist in children. *Pub. Health Rep., Washington*, 1954, 69, 671-683.

Three groups of children, aged 7 to 14 years, 591 at Amarillo and 690 at Lubbock in Texas and 769 at Cumberland in Maryland, were examined. The Texas children had had drinking water with about 4 p.p.m. F and, at Amarillo, sometimes as much as 6.2 p.p.m., those in Maryland water with a low level of F, 0.12 p.p.m. at the time of the study. Ossification ratios as described by Carter (*J. Educat. Psychol.*, 1926, 17, 237) and skeletal age by the Todd standard were measured. The data are tabulated according to chronological age, the F content of the water and the degree of mottling of enamel seen at Amarillo and Lubbock and are compared with those reported by Flory (*Abst. 3602*, Vol. 7) for normal U.S. children.

No evidence was obtained to indicate that a level of F between 3.5 and 6.2 p.p.m. in drinking water has any adverse effect on the growth of carpal bones or causes any alteration in the difference in rate of skeletal maturation known to exist between boys and girls. The conclusion is that

controlled fluoridation of public water supplies at the rate of about 1 p.p.m. F is safe as a measure for the reduction of tooth decay.—D. Harvey.

See also Absts. 1192, 1262.

POISONS: PATHOGENIC ORGANISMS: FOOD LAWS

1262

KREPKOGORSKII, L. N. K probleme flyuoroz. [Contribution to the problem of fluorosis.] *Gigiena Sanit.*, 1953, No. 11, 7-10. [Kazakh. Inst. Epidemiol.]

A survey was made of the fluoride content of drinking water and of fluorosis in schoolchildren in a number of localities in certain regions of Kazakhstan. The fluoride contents of the water samples varied from 1 to 3 mg. per litre and in one case reached a value between 7 and 10 mg. per litre. Children with a mild degree of fluorosis of the teeth had a lower percentage incidence of caries than those with no evidence of fluorosis, but caries was most common in the group with the most severe degree of fluorosis. Populations drinking the same water throughout sometimes showed a higher incidence of dental fluorosis than those using more than one water supply, although these latter might at times be consuming water with a very high fluoride content.—D. W. Taylor.

1263

HAMAMOTO, E., FUJIWARA, H., KIMOTO, H., FURUTANI, A., YOSHIMATSU, M., ODA, N., OHARA, T. and ANDO, H. On bone changes observed in residents of high fluorine zone. *Proc. Japan Acad.*, 1954, 30, 53-60. [Dept. Paediat., Med. Sch., Univ. Okayama.]

In 1952-53 examination was made of 247 inhabitants of Odani village in Okayama prefecture. In 25, signs and symptoms referable to the joints were found, and X-ray examination showed the bone changes to be extensive and characteristic of fluorine poisoning. In 10 of the 25, estimation of 17-ketosteroids in the urine gave a mean value of 6.9 mg. in the 24 hr. for men and 4.5 for women; the corresponding values for normal subjects were 12.5 and 9.6. The cases all occurred on farms using water from wells containing from 6 to 13 p.p.m. F. Water from other neighbouring wells, with which fluorosis was not associated, contained from 0 to 2 p.p.m.—E. M. Hume.

1264

FONSECA, F., MARQUES DA GAMA, M., CORREIA MENDES, A. and GUERREIRO, J. P. Favismo. [Favism.] *An. Inst. Med. trop.*, 1953, 10, 1655-1661. *Proc.*

1265

GHOSHAL, R. Lathyrism. *Calcutta Med. J.*, 1954, 51, 191-204.

See also Absts. 127, 247, 279.

THERAPEUTIC AND PREVENTIVE DIETETICS

GENERAL

1266

POLLACK, H. Amino acids and protein in therapy. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 8*, 1954, 91-103. [Mount Sinai Hosp., New York.]

Changes in N metabolism in disease and after injury are discussed and conditions affecting the patient's protein requirement are outlined. It is important to assure an adequate intake of energy as well as of protein. It is pointed out that the allowances recommended by the U.S. National Research Council for normal persons are not intended to meet the requirements created by pathological states or the demands during nutritional rehabilitation. Yet many hospital therapeutic diets do not supply these recommended allowances. In support of this contention the nutritive value of New York hospital diets are quoted.

The use of preparations of milk solids in high-protein diets and of protein hydrolysates or amino-acid mixtures in intravenous feeds is briefly described.—F. C. Aitken.

1267

SCHLEGEL, J. U. A new approach to the treatment of electrolyte disturbances in shock and severe stress. *Surgery*, 1954, 35, 449-459. [Sch. Med. Dent., Univ. Rochester, N.Y.]

In the treatment of sodium retention in shock and severe stress a distinction is drawn between physiological and pathological retention, and an indirect method of establishing the type of retention is described. The method requires the measurement of fluctuations of urine pH, for which a suitable pH meter is described and illustrated.

F. C. Aitken.

1268

O'BRIEN, J. R. Is liver a "tonic"? A short study of injecting placebos. *Brit. Med. J.*, 1954, ii, 136-137.

Four groups of non-anaemic patients, 86 in all, were given injections totalling 227 of a liver extract, vitamin B₁₂ or normal saline. From their replies to questions put in standardised form on their general wellbeing, energy, appetite and sleeping it is concluded that they were unable to distinguish between the injections. The suggestibility of the patient was important and women were more suggestible than men.—D. Harvey.

DIABETES

1269

ROOTH, G. The mortality in diabetes mellitus in some European countries 1935-1949. *Acta*

med. scand., 1954, 149, 65-74. [Med. Dept., Univ. Hosp., Lund.]

1270

HARTMANN, A. F. (Sr.), WOHLTMANN, H. J. and HARTMANN, A. F. (Jr.) Dietary fructose in children with diabetes mellitus. *J. Pediat.*, 1954, 45, 27-50. [Dept. Paediat., Sch. Med., Washington Univ., St. Louis, Mo.]

The diets of 5 children were varied so that the sugar supplying 25 per cent. of the total energy was sometimes fructose, sometimes sucrose and at other times glucose. In 4 of the children insulin requirement remained constant despite the changes in diet. In the fifth child a seeming insulin-sparing effect of fructose was attributed to spontaneous improvement of tolerance.—F. C. Aitken.

1271

LESTRADET, H. and SEYNAEVE, A. Le problème du régime chez l'enfant diabétique. Effet d'une augmentation importante de l'apport hydrocarboné sur la glycosurie et les besoins insuliniques. [The dietary problem of the diabetic child. The effect of a considerable increase in carbohydrate on glycosuria and insulin requirement.] *Presse méd.*, 1954, 62, 707-709. [Inst. Nat. Hyg., Paris.]

A holiday settlement for diabetic children provided the opportunity to study, in 8 children, the effect of an abrupt change of diet on the 24 hr. excretion of sugar and on insulin requirements. The children had been on a restricted diet containing only 80 to 150 g. carbohydrate but after 5 days in the settlement the older ones were permitted to take diets containing 350 to 400 g. carbohydrate, and the younger 250 to 300 g. Increased loss of sugar such as might have been expected if the processes regulating it were really dependent on a definite "tolerance" of the organism for carbohydrates did not occur. The findings are thought to favour treatment of diabetic children with insulin only provided it is rigorously controlled, and the daily dose is based on analyses of urine made every 2 or 3 days.

M. B. Richards.

1272

LOOS, M. Studies in the utilization of pentoses in diabetics. *Acta med. scand.*, 1954, 148, 425-431. [2. Med. Clin., Univ. Hamburg, Eppendorf.]

A study of 9 normal and 63 diabetic subjects showed that there was no difference between diabetics and healthy individuals in the utilisation of xylose or in its influence on carbohydrate metabolism. In all cases there was good absorption with no disturbance, provided a single dose

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did not exceed 40 g. and the total daily intake 80 g. In no case was pentose excreted by the intestine. Urinary pentose excretion was on the average 15 per cent. in the healthy subjects and 13.5 per cent. in the diabetic. In no diabetic patient was there a deterioration of condition. Glucose was never excreted in increased amount after ingestion of xylose. When patients were given 40 g. glucose and 40 g. xylose on consecutive days nearly all showed, on the xylose day, less glucosuria and a lower excretion of β -hydroxybutyric acid. This favourable influence of xylose on the excretion of glucose and ketone may be attributable to a stimulating effect on intermediary metabolism, and the good effect of a vegetable diet in diabetes may be explained by its pentose content.—M. B. Richards.

1273

COLLENS, W. S. Regulated versus free diet in the treatment of diabetes mellitus. *J. Clin. Nutr.*, 1954, 2, 195-203. [Diabetic Clin., Maimonides Hosp., Brooklyn, N.Y.] Spanish summary.

1274

BERNHEIM, M., FRANÇOIS, R. and BIANCO, E. Traitement du diabète par le régime libre. [Treatment of diabetes by a free regime.] *Pédiatrie*, 1954, 9, 122-136. [76 Avenue de Saxe, Lyons.]

1275

GROGAN, M. V. Some results from treating diabetic patients with lente insulin. *Nutrition*, 1954, 8, 133-135. [Leeds (A) Group Hosps.]

1276

MELTON, G. Treatment with insulin zinc suspensions. *Brit. Med. J.*, 1954, ii, 448-449. [Highlands Gen. Hosp., London.]

1277

ROLLAND, C. Diabetes in pregnancy. *Edinb. Med. J.*, 1954, 61, 257-272. [Dept. Therap., Univ. Edinburgh.]
Report of Honyman Gillespie Lecture.

1278

ZETTERSTRÖM, R. Clinical observations in newborn infants of diabetic mothers. *Acta paediat.*, 1954, 43, 305 (with discussion 305-306). *Proc.*

1279

NOTHMAN, M. M. The history of the discovery of pancreatic diabetes. *Bull. Hist. Med.*, 1954, 28, 272-274.

See also Abstr. 1232.

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GASTRO-INTESTINAL CONDITIONS

1280

FRIEDRICH, L. and TIBOR, F. Le traitement dit "par placebo" de l'ulcère et les épreuves d'activité. [Treatment by placebo of ulcer and tests of activity.] *Acta gastro-enterol. belg.*, 1954, 17, 521-538. [Hôp. Koranyi, Budapest.] Dutch, English, German and Spanish summaries.

Placebo treatment was given to 188 patients, 135 men and 53 women with gastric or duodenal ulcer. In hospital they received injections of physiological saline and on discharge tablets containing a small quantity of NaHCO_3 .

In 92 patients subjective symptoms disappeared in a week, in 33 after 2 weeks and in 13 after 3 weeks; in 50 the symptoms continued. X-ray examination after a month showed that 30 gastric and 58 duodenal ulcers had disappeared and 27 gastric ulcers were smaller. The long-term results were somewhat less good; nevertheless, 25 per cent. of the patients remained symptom-free after a year.—D. Duncan.

1281

SCHMID, J. and LEONHARTSBERGER. Die Behandlung der Hyperazidität mit Kalziumsalzen von Huminsäuren als Kationenaustauscher. [Treatment of hyperacidity with calcium salts of humic acid as cation exchange agents.] *Deutsch. med. Wochenschr.*, 1954, 79, 1009-1012. [2. Med. Klin., Univ. Vienna.]

1282

LAWSON, D. The gluten-free management of coeliac disease. *Proc. Nutrition Soc.*, 1954, 13, 75-82. *Proc.* [Queen Mary's Hosp. Child., Carshalton.]

1283

RUFFIN, J. M., CARTER, D. D., JOHNSTON, D. H. and BAYLIN, G. J. "Wheat-free" diet in the treatment of sprue. *New Engl. J. Med.*, 1954, 250, 281-282. [Dept. Med., Sch. Med., Duke Univ., Durham, N.C.]

A patient with long-standing sprue in severe relapse was treated with a wheat-free diet and calcium. There was immediate and dramatic clinical improvement. After 3 months the patient had gained 43 lb. X-ray studies showed that the pattern of the small intestine had become regular. Biochemical tests showed that blood protein and serum Ca were normal and that there was improvement in absorption of vitamin A and glucose. In an addendum, remissions are reported in 2 other patients who were receiving the wheat-free diet.—F. C. Aitken.

1284

MACLEAN, L. D., PERRY, J. F., KELLY, W. D., MOSSEY, D. G., MANNICK, A. and WANGENSTEEN, O. H. Nutrition following subtotal gastrectomy of four types (Billroth I and II, segmental and tubular resections). *Surgery*, 1954, 35, 705-718. [Dept. Surg., Med. Sch., Univ. Minnesota.]

The causes of weight loss after subtotal gastrectomy were studied in a group of 35 patients, of whom 32 had lost weight. In 8 patients there was an abnormally high faecal excretion of fat. In only 3 could excessive fat loss be attributed to pancreatic insufficiency as judged by the secretion test and in only 1 of these patients was there an excessive excretion of N in faeces, characteristic of pancreatic insufficiency. Patients who lost weight claimed to be eating less food since operation.

It is suggested that treatment might more profitably be directed towards increasing energy intake than towards improving fat absorption.

F. C. Aitken.

1285

KELLY, W. D., MACLEAN, L. D., PERRY, J. F. and WANGENSTEEN, O. H. A study of patients following total and near-total gastrectomy. *Surgery*, 1954, 35, 964-982. [Dept. Surg., Med. Sch., Univ. Minnesota, Minneapolis.]

Twenty-six patients were studied 2 months to 8 years after operation. Data on weight, eating habits and gastro-intestinal signs, faecal fat and N excretion, pancreatic function, blood picture, iron tolerance, X-ray studies and oesophagitis are tabulated and discussed. In general there was loss of weight, which seemed to be due to reduced food intake. Faecal fat was increased but, on the average, by an amount insufficient to account for the loss of weight. Pancreatic function was not impaired. Megaloblastic anaemia occurred frequently in patients who survived for a long time. Impaired iron absorption and hypochromic microcytic anaemia also occurred.

A high-calorie, high-protein, high-fat diet with small and frequent meals is recommended. Anaemias respond to the appropriate treatment.

F. C. Aitken.

1286

BEAL, J. M., BRIGGS, J. D. and LONGMIRE, W. P. Use of jejunal segment to replace the stomach following total gastrectomy. *Amer. J. Surg.*, 1954, 88, 194-197 (with discussion 197-199). [Surg. Serv., Wadsworth Hosp., Veterans Admin. Centre, Los Angeles, Calif.]

The use of a jejunal implant appears to enhance the assimilation of food by the patient after total gastrectomy. The majority of the 29 patients in

this series were able to take a normal diet in multiple small feedings and the weights of most were satisfactory. The anaemia which frequently develops can usually be controlled by parenteral administration of vitamin B₁₂ and liver extract.

M. B. Richards.

1287

BARON, A. Body weight after gastrectomy. *Brit. Med. J.*, 1954, ii, 69-73. [St. George's Hosp., London, S.W.1.]

Records of bodyweight were available for 285 patients who had undergone subtotal gastrectomy, and were compared with British insurance companies' standards. Before operation more than 75 per cent. of the subjects were underweight. The group showing post-operation failure to gain weight included a high proportion of those whose pre-operation loss of weight had been greatest, 30 to 40 per cent. of standard. Loss of weight after operation was most pronounced in those whose weight before operation had been much above standard.

In 12 patients who were fed by drip with a mixture high in energy and protein from the third morning after operation loss of weight in the early post-operation period was prevented. Such feeding, especially of patients weighing less than 80 per cent. of standard, is worthy of consideration.

D. Harvey.

1288

WIESNER, H. Über die alimentäre enterogene Kollapsneigung magenresezierter Patienten. [Tendency to collapse after a meal in patients after gastrectomy.] *Ztschr. ges. inn. Med.*, 1954, 9, 252-254. [Chirurg. Klin., Städt. Krankenhaus Altstadt, Magdeburg.]

Hurry, consumption of carbohydrate and simultaneous intake of fluid are predisposing causes of collapse. To lie down gives relief. The same effect can be produced in normal subjects by giving 100 g. glucose in 250 ml. water through a stomach tube.

The condition was investigated in 7 women and 34 men who had been subjected to gastrectomy from 2½ weeks to 2 years previously. Blood pressure, pulse rate and fasting blood sugar were measured before and at frequent intervals after administration of glucose as just described. Four of the patients whose operation was most recent suffered complete circulatory collapse. Thirty-eight had a rise of pulse rate, and 14 a rise of blood pressure, but 11 had a slight fall of blood pressure. Twenty-two reported unpleasant sensations. On the whole, the more remote the operation, the less the upset. The condition occurred while the blood sugar was rising and could not be ascribed to hypoglycaemia.—E. M. Hume.

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THYROID DISEASE

1289

Grupo de estudio de la OMS sobre el bocio endémico: informe final. [Study group of the WHO on endemic goitre. Final report.] *Bol. Ofic. sanit. panamer.*, 1954, **36**, 296-303.

1290

ORTIZ DE LANDÁZURI, E., MORREALE DE CASTRO, G., ESCOBAR DEL REY, F. and MORA LARA, J. R. Valor clínico de la iodemia en las alteraciones del tiroides. [Clinical value of blood iodine in thyroid changes.]

MORREALE DE CASTRO, G., ORTIZ DE LANDÁZURI, E., MORA, J. R., ESCOBAR DEL REY, F. and ARANZANA, A. La iodemia en el bocio endémico. [Blood iodine in endemic goitre.] *Rev. clín. española*, 1954, **52**, 236-247; 247-253. [Clin. Méd., Univ. Granada.] English, German and French summaries.

The results of laboratory tests were compared with the clinical findings in 50 patients with different forms of goitre. In hyperthyroidism the estimation of protein-bound I in the blood proved valuable, since it indicated the functional state with greater sensitivity than did the B.M.R. or blood cholesterol value, although frequently all 3 tests agreed. In hypothyroidism, on the other hand, B.M.R. and blood cholesterol appeared to be more sensitive. In such cases there were frequently differences not only between clinical and laboratory findings, but also among the laboratory finding themselves. In following the results of treatment, whether surgical or with thyroxine or thiouracil, estimation of organic I proved most useful, since its variations were greater and were evident at an earlier stage than were those of the B.M.R. or blood cholesterol. The most interesting application of the method is probably in relation to thyroidectomy, since it indicates the most suitable post-operative treatment and prevents the occurrence of thyrotoxicosis, common in such patients and accompanied, paradoxically, by a fall in the organic I.

A statistical study was made in a region of endemic goitre in Granada, where the incidence of goitre was over 50 per cent. In general the goitres were small, with normal clinical function, although there were cases of hypo- and hyperthyroid syndromes. Etiologically most importance was attributed to I deficiency, since very small amounts, 0.23 to 0.25 µg. per litre, were found in the waters analysed. The values for organic I in the serum were mostly near the upper normal limit, sometimes above it. This might be interpreted as evidence of thyroid hyperactivity of pituitary origin, or of a disturbance in the biosynthesis of the hormone, whereby I compounds with no hormonal activity would enter the blood-

stream and the organic I level would not be a measure of the amount of thyroxine and triiodothyronine circulating in the blood. In the region studied a prophylactic campaign with iodised salt has been introduced.—M. B. Richards.

1291

WERNER, S. C., SPOONER, M. and HAMILTON, H. Further evidence that Graves' disease is hyperthyroidism and not hyperpituitarism: effects of triiodothyronine and sodium iodide. *J. Clin. Endocrinol.*, 1954, **14**, 768-769. *Proc. [Dept. Med., Coll. Phys. Surg., Columbia Univ., New York.]*

1292

ANDERSON, B. G. Treatment of recurrent hyperthyroidism with radioactive iodine. *Metabolism*, 1954, **3**, 297-302. [Ziskind Res. Labs., New England Centre Hosp.]

1293

SCRIMSHAW, N. S. El bocio endémico en la América Latina. [Endemic goitre in Latin America.] *Bol. Ofic. sanit. panamer.*, 1954, **36**, 277-287. [Ofic. Sanit. Panamer., Ofic. Reg. Org. Mundial Salud.] English summary.

1294

GREENWALD, I. Goiter in Uruguay and Chile. *J. Clin. Endocrinol.*, 1954, **14**, 800. *Proc. [Coll. Med., Univ. New York.]*

See also Abst. 678.

ANAEMIA

1295

GONÇALVES, F. T. Alguns dados hematológicos respeitantes às anemias hipolimentares dos habitantes de Macau. [Haematological data on the deficiency anaemias of the inhabitants of Macau.] *An. Inst. Med. trop.*, 1953, **10**, 1319-1324. *Proc. English summary.*

1296

BINGOLD, K. and STICH, W. Die Behandlung der Eisenmangelanämien. [Treatment of iron-deficiency anaemias.] *Munch. med. Wochenschr.*, 1954, **96**, 586. [I. Med. Klin., Univ. Munich.]

1297

WILKINSON, J. F. Laboratory investigation in the hyperchromic anaemias. *Brit. Med. J.*, 1954, **i**, 1370-1372. [Dept. Haematol., Royal Infirmary, Manchester.]

1298

BADENOCH, J. and CALLENDER, S. T. The use of radioactive iron in the investigation of anaemia.

Brit. J. Radiol., 1954, **27**, 381-386. [Nuffield Dept. Clin. Med., Oxford.]

The metabolism of Fe is briefly reviewed.

Two tests are described in which measured amounts of Fe labelled with ^{59}Fe are given either by mouth in an ordinary hospital mixture or intravenously in a sample of the patient's serum. The tests were made on patients in whom treatment of hypochromic anaemia with Fe by mouth had been unsuccessful. Of 18 such patients 8 were found to have idiopathic steatorrhoea.

The tests were valuable for distinguishing patients in whom there was a true failure of absorption of Fe from others in whom conditions such as intolerance of treatment, excessive loss of Fe by haemorrhage or inability to utilise Fe after absorption might account for the lack of response to treatment and for whom case histories might be lacking or misleading.—D. Harvey.

1299

WEAVER, J. A. and NEILL, D. W. **Amino-aciduria in pernicious anaemia and subacute combined degeneration of the cord.** *Lancet*, 1954, **266**, 1212-1213. [Royal Victoria Hosp., Belfast.]

The urine amino-acids were estimated by paper partition chromatography. In 5 patients with untreated pernicious anaemia and in one with subacute combined degeneration of the cord with normal blood and bone marrow findings there was abnormally high excretion of taurine associated with varying degrees of excess of lysine, cystine and leucine; treatment with vitamin B_{12} caused the pattern of excretion to return towards normal. In patients with other types of anaemia of similar degree the amino-acid pattern was found to be normal.—L. Wills.

See also Absts. 483, 598, 887.

OTHER CONDITIONS

1300

TOMPKINS, W. T. and WIEHL, D. G. **The significance of nutrition and nutritional deficiencies in pregnancy.** *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 7*, 1953, 133-155. [Nutrit. Res. Clin., Pennsylvania Hosp. (Philadelphia Lying-in Hosp.), Philadelphia.]

Data are presented graphically to show that the woman who is underweight at the onset of pregnancy has the greatest likelihood of both premature labour and toxæmia. The woman who is obese is also more likely to develop toxæmia than is the woman of normal weight; her tendency to do so is, however, not as great as that of the woman who is underweight. Low Hb values are related to the occurrence of premature labour and low serum proteins to that of toxæmia. These and other data emphasise the importance of nutrition in pregnancy.—F. C. Aitken.

1301

FERGUSON, A. W. and MCGOWAN, G. K. **Idiopathic hypercalcaemia of infants. Low-calcium treatment.** *Lancet*, 1954, **266**, 1272-1274. [Child's Hosp., Bristol.]

The basis of the low-calcium diet is cow's milk treated by passage through cation exchange resin in a simple apparatus which is described in detail, or artificial human milk prepared from low-ash casein. Four infants with hypercalcaemia were given one of the 4 treatments, resin-treated cow's milk, resin-treated human milk, artificial human milk followed by resin-treated cow's milk or artificial human milk. In each there was improvement of wellbeing, rapid gain of weight and a fall of serum Ca. Although recovery is usually spontaneous, the results seem to justify the use of such diets.

D. Harvey.

1302

CHALMERS, T. C. **Dietotherapy of acute infectious hepatitis.** *Amer. J. Med.*, 1954, **16**, 902. *Proc.* [Army Med. Serv. Grad. Med. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

1303

LATNER, A. L. **Dietetic aspects of the treatment of liver disease.** *Proc. Nutrition Soc.*, 1954, **13**, 139-144. *Proc.* [Sect. Chem. Pathol., Dept. Pathol., King's Coll., Newcastle upon Tyne.]

1304

BRAUN, G. and KÖRTGE, P. **Klinische Erfahrungen über die Leberhydrolysatbehandlung der chronischen Hepatitis und Leberzirrhose. [Clinical results of the treatment with a liver hydrolysate of chronic hepatitis and cirrhosis of the liver.]** *Gastroenterologia*, 1954, **81**, 300-318. [Med. Klin., Freie Univ., Berlin.] English and French summaries.

Treatment was controlled for up to 3½ years by laparoscopy and liver biopsy. Results were good in some patients.—I. Leitch.

1305

SJÖVALL, B. **Fettsot och dess behandling. [Obesity and its treatment.]** *Nord. Med.*, 1954, **51**, 871-874. [Lasarettet, Karlskoga, Sweden.] English summary.

Reasons are given for regarding obesity as a disease, or a complication rendering many other diseases more serious. There has been no survey of its incidence in Sweden. Among 2300 hospital patients 24 per cent. of the men and 45 per cent. of the women were overweight. The majority of such patients respond satisfactorily to restricted diet providing 800 to 1200 Cal. daily, but, out of 84 so treated in hospital, 12 (14 per cent.) responded

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very slowly or did not lose weight. Controlled tests should be made of Pennington's theory that the obese cannot oxidise pyruvic acid and that pyruvic acid interferes with the oxidation of fat, which implies a therapeutic diet of lean meat and fat (see Abst. 2440, Vol. 24).—I. Leitch.

1306

SCHREINER, B. and GOLLMANN, T. Ein neuer Weg zur Behandlung der Fettsucht. [A new method of treating obesity.] *Wien. klin. Wochenschr.*, 1954, 66, 213-214. [Med. Klin., Univ. Graz.]

In this summary of a lecture a brief account is given of the author's method of rapid weight reduction by initial treatment with ion exchange substances. After a period of great fluid loss thus induced, it was possible to give the patients a low-calorie diet with unrestricted fluid intake and to achieve satisfactory loss of fatty tissue. It is stated that the use of the ion exchange method gives much greater comfort to the obese subject during weight loss, and that it does not disturb the electrolyte balance in the blood or cause changes in the electrocardiogram.—A. M. Copping.

1307

HARVEY, H. I. and SIMMONS, W. D. Weight reduction: a study of the group method: report of progress. *Amer. J. Med. Sci.*, 1954, 227, 521-525. [Herrick Mem. Hosp., Berkeley, Calif.]

More evidence was obtained in favour of the group method of weight reduction (Abst. 1227, Vol. 24) but the permanency of the results seems doubtful. Of 188 women questioned, over one-third associated the onset of obesity with pregnancy, illness or operation. Eating between meals was a common habit, and bread a favourite food. W. M. Deans.

1308

HADORN, W. Behandlungsmöglichkeiten der Fettsucht. [Possible methods of treating obesity.] *Schweiz. med. Wochenschr.*, 1954, 84, 575-587. [Med. Klin., Univ. Berne.]

In a useful review diet control in the treatment of obesity is discussed, and recent low-energy diets, and nomograms for their application to patients of varying age, height and weight, are quoted.—A. M. Copping.

1309

BARR, D. P. Obesity: red light of health. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 6*, 1953, 90-101 (with discussion 101-105). [New York Hosp.-Cornell Med. Centre, N.Y.]

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1310

WALKER, H. C. (Jnr.). Obesity. Its complications and sequelae. *Arch. Int. Med.*, 1954, 93, 951-966. [Veterans Admin. Hosp., Med. Sch., Univ. Minnesota, Minneapolis.]

1311

EISLER, M. Revision del problema de la obesidad. [Review of the problem of obesity.] *Rev. Asoc. argent. Dietologia*, 1953, 11, 114-122.

1312

EVANS, F. A. A practical regimen for the cure of obesity. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 6*, 1953, 130-135 (with discussion 135-138). [W. Pennsylvania Hosp., Pittsburgh.]

1313

DUBLIN, L. I. Fat people who lose weight live longer. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 6*, 1953, 106-116 (with discussion 117-122). [Metropolitan Life Insurance Co., New York.]

1314

PENNINGTON, A. W. Practical reducing regimens. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 6*, 1953, 123-129. [E. I. du Pont de Nemours and Co., Wilmington, Del.]

1315

STRANGWAY, A. K. Tratamento dietético do edema num internato masculino em África. [Dietary treatment of oedema in boarding-school boys in Africa.] *An. Inst. Med. trop.*, 1953, 10, 1191-1197. *Proc. English summary.*

1316

SEIFERT, W. H. Poliomyelitis and the relation of diet to its treatment. *J. Amer. Dietetic Assoc.*, 1954, 30, 671-673. [Northwestern Univ. Med. Sch., Chicago, Ill.]

Bulbar poliomyelitis is the form requiring most careful diet treatment, since swallowing is difficult or impossible. Feeding is at first by vein, then oral feeding is introduced in 4 stages: (1) tube feeding, (2) liquid diet, (3) soft diet, (4) more solid diet. When the patient is able successfully to swallow all foods given in stage 4 he is allowed the high-calorie, high-protein, high-vitamin diet prescribed in spinal poliomyelitis.—F. C. Aitken.

1317

ROBINSON, C. H. The low purine diet. *Amer. J. Clin. Nutrit.*, 1954, 2, 276-277. [Dept. Food Nutrit., Coll. Home Econ., Drexel Inst. Technol., Philadelphia, Pa.]

In the treatment of gout exclusion of nucleoproteins from the diet cannot be expected to reduce uric acid in blood and tissues to any great extent since protein, fat and carbohydrate each contribute to the production of uric acid. Some benefit may, however, derive from long-continued adherence to a restricted diet, and a list of basic foods is presented together with suggested meal patterns and sample menus for a low-purine diet.

F. C. Aitken.

1318

EX, J., BUCHT, H. and WERKÖ, L. The influence of a rapid infusion of glucose on renal dynamics and sodium excretion in patients with arterial hypertension. A preliminary report. *Amer. Heart J.*, 1954, 48, 102-109. [Cent. Clin. Lab., St. Eriks Hosp., Stockholm.]

In 9 patients with arterial hypertension rapid infusion of 3 to 5 per cent. glucose caused an immediate increase in the renal clearances of inulin, endogenous creatinine, sodium *p*-aminohippurate and Na. The Na excretion increased up to several hundred per cent. In 4 patients in whom it was examined during and after the infusion, blood pressure decreased considerably for several days.—M. B. Richards.

1319

SMITH, C. W., QUICKEL, K. E., BROWN, A. E. and THOMAS, C. G. How safe is cation exchange resin therapy when used in private practice? A clinical study and parallel laboratory study. *Ann. Int. Med.*, 1954, 40, 1169-1176. [Harrisburg Clin., Pa.]

Forty patients with oedema and 10 with severe hypertension without oedema were treated for 12 weeks with restriction of Na intake and resin administration. The patients were examined clinically each week. Of the 4 physicians caring for the patients only one had access to the results of parallel

laboratory tests. Complications occurred in only 3 patients. In them low blood K was recognised from clinical signs, and successful treatment by administration of K and relaxation of Na restriction was instituted by physicians who had had no access to the laboratory finding.—F. C. Aitken.

1320

VERZAR, F. Vollwertige Ernährung als Mittel zur Bekämpfung einer Sucht (Coca-Kauen). [Complete diet as a means of combating a drug habit (coca chewing).] *Internat. Ztschr. Vitaminforsch.*, 1954, 25, 303-304. *Proc. [Physiol. Inst., Basle.]*

1321

DEPEYSTER, F. A. and GILCHRIST, R. K. Clinical response of spontaneous hypoglycemia to dietary and drug therapy. *J. Amer. Med. Assoc.*, 1954, 155, 884-889. [Dept. Surg., Presbyterian Hosp., Chicago, Ill.]

The treatment of choice in spontaneous hypoglycaemia is excision of the islet cell adenoma, but management before operation is important. In one of 3 cases reported hypoglycaemic attacks were prevented by a dietary regimen of 3 meals daily with between-meal feeds so that food was taken every 3 hr. Dietary management failed in the second patient because the regimen was not strictly followed and in the third because between-meal feeds were inadequate. Alloxan administration failed to control the hypoglycaemia of the second patient but corticotropin, at least 25 mg. daily, was effective in the management of the third. In this patient 50 mg. cortisone alone or 25 mg. cortisone with 10 mg. corticotropin was ineffective.—F. C. Aitken.

See also Absts. 755, 778, 869, 873, 889, 1096, 1166, 1171, 1206.

6. FEEDING OF ANIMALS

GENERAL, INCLUDING DIGESTIBILITY TRIALS

1322

ZORN. Konstitution durch Ernährung und Haltung. [Constitution through diet and management.] *Ztschr. Tierzücht. Züchtungsbiol.*, 1954, 63, 87-99. [Inst. Konstitutionsforsch., Forschungsanst. Landwirtschaft., Völkeneinrode, Grub.]

Constitution is defined as "the capacity of the body to react to external stimuli" or, more simply, "the resistance of the individual to harmful influences". In modern views it is determined partly by inheritance and partly by environment.

For instance, it has been estimated that longevity is only 30 per cent. inherited and 70 per cent. the result of environment. The discussion is concerned chiefly with the general virtues of balanced diet and "open-air" housing, e.g., of pigs in moveable huts and cattle in open stalls.—I. Leitch.

1323

MAYNARD, L. A. Animal species that feed mankind: the role of nutrition. *Science*, 1954, 120, 164-166. [Sch. Nutrit., Cornell Univ., Ithaca, N.Y.]

This is a discussion of the economic and nutritional factors which determine the use of animals as food for man.

Improvements in breeding and management, the use of vitamin B₁₂ and antibiotics, provision of trace element, the higher efficiency of feed utilisation in ruminants and the replacement of part of their protein requirements by urea are cited as notable advances in animal nutrition during the last two decades.—A. Hepburn.

1324

VAN ES, A. J. H. and BROUWER, E. De betekenis van het colostrum voor de voeding. [The importance of colostrum in nutrition.] *Voeding*, 1954, 15, 372-379. [Lab. Physiol. Dieren, Landbouwhogeschool, Wageningen.] English summary.

A review.

1325

CRASEMANN, E. Einige Probleme der Diätetik bei der Fütterung auf betriebseigener Grundlage. [Some problems of rationing when home-produced feedingstuffs are used.] *Fortpflanzung, Suchthyg. Haustierbesamung*, 1954, 4, 1-8. [Inst. Haustierernährung, Tech. Hochschule, Zürich.]

Home produced feedingstuffs should be understood to include not only those grown on the farm but residues from dairy, cheese factory and kitchen, milling offal and industrial residues such as yeast, sugar beet pulp and fruit waste. The proper use of home-grown feeds requires that rations shall be of such water content that the requisite nutrients can be taken daily. This is important at least for ruminants; probably much less for pigs and poultry. The amount of indigestible residue (ballast) must not be too great; colour and texture, smell, taste and stimulant effects must be acceptable; there should be neither poison nor dirt in the feedingstuffs and the temperature should be suitable. Each of these points is discussed with reference to ruminant, pig, rabbit, and sometimes poultry.

The use of home-produced feeds must be carefully planned also to supply the correct amount of protein. There is a danger of deficiency disease which may appear in seasons of bad weather or when the necessary fertilisers are not applied. The defects of particular plants and classes of plants must be remembered, e.g., the high oxalic acid content of beet leaves and the goitrogenic effect of *Brassicaceae*.—I. Leitch.

1326

GERI, G. I microelementi nell'alimentazione del bestiame. 1. 2. [Trace elements in livestock feeding. 1. 2.] *Riv. Zootec.*, 1954, 27, 177-182; 210-214.

A review.

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1327

GALLUP, W. D., WHITEHAIR, C. K. and BELL, M. C. Utilization of urea and protein nitrogen by ruminants fed high-molasses and sugar rations. *J. Animal Sci.*, 1954, 13, 594-600. [Dept. Agric. Chem. Res., Oklahoma Agric. Exp. Stat., Stillwater.]

Six Hereford steers were used in two 20-day N balance trials. A basal ration of 53.7 per cent. prairie hay, 44.8 per cent. cane molasses and 1.5 per cent. of a mixture of salt and bonemeal was given to 2 of the steers; 2 others were given urea as a supplement to the basal ration and 2 soya bean oilmeal. The urea supplied 54 per cent of the total N and the soya bean oilmeal replaced the molasses so that the total N content equalled that of the urea ration.

Steers on the basal ration lost weight and failed to maintain positive N balance. Those on the supplemented rations maintained weight and retained from 13 to 17 per cent. of the N intake. The apparent digestibility of the N was higher in the urea than in the soya bean ration. The results indicated a more efficient utilisation of soya bean N than urea N. Supplements of soya bean oilmeal and urea increased the digestibility of the organic matter and crude fibre of the basal ration.

The utilisation of N in rations containing either sucrose, glucose, or lactose was estimated in balance trials with 12 wether lambs. The experimental rations were identical except for the kind of sugar used. Nutrient digestibility and N utilisation were similar in all 3 rations.

J. N. Aitken.

1328

GALLUP, W. D., POPE, L. S. and WHITEHAIR, C. K. Urea in rations for cattle and sheep. A summary of experiments at the Oklahoma Agricultural Experiment Station, 1944 to 1952. *Oklahoma Agric. Exp. Stat. Bull.* No. B-409, September 1953, pp. 35. [Stillwater, Okla.] See above Abst.

1329

HERZIG, J. Úprava a využití krmiv. [Preparation and utilisation of forage.] *Veterinářství*, 1953, 3, 106-107. [Res. Inst. Animal Nutrit., Brno.]

1330

RIVERA-BRENNES, L., CABRERA, J. I. and COLÓN, L. F. Comparison of Guinea grass-tropical kudzu, Pará grass, Pangola grass, and St. Augustine grass as pasture crops in the Yabucoa Valley in Eastern Puerto Rico. *J. Agric. Univ. Puerto Rico*, 1954, 33, 96-104. [Dept. Animal Husb., Agric. Exp. Stat., Univ. Puerto Rico, Río Piedras.]

The carrying capacities of Pangola grass, St. Augustine grass, Guinea grass and tropical kudzu mixture, and Pará grass were estimated over a 2-year period with scrub bullocks. Protein contents of the grasses in the above order were 10.18, 8.14, 12.75 and 11.21 per cent. and yields of total digestible nutrients per acre 5805, 4661, 7484 and 3457 lb. Carrying capacities were 1.12, 1.42, 1.23 and 0.87 head per acre. All the grasses except Pará grass were well adapted for growing on the light soil of the district.—J. S. Thomson.

1331

LAUTNER, V. and MÜLLER, Z. Krmné hodnoty některých našich vodních rostlin. [Feeding value of some water plants.] *Sborn. Est. Akad. Zemed.*, 1954, 27 [A], 333-354. [Biochem. Lab. Kváz, Prague.] Russian and German summaries.

Data are given for organic constituents, minerals, β -carotene, lycopene, xanthophyll and chlorophyll in species of algae, Hepaticae, Lemnaceae and other water plants. (From German summary.)

J. S. Thomson.

1332

ALDER, F. E. Some effects of fertilizers on the output of leys with particular reference to extension of the grazing season. *J. Brit. Grassland Soc.*, 1954, 9, 29-33. [Grassland Res. Stat., Hurley, Berks.]

Several manurial experiments on pasture made at Hurley, Berkshire are surveyed. Cocksfoot and alfalfa are of value for grazing during the summer dry period and it is suggested that when they are sown in alternate rows, nitrogenous fertiliser could be used more economically if applied only to the grass drills, obviating suppression of the legume. For winter grazing the yield and winter-green condition of cocksfoot were improved by high levels of N application. N also increased the crude protein content of herbage through the year, but unless potash was deficient, superphosphate had little effect beyond small increases in P content. Ten different seeds mixtures on 36 acres of downland, liberally manured, have maintained the equivalent of one mature bullock on $\frac{1}{2}$ acres on grazing alone for 9 to 10 months of the year. Hay and silage from the same area were given for the rest of the year. Liveweight increase was 318 and 335 lb. per acre in 2 successive years.—J. L. Corbett.

1333

ESAT-KADASTER, I. Orta anadolu hayvan Yemleri. [Crop feedingstuffs of Middle Anatolia.] *Arb. Yüksek Ziraat Enst. Ankara*, No. 85, 1940, Turkish text, pp. 227; German text pp. 207; + 56 (Pictures and Tables).

This thesis presents the results of pioneer work

done in 1935 on the feedingstuffs in use in Middle Anatolia. It is prefaced by a brief description of the region. Rainfall is low, 200 to 350 mm., mostly in winter and spring, but water shortage is not acute. Straw is the main feed. When the supply runs out in dry years the peasants collect *Astragalus* spp., mainly *A. tragacantha* (tragacanth), from the hills in autumn or winter. The whole plant, roots and all, is cut up and pounded, work which can be done indoors. They also collect thorny plants, the best of which is kangal (*Cirsium*, creeping thistle), for threshing. Certain oilseeds grow wild or are cultivated.

Samples of feeds purchased or collected in different parts of the region were analysed by German official methods (numbers in brackets): meadow hay (7), lucerne hay (8), *Cirsium* (3), *Astragalus tragacantha* (3), wheat straw (11), rye straw (1), barley straw (5), oat straw (2), barley (5), oats (3), melenir (*Cephalaria syriaca*) (3), safflower seed (1), safflower cake (1), linseed cake (2), and izgin (*Eruca sativa* (cappodocia)) cake (2). From 1 to 3 samples of all but straws of rye, barley and oats were used for digestibility trials with 2 or 4 Karaman wethers. The results for proximate composition of the natural feed and its dry matter, digestibility coefficients, and digestible nutrients in the dry matter are tabulated in detail and discussed with reference to the literature, if any. Some of the findings are briefly as follows [values quoted in the summary are not all consistent with the main text]. Meadow hay was low in digestible protein, but rich in energy. Lucerne hay was exceptionally good, probably owing to the sunny climate. The straw substitute *Cirsium* (digestible protein 4.25 per cent., starch value per 100 kg. 20) was much better than straw, provided the animals would eat it; cattle will, but sheep do not always readily do so. The same is true of tragacanth. According to these experiments tragacanth had a lower starch value than *Cyrtium*, but this is contrary to the views of the peasants. Wheat straw, that most used, was good only as ballast. *Cephalaria* seeds had digestible protein 13.94 per cent. and starch value 92.24. Safflower seeds were bitter and unpalatable; safflower cake was eaten, but the values were inferior to those in the literature. For linseed cake the results were similar to those reported elsewhere. *Eruca sativa* cake was rich in nutrients but was not readily eaten. It is concluded that the best prospects for the future lay in the encouragement of the cultivation of lucerne and, for concentrates, of oilseeds, either those already grown or those growing wild.—W. M. Deans.

1334

BROUWER, E. and BRANDSMA, S. Over de minerale bestanddelen en hun onderlinge verhoudingen

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in verschillende voedermiddelen en rantsoenen. [The mineral constituents and their ratios in various feedingstuffs and rations.] *Med. Landbouwhoges.* Wageningen (Nederland), 1953, 53, No. 3, 31-73.

Tables of composition of feedingstuffs compiled by Wolff (1880) and Mach and Herrmann (1934) and analyses from the Centraal Veevoederbureau of hay in 1931, 1932 and 1933 are used to prepare diagrams showing the characteristic groupings of inorganic constituents in feeds of different types. Then typical winter rations for a dairy cow are similarly treated.

When average values for individual feeds are used in the computation of composition of the rations, the dispersion of composition of the rations is small and all approach theoretical requirements. The dispersion so computed is less than that of many single feedingstuffs. The chief differences derive from the type of farming for which the rations were planned. Rations for mixed farms where green fodder of sugar beet, fodder beet or turnips is much used may have a base excess greater than that of pasture where tetany occurs. Rations on purely pastoral farms had low earth-alkalinity ($\text{Ca} + \text{Mg} - \text{P}$). In general winter rations supply more Mg than does grass, and the transition from stall-feeding to pasture would, on most farms, imply a relative fall in Mg intake. The Na supply is also relatively low on pasture alone and that of K is high: the ratios are better on mixed farms.—I. Leitch.

1335

LEROY, A. M. Mesure de la quantité d'herbe ingérée par un ruminant en liberté au pâturage au moyen de la comparaison des compositions chimiques du fourrage ingéré et des matières fécales excrétées. [Measuring the quantity of herbage consumed by ruminants at pasture by comparison of the chemical composition of the pasture consumed and of the faecal matter excreted.] *Ann. Zootech.*, 1952, 1, No. 4, 43-48. [Inst. Nat. Agronom., Paris.]

From published results the author calculates that the quantity of faecal N per 100 g. organic matter ingested, n , varies with the percentage of N in the faecal organic matter, N , so that when $N = 1.5$, $n = 0.54$ and when $N = 5.0$, $n = 0.81$. There is also a negative correlation between the crude fibre content of the organic matter of grass and its coefficient of digestibility. A relation is shown between the faecal crude fibre per 100 g. organic matter ingested and the coefficient of digestibility of the organic matter. By collection of faeces in bags from animals at pasture it is possible to know the weight of faecal organic matter excreted in 24 hr. and to estimate the N and crude fibre contents. From the coefficients

tabulated the coefficient of digestibility of the organic matter ingested may be calculated from the formula $(N - n)/N$.—D. Duncan.

1336

KATSHIO, Y. [Studies on the determination of productive value of feeds in poultry. 1. Relation of the intake of indigestible organic matter to the energy expenditure by poultry. 2. Relation of the indigestible organic matter content in ration to maintenance, growth, egg-production, or fattening. 3. Digestion trials of Japanese popular feeds with poultry.] *Bull. Nat. Inst. Agric. Sci., Japan* [G], 1954, 8, 169-292. In Japanese: English summary.

1. The net productive energy of feeds for poultry was estimated by respiration calorimeter. Rations were fed at sub-maintenance, maintenance, and above-maintenance levels to find the energy used in digestion, by (a) the gizzard (muscular stomach), and (b) the remainder of the alimentary tract (peristalsis). Powdered feeds were given at varying levels of intake to estimate the energy consumption of peristalsis, and whole grain versus powdered grain was given to estimate the energy consumption of the muscular stomach.

The total digestible nutrients (T.D.N.) contents of diets for maintenance, growth and fattening were then corrected for the work of digestion, these corrections (expressed as T.D.N.) being related to the content of indigestible organic matter and/or dry matter, in the ration.

2. Groups of 20 to 30 hens were fed for a period of approximately 1 month on 10 different mixtures of feed containing varying amounts of indigestible organic matter. The highest utilisation of nutrients for maintenance, growth, egg production or fattening was obtained when the daily intake of indigestible organic matter was between 20 to 25 g.

3. Forty kinds of popular Japanese feeds were tested in digestibility trials with poultry. The digestibility of nutrients was estimated by chemical analysis of the mixed excreta (urine plus faeces), not by separate collection of urine and faeces by means of an artificial anus, or by the use of tracer methods. (From English summaries.)

D. M. Walker.

1337

NOLAND, J. E. and MORRISON, S. H. The digestibility of honeysuckle (*Lonicera japonica*) for yearling dairy bulls. *J. Dairy Sci.*, 1954, 37, 173-175. [Dairy Dept., Univ. Georgia, Athens.]

A digestibility trial was made with a pair of identical twin Jersey bulls. During each of the 10-day trial periods the terminal shoots of honeysuckle were given as the sole roughage. The chemical composition was estimated. The average digestion coefficients were: fat 22.1, crude protein

66-8, crude fibre 42-6, N-free extractives 69-5. The average total digestible nutrient content of the fresh material was 23 per cent.—J. N. Aitken.

1338

MARRERO, J. L. Composicion de la "Asphodelus microcarpus", Viv, y de la "Ampelodesmos tenax", Lk. y su posible utilizacion como alimento animal. [Composition of *Asphodelus microcarpus*, Viv, and of *Ampelodesmos tenax*, Lk., and their possible use to feed animals.] *Bol. Inst. nac. Invest. agronom., Madrid*, 1954, 14, 75-82. English summary.

The samples of *Asphodelus microcarpus* and *Ampelodesmos tenax* came from Majorca, where the plants are abundant and are called *Aubó* or *Porrasa* and *Carrita*. Because of their high fibre content both are considered more valuable for ruminants than for pigs. Both are useful bulky fodders, of somewhat higher energy value and digestible protein content than cereal straw.

D. Duncan.

1339

ŠMALCERJ, I. Tikva, bundeva (*Cucurbita pepo* L. var. *mellopepo*, Heyek) kao krma za stoku. [Pumpkin (*Cucurbita pepo*, L., var. *mellopepo*, Heyek) as livestock feed.] *Veterinaria*, 1952, 673-686. English summary.

The pumpkin is an important succulent fruit for livestock in Yugoslavia. Three different kinds were investigated. Pumpkins are usually an intercrop of maize. The yield of pumpkin fruits per hectare was from 84 to 110 metric cwt. The green plant gives a yield of 11-4 to 24-11 metric cwt. per hectare and is also used for feeding livestock. The weights of single fruits were from 1-73 to 3-25 kg. The quantity of pumpkin seeds is considerable and they are important for oil production.

S. Pribičević (Yugoslavia).

1340

CAMBURN, O. M. and JONES, C. H. Comparison of sun-cured and barn-cured hay from the same field. *Vermont Agric. Exp. Stat. Bull.* No. 574, November 1953, pp. 19. [Burlington, Vt.]

The report covers 6 hay seasons, 1944 to 1949, with timothy, alfalfa, red clover and mixed hay (bromegrass, timothy and clover) to test the effect of sun- and barn-curing on the composition, nutritive value and losses after 3 months' storage. Barn-curing was by blowing unheated air through the hay.

Percentage losses in sun-cured and barn-cured hays were: dry matter 6-08, 4-11; crude protein 4-99, 7-02; crude fibre 2-52, 2-88; N-free extract 9-21, 4-28; ether extract 11-60, 10-08. Digestibility trials with cows were made on each sample of hay and digestion coefficients and total digestible nutrients are recorded. From 34 di-

gestibility trials the total digestible nutrients of sun-cured and barn-cured hays were found to be 48-47 and 48-78, respectively. Retentions of Ca and P during storage were similar under both methods of curing. Sun-cured hays showed a loss of water-soluble carbohydrates. Yields of cured hay per acre were 1-57 tons for sun-curing and 1-77 tons for barn-curing. Retention of carotene in the hay was much higher with barn-curing than with sun-curing.—J. S. Thomson.

1341

MOXON, A. L., GASTLER, G., STAPLES, G. E. and JORDAN, R. M. Grass hay at its best as shown by chemical analysis and feeding value. *S. Dakota Agric. Exp. Stat. Bull.* No. 405, January 1951, pp. 23.

Investigations over 8 years were made in different areas of South Dakota to determine the changes in chemical composition of grasses during the growing season and the relation between time of cutting and yield. Digestibility trials were also made to assess the relationship of composition to feeding value. The grasses used were mostly western wheat grass and blue grama.

Data on composition at different stages of growth from shooting to ripening showed the usual decrease in protein and increase in fibre, with a fall in P and an increase in Mn content. Yields of dry matter per acre over a 2-year period were 400 lb. higher for early than for late cutting and yields of protein 50 lb. per acre higher. Hay cut in July and left in the windrow for winter feed showed little change during that time in protein or P content, but hay left standing in the field showed large decreases; both types showed considerable loss of carotene, the standing crop losing all its carotene while the windrow crop retained a quarter of its original content. Digestibility trials with steers and lambs on prairie hay cut early, medium or late showed a progressive fall in digestibility coefficients for all nutrients with time of cutting. It was calculated that early-cut hay supplied over 5 times as much digestible protein for steers as late-cut hay. Feeding trials with calves generally showed the superiority of early- and medium-cut hays over late-cut. Hay cut at the early to medium stage and stored for 3 years was still superior to late-cut hay used in the year it was harvested.—J. S. Thomson.

1342

DODSWORTH, T. L. Further studies on the fattening value of grass silage and on the effect of the dry-matter percentage of the diet on dry-matter intake in ruminants. *J. Agric. Sci.*, 1954, 44, 383-393. [N. Scotland Coll. Agric.] Four groups of bullocks were fattened on silage only, roots and oat straw in the morning and silage

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in the evening and vice versa, and on a mixture of roots, oat straw, oats and hay. Silage alone produced the greater rate of fattening and had the highest efficiency of dry matter (DM) conversion. The feeding of roots in the morning and silage at night caused a 10 per cent. increase in DM consumption and a greater gain in weight than when the order of feeding was reversed. The starch equivalents (SE) of roots and silage were higher when they were given together.

In another experiment sheep fed on silage of 19.46 per cent. DM from the bottom of the silage pit consumed 16.7 per cent. more DM and 19.8 per cent. more SE than sheep fed on the same silage watered to 15.85 per cent. DM. Digestibility of the DM was about the same in both groups. After 39 days both groups were given silage from the top layer containing 15.77 per cent. DM. The digestibility of the DM on changing from 19.46 to 15.77 fell by about 10 per cent. but returned to the original value after 10 days.

The SE of the silage from the bottom layer of the pit calculated from the results of digestibility trials on sheep and from the cattle feeding trials was 65.88 and 66.15 per cent. Losses of DM and of crude protein from 25 silos each averaged about 40 per cent.—A. Hepburn.

1343

PAVLOV, I. Kormovaya tzennost' ozimoi rhi v kachestve zelenoi podkornki. [The feeding value of winter rye as a green fodder.] *Sovet. Agronom.*, 1953, No. 5, 93-94. [All-Union Sci. Res. Inst. Agric. Animals Nutrit.]

A mixture of meadow grasses (red clover, timothy, *Festuca pratensis*, *Bromus inermis* and *Dactylus glomerata*) and a mixture of red clover and *Festuca pratensis* produced a higher yield of greenstuff and absolute dry matter than winter rye. The dry matter in the grasses was 39.8 per cent. higher than in the winter rye. The nutritive value of the grasses was also considerably higher.

H. Scherbatoff.

1344

LIESCHER, W. Beitrag zur Frage der Keimfutterbereitung. [Production of germinated fodder.] *Bodenkultur*, 1953, 7, 254-267.

Because inflated claims of the superior value of fodder from grains grown in nutrient solutions without soil are again being made, the results of

hitherto unpublished experiments made with oats, barley and maize at the *Landwirtschaftlich-chemische Bundesversuchsanstalt* in Vienna in 1935 are now reported.

Comparison of the germinated fodder with the original grain on a dry basis showed that the former was lower in organic matter by from 20 to 40 per cent. and in true protein and N-free extract, higher in crude protein, amides, crude fibre and minerals. The greater weight of the germinated fodder was almost all due to water; small quantities of minerals were taken up from the nutrient solution, but there was no synthesis of protein.

Trials with two 5-year-old wethers given barley or germinated barley along with hay gave the following digestibility coefficients: organic matter 86.6, 76.9; crude protein 85.2, 75.1; true protein 84.2, 66.1; crude fat 87.0, 76.2; N-free extract 90.8, 83.1; crude fibre 45.4, 43.4. The losses are considered to outweigh any conceivable beneficial effect of germinated grain.—W. M. Deans.

1345

MERECALI, A. Le possibilità di impiego dei residui della lavorazione industriale delle carrube nell'alimentazione del bestiame. [The possible use of residues from the industrial processing of the carob bean in livestock feeding.] *Riv. Zootec.*, 1954, 27, 182-184.

After industrial processing of carob beans the germ, consisting of the embryo and cotyledons, is sometimes available for animal feeding. The percentage composition of carob germ is as follows: moisture 9.60, crude protein 40.99, crude fat 3.50, crude fibre 8.05, ash 5.58 and N-free extract 33.18. The crude protein is about 88 to 90 per cent. true protein and 80 per cent. digestible and the ash contains 7.33 per cent. Ca and 16.3 per cent. P. The vitamin content is somewhat low. The germ is thus a concentrate feed with high nutritive value despite its low Ca content.

Spent carob pulp after alcohol extraction has the following percentage composition on a dry matter basis: crude protein 10.40, crude fat 0.71, crude fibre 18.15, ash 4.94 and N-free extract 65.80. The moisture content is about 17 per cent. The pulp is comparable in composition to good quality hay, but its digestibility, in 3 trials with groups of 2 or 3 wethers, was extremely low.—D. Duncan.

See also Absts. 40, 207, 399.

HORSES

1346

FEDOTOV, P. A. K voprosu o molochnom konevodstve v usloviyakh Buryat-Mongolii. [Horse management for milk under conditions in Buryat-Mongolia.] *Konevodstvo*, 1953, No. 11, 37-40.

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The Council of Ministers of the Buryat-Mongolian ASSR have decreed that 17 special koumiss farms should be organised in the region; a system of management of the mares and foals is discussed.

Mares' yield of milk was on the average 5 to 6 lb.

daily. The fat content of milk from mares of the local breed ranged from 1.4 to 2.3 per cent.

Mares should not be milked until their foals are 45 to 60 days old. Two hr. before the first milking the foals should be removed from their dams; at night they are pastured with their dams. During the hot hours of the day the foals are kept in a dry barn with plenty of fresh water and receive an additional daily feed of 1 kg. oats, 0.5 kg. wheat bran, 2 kg. grain residues and 15 to 20 g. salt. During the cool hours the foals are pastured on green grass near the barn. Under these conditions the foals grow and develop normally.

H. Scherbatoff.

1347

MAGIDOV, G. A. and CHALYUK, E. A. Ispol'zovanie kartofelya kak kormovoi kul'tury v konevodstvo. [The use of potatoes as a fodder crop

in horse management.] *Konevodstvo*, 1953, No. 12, 26-30. [Dept. Nutrit., VNIK.]

In these experiments the introduction of potatoes into the ration improved the digestion and metabolism of the horses and the results approximated to feeding under summer conditions. A ration for heavy horses and racehorses of 11 to 12 kg. cereal and legume hay, 5 kg. potatoes and 1.5 kg. oats improved the physiological condition of the horses and did not have a detrimental effect on their growth, development or production. In replacing concentrated foods with potatoes, the replacement should be at the rate of up to 3.5 kg. potatoes for 1 kg. oats. Raw potatoes are preferable to boiled ones, as boiling removes part of the N and mineral matter and part of the vitamins and has no effect on the assimilation of the nutrients.

H. Scherbatoff.

See also Abst. 262.

CATTLE

GROWTH AND FATTENING

1348

DAVIS, H. P., PLUM, M. and BROST, B. Studies of herd management records. 2. Relation of gestation length to birth weight of Holstein calves of both sexes at various calvings. *J. Dairy Sci.*, 1954, 37, 162-166. [Dept. Dairy Husb., Univ. Nebraska, Lincoln.]

Data on 755 normal gestations and birthweights of 384 male and 371 female Holstein calves were analysed statistically. It was found that male calves were carried on the average for 278.9 days and female calves for 278.4 days. Birthweights of male calves were on the average 96.7 lb. and of females 90.3 lb. Differences in birthweight due to sex, calving sequence and gestation length were statistically significant.—J. N. Aitken.

1349

HOYER, N. and LARKIN, R. M. Bucket and nipple feeding of calves. *Queensland Agric. J.*, 1954, 79, 46-50. [Cattle Husb. Branch.]

1350

BERZIN', YA. M. Novaya sistema kormleniya i vyrashchivaniya telyat. [A new system of feeding and rearing calves.] *Priroda*, 1954, No. 2, 49-54. [Acad. Sci., Latvian S.S.R.]

With 18 calves in the experimental and 11 in the control group, the experimental animals were started on skimmed milk from the 6th day after birth, and were entirely taken off whole milk on the 16th day. Immediately they were started on skimmed milk they were given vitamin concentrates, 300 units of vitamin A and 100 units of

vitamin D, daily per kg. liveweight. From the 16th day to 2 months each calf received 10 kg. skimmed milk daily. From the third month the skimmed milk was gradually reduced and at the end of the month they were only receiving 6 kg. Concentrates and hay were introduced into the ration from the 21st day. Both groups received salt and bonemeal. During the 3 months the experimental group received 182 kg. less whole milk per calf than the control group.

In further experiments at the end of 5 months the calves were fed entirely on plant foods, which contained sufficient natural vitamins, so that vitamin concentrates were not given. The calves were then fed on boiled potatoes, average 142 to 227 kg. each, fodder beet 171 kg., and sugar beet 19 kg. The concentrates part of the ration consisted of a mixture of oatmeal, wheat bran and various oil cakes, a total of 185 to 194 kg. per head. During the summer the roots were replaced by grass. When under cover the calves were given as much hay as they could eat. During the summer months they were out at pasture. The sheds were not heated.

Calves brought up on this system were superior to the control group in health and resistance to disease and developed into highly productive cows, producing not only more milk than their dams, but also milk with a higher fat content.

H. Scherbatoff.

1351

POUNDEN, W. D., CONRAD, H. R. and HIBBS, J. W. Observations on some substitutes for rumen inoculation. *J. Amer. Vet. Med. Assoc.*, 1954, 124, 394-396. [Dept. Vet. Sci., Ohio Agric. Exp. Stat., Wooster.]

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Previous work had demonstrated the value of fresh rumen contents as an inoculum for the rumen of young calves fed on good quality roughage but only a limited quantity of grain. As substitutes for fresh rumen material, frozen fresh rumen juice and 3 commercial products advertised as containing viable rumen micro-organisms were investigated.

In vivo, their benefits were found to be not comparable to those of fresh rumen contents. *In vitro*, cellulose digestion tests indicated that the frozen product was only 80 per cent., and the one commercial product tested only 30 per cent., as efficient as the fresh material. Volatile fatty acids were produced by the frozen material, but scarcely at all by the commercial product; neither substitute promoted protein synthesis.

The frozen material, after thawing, contained microflora and microfauna morphologically similar to those of the original fresh material, but the protozoa were no longer motile. Examinations of aqueous solutions of the 3 commercial products did not reveal any of the indicator micro-organisms characteristic of the rumens of mature normal dairy cattle.

It was therefore concluded that, as rumen inoculants, the substitutes studied were inadequate. W. A. Greig.

1352

BARTLEY, E. E., FOUNTAINE, F. C., ATKESON, F. W. and FRYER, H. C. Antibiotics in dairy cattle nutrition. 4. Comparative effects of different levels of crystalline aureomycin and a crude aureomycin fermentation product (Aurofac 2A) on the growth and well-being of young dairy calves. *J. Dairy Sci.*, 1954, 37, 982-989. [Dept. Dairy Husbandry, Kansas Agric. Exp. Stat., Manhattan.]

For previous work see Absts. 5185, Vol. 23; 5358, Vol. 24.

Ayrshire, Guernsey, Holstein and Jersey calves were divided into 4 groups of 8 animals each. One group was used as a control. Crude aureomycin was given to the second group in amounts calculated to supply 45 mg. aureomycin daily per 100 lb. liveweight. The remaining 2 groups received pure crystalline aureomycin at rates of 45 and 90 mg. daily per 100 lb. liveweight.

Calves given aureomycin were less affected by scour, pneumonia or other undiagnosed infections than the control calves. Bodyweight gains of the treated calves to 25 weeks of age were superior to those of the controls. From birth to 13 weeks the growth response of calves given the crude aureomycin was greater than that of the other 3 groups. During the last 11 weeks of treatment the growth of calves given 45 mg. pure aureomycin was significantly greater than that resulting from all other treatments. From birth to 25 weeks the growth

rate of calves given 90 mg. aureomycin was below that of the calves given 45 mg. aureomycin. There was no significant difference between the groups in the consumption of skimmed milk, hay and grain. The efficiency of feed utilisation of the calves given aureomycin was greater than that of the controls.—J. N. Aitken.

1353

HIBBS, J. W., CONRAD, H. R. and POUNDEN, W. D. A high roughage system for raising calves based on the early development of rumen function. 5. Some effects of feeding aureomycin with different ratios of hay to grain. *J. Dairy Sci.*, 1954, 37, 724-736. [Dept. Dairy Sci., Ohio Agric. Exp. Stat., Wooster.]

Three groups of Jersey calves were started on experiment at 3 days of age. Whole milk was given at the rate of 1 lb. per 10 lb. birthweight to 7 weeks of age. Mixed hay and a grain concentrate were given to the 3 groups, respectively, at one of the following hay to grain ratios: 4:1, 3:2 and 2:3. All calves were rumen-inoculated at 6 weeks of age as previously described (Abst. 624, Vol. 19).

Aureomycin was given at the rate of 15 mg. daily to 7 weeks of age to 4 calves in each group; from 7 to 12 weeks the rate was 20 mg. per lb. total dry feed. Some of the calves were continued on experiment to 26 weeks of age and were given a 2:1 or a 4:1 ratio of hay to grain. No aureomycin was given during the final phase of the experiment.

The calves given aureomycin made greater gains both in weight and in height at withers, irrespective of the ratio of hay to grain. They also consumed more total feed and estimated total digestible nutrients and net energy and utilised their feed more efficiently than untreated calves. Efficiency of feed utilisation was not influenced by the ratio of hay to grain. The advantages gained by the aureomycin-fed calves were lost during the period 12 to 26 weeks. During the final phase of the experiment calves on a 2:1 hay to grain ratio utilised their feed more efficiently than those on a 4:1 ratio.

From digestibility trials it was found that the increased efficiency during aureomycin feeding was not due to increased digestibility of dry matter, cellulose or protein. Percentage digestibility of protein and daily N retention increased as the amount of grain increased from the 4:1 to the 2:3 hay to grain ratio.

The average riboflavin content of both rumen juice and urine was higher in calves given aureomycin, but there was no difference in the vitamin B₁ content. Calves given aureomycin maintained a significantly higher level of blood sugar between 8 and 12 weeks. Changes in the proportion of

propionic and butyric acid in rumen liquor occurred as the result of aureomycin feeding and as a result of increasing the proportion of grain in the ration. Aureomycin inhibited the growth of the Hay II group of rumen bacteria. Increasing the amount of grain also decreased the number of bacteria in this group. It was concluded that the increased growth due to aureomycin was associated with an alteration in energy metabolism involving the microflora of the digestive tract.—J. N. Aitken.

1354

VOELKER, H. H., ALLEN, R. S., JACOBSON, N. L. and BLAKE, J. T. *In vivo* (dairy calves) and *in vitro* studies with surface-active agents. *J. Dairy Sci.*, 1954, **37**, 737-743. [Dept. Animal Husb., Iowa Agric. Exp. Stat., Ames.]

Addition of a cationic detergent to a milk replacement diet for young calves and of anionic, cationic and non-ionic detergents to the concentrate mixture for older calves had no effect on growth rate, feed consumption, incidence of diarrhoea, faecal pH, blood plasma fat or blood cell values. Studies *in vitro* showed that the addition of surface-active agents and penicillin to distilled water and rumen fluid reduced the surface tension; aureomycin and terramycin did not.—J. N. Aitken.

1355

BRANSON, W. F., REID, J. T. and MILLER, J. I. The influence of certain factors upon the digestibility and intake of pasture herbage by beef steers. *J. Animal Sci.*, 1954, **13**, 535-542. [Cornell Univ., Ithaca, N.Y.]

During 4 months of the summer grazing season the following rations were given, respectively, to 3 groups each of 2 beef steers; pasture alone, pasture plus cane molasses and pasture plus ground yellow maize. Herbage intakes were measured by the use of chromium oxide and chromogen indicators. The estimated total intakes obtained by this method were compared with those estimated from total faecal collections. The results were in good agreement.

Digestibility of the herbage declined as the forage became more mature and increased as the aftermath became plentiful. Giving molasses depressed the digestibility of the herbage. Herbage intakes increased during periods of lush growth and declined when the herbage matured. Intakes of the supplements were greatest when the digestibility of the herbage was lowest. The steers receiving maize consumed the largest amount of feed and made the greatest weight gains. Total feed intakes and weight gains of the steers getting molasses were greater than those on pasture only.

J. N. Aitken.

1356

NELSON, A. B., ROSS, O. B., DARLOW, A. E., CAMPBELL, W. D. and MACVICAR, R. W. Studies on winter rations for commercial beef cows. *Oklahoma Agric. Exp. Stat. Bull. No. B-418*, March 1954, pp. 22. [Oklahoma Agric. and Mech. Coll., Stillwater.]

Two systems of wintering beef cattle were compared over a period of 9 years. In the first the cattle were on pasture, mostly bluestem, all the year round, with a supplement of cottonseed cake for 5 months in winter. In the second the cattle were on pasture for 7 months only and then received prairie hay and a cottonseed cake supplement. Both systems proved satisfactory. In both alfalfa hay could replace cottonseed cake, 8 lb. of the former replacing 2.5 lb. cottonseed cake. The replacement would be profitable when the cost of alfalfa was less than one-third that of cottonseed cake. When alfalfa hay was given as a winter supplement the birthweight of calves was higher when the cows grazed all the year than when they received prairie hay during the winter.

J. S. Thomson.

1357

FRANKLIN, M. C. Feeding standards for beef cattle. C.S.I.R.O., Melbourne, Leaflet No. 7, 1953, pp. 16.

American and British feeding standards for beef cattle are tabulated and discussed in relation to Australian conditions where the optimum level food supplies and steady weight gains are frequently unattainable. When cattle are hand-fed during droughts special attention should be paid to the provision of calcium supplements and carotene-rich foods. Protein supply may also be deficient under these conditions and when rapidly maturing pasture is grazed, but the British standard of 1½ lb. digestible crude protein daily for a mature bullock is over-generous and wasteful of locally scarce feedingstuffs.—J. L. Corbett.

1358

MAWSON, W. F. Growth rates of beef cattle in tropical Queensland. *Queensland Agric. J.*, 1954, **78**, 301-307. [Cattle Husb. Branch.]

In this preliminary report the bodyweight gains of Shorthorn and Shorthorn × Hereford cross steers were compared with those of Shorthorn-Brahman and Shorthorn × Hereford × Brahman cross steers. Bodyweights were recorded monthly throughout 360 days. The breeds of purely British ancestry gained on the average 159 lb. per head and the Brahman crosses gained 231 lb. per head.

Environmental conditions and methods of management are described. It is proposed to continue the observations until the animals reach slaughter weight.—J. N. Aitken.

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1359

McCONN, W. C. **Fattening yearling beef cattle on pasture.** *S. Dakota Agric. Exp. Stat. Bull.* No. 407, March 1951, pp. 16.

This trial was made in 2 phases. In the first the feeding value of brome hay, alfalfa hay and maize silage was compared in winter rations for beef calves. The second phase was planned to study the possibility and economy of fattening the same calves off summer pasture as yearlings. In each of 3 successive years 48 Hereford calves weighing about 450 lb. were used. A control group of 12 calves in each year was full-fed in dry lot throughout both winter and summer phases.

Both brome hay and maize silage when supplemented with 3 lb. shelled maize and a limited amount of alfalfa hay proved satisfactory for bringing the calves to a suitable state for finishing off pastures. A daily intake of up to 17 lb. alfalfa hay with 3 lb. shelled maize also proved satisfactory. Maize silage with limited alfalfa hay gave slightly higher daily gains than either of the other 2 rations. During the summer the feeding value of native grass, mainly Kentucky bluegrass, was compared with mixed brome and alfalfa pastures. Trials were made on both types of pasture to measure the value of giving maize throughout the grazing period as compared to grazing for 8 to 10 weeks and then giving maize and protein supplements. The calves full-fed in dry lot throughout the 2 periods reached slaughter weight a month before those receiving maize for the whole of the grazing season and 8 weeks before those getting maize for part of the season only. Calves which grazed the brome and alfalfa pasture with a supplement during the whole season gained 2.59 lb. daily; those pastured on native grass with an all-season supplement gained 2.26 lb. daily. The average daily gains of the calves which grazed the brome and alfalfa or the native pasture with half-season supplement were 1.99 and 1.95 lb. daily, respectively. Cattle fed in dry lot throughout cost more to feed, but the carcasses were better finished than those of cattle fattened on pasture.—J. N. Aitken.

1360

FRANKLIN, M. C. **Feeding trials with beef cattle.** C.S.I.R.O., Melbourne, Leaflet No. 8, 1954, pp. 16.

Australian beef is almost entirely grass-fed. Even on improved grazings the bodyweights of cattle of all ages remain stationary or decline during the long periods of pasture dormancy occurring in summer and autumn each year. Supplementary feeding during the droughts by grazing irrigated crops or by stall-feeding is only economical for the final finishing period. Maximum use must be made of home-produced fodders

compounded and fed according to British or American feeding standards. A ration containing 65 per cent. total digestible nutrients is a suitable maximum and more than 1.2 lb. digestible crude protein daily for a 1000-lb. beast is wasteful of scarce feed. Stall-fed animals must be of quiet temperament and have an ample supply of good water.—J. L. Corbett.

1361

FRANKLIN, M. C. **Feeding beef cattle for show.** C.S.I.R.O., Melbourne, Leaflet No. 9, 1954, pp. 8.

Recommendations are made on the quantities and qualities of feedingstuffs and methods of feeding for producing the high condition required in show cattle.—J. L. Corbett.

1362

KIDWELL, J. F., BOHMAN, V. R. and HUNTER, J. E. **Individual and group feeding of experimental beef cattle as influenced by hay maturity.** *J. Animal Sci.*, 1954, 18, 543-547. [Dept. Animal Husb., Univ. Nevada, Reno.]

The weight gains of weaned Hereford steers and heifers fed on early- or late-cut meadow hay were compared. A further comparison was made between those fed individually, in pairs, or in groups. The weight gains of animals on early-cut hay were significantly higher than those on late-cut hay of poorer quality. Steers and heifers receiving early-cut hay in pairs or in groups made greater weight gains than those fed individually. With late-cut hay the method of feeding made little difference to rate of gain. Animals fed individually on early-cut hay were more restless and had a lower feed consumption and more feed waste than those fed in pairs or groups.

J. N. Aitken.

1363

BURROUGHS, W., CULBERTSON, C. C., KASTELIC, J., CHENG, E. and HALB, W. H. **The effects of trace amounts of diethylstilbestrol in rations of fattening steers.** *Science*, 1954, 120, 66-67. [Iowa Agric. Exp. Stat., Ames.]

Three experiments are reported in which diethylstilbestrol given by mouth to fattening steers for up to 84 days, at levels of from 2.5 to 10 mg. daily, produced a 35 per cent. increase in liveweight gain over that of control animals and a 20 per cent. reduction in feed required per 100 lb. gain.—J. S. Thomson.

1364

POPE, L. S., LONG, R. A., DARLOW, A. E. and MACVICAR, R. **Cowpeas as a protein feed for fattening steer calves.** *Oklahoma Agric. Exp. Stat. Bull.* No. B-399, May 1953, pp. 7. [Stillwater, Okla.]

Ground cowpeas were compared with cottonseed cake as a protein supplement to a ration of yellow maize, sorgo silage and alfalfa hay. The protein content of the cowpeas was 24.6 per cent. as compared with 42.8 per cent. for cottonseed cake, and in the daily ration of fattening steer calves 2.6 lb. of the peas replaced 1.5 lb. cake. Average daily gains were 2.15 and 2.19 lb., respectively. Cowpeas can replace cottonseed cake when their price is 76 per cent. of that of cottonseed cake.

J. S. Thomson.

See also Absts. 351, 353, 354.

MILK PRODUCTION

1365

VOISIN, A. Quand une vache est-elle rassasiée? [When is a cow's appetite satisfied?] *Ann. Zootech.*, 1952, 1, No. 2, 1-45. [Union Co-opératives Laitières, Seine-Inférieure.]

1366

USUELLI, F. and PIANA, G. Particolari aspetti del problema inerente i rapporti tra alimentazione e produzione lattica. (Considerazioni critiche ed applicative.) [Particular aspects of the problem inherent in relations between nutrition and milk production. Critical and practical considerations.] *Riv. Zootec.*, 1954, 27, 199-209.

A review.

1367

MCCLYMONT, G. L. Feeding for milk production. *New South Wales Dept. Agric. Publ.*, 1954, pp. 48.

This bulletin provides a guide to better feeding and pasture management with particular reference to conditions in New South Wales.—J. N. Aitken.

1368

DELAGE, J., LEROY, A. M. and POLY, J. Une étude sur les courbes de lactation. [Study of lactation curves.] *Ann. Zootech.*, 1953, 2, No. 3, 225-267. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

The trend in milk yield from the 60th to the 250th day after calving is discussed. Mean production figures for each 10-day interval were obtained in 1949 from 146 lactations of cows of the black and white Friesian breed. These were picked out from a much larger number available, to avoid cases of inadequate feeding, and to obtain an even spread of calvings over the year. The cows were in their second, third or fourth lactation, were milked twice a day, and were served on the average 140 days after calving.

Linear, exponential, hyperbolic and parabolic curves were fitted to the data and the last of these was found to give the best fit over the period, the

exponential curve being second best. If the persistence of lactation is measured by the ratio of production in one month to that in the previous month, the exponential curve predicts a constant value for persistence; the parabolic curve agrees with the data in showing a slight increase over the period concerned. The use of persistence, averaged over the period from maximum production to about 4 months after conception, is advocated as a convenient parameter to describe the course of milk production.

The data used were not adequate for a study of the first 60 days of lactation, in which the yield attained its maximum value in most of the cows. In the final stage of lactation, from the 250th day to somewhat over the 300th day, there is a comparatively sharp drop in yield and the timing of this fall is shown to be related to the service period.

A detailed survey is made of the literature on the subject and the authors' results are discussed in relation to those of others.—I. McDonald.

1369

LEGATES, J. E. and LUSH, J. L. A selection index for fat production in dairy cattle utilizing the fat yields of the cow and her close relatives. *J. Dairy Sci.*, 1954, 37, 744-753. [Dept. Animal Husb., Iowa State Coll., Ames.]

In selective breeding of cattle for the improvement of fat production it may be useful to consider not only the lactation records for the individual cow, but also those for other cows closely related to her. To discover how best to combine this information give to an index of breeding value, use was made of 23,330 lactation fat yield records from 12,405 Jersey cows in 293 herds in the United States. From analyses of the intra-herd variability, measures were obtained of the repeatability of fat records of the same cow, of the correlations between fat records of maternal and of paternal half-sisters, and of the correlation between daughter and dam, the last showing the heritability of fat production. In the course of the analyses it was found that the herd component accounted for 39 per cent. of the total variance, and that year-to-year variations accounted for 8 per cent. of the intra-herd variance but tended to cancel out over the average for all herds. The index devised from these measures is given in the form of a linear combination of the estimated real producing abilities of the cow and her dam and of the sums of those of her daughters, maternal sisters, and paternal sisters, with coefficients depending on the numbers available in each case.

Estimates are obtained, for a variety of situations, of the genetic improvement in fat production which might be expected from the use of the index as a basis for selection, and this is compared

with the improvement to be expected from the use of the cow's own performance. It is concluded that in practice progress would be about 1.10 to 1.15 times faster by the method described, the exact ratio depending on the information available.—I. McDonald.

1370

BALCH, C. C., BALCH, D. A., BARTLETT, S., COX, C. P., ROWLAND, S. J. and TURNER, J. *Studies of the secretion of milk of low fat content by cows on diets low in hay and high in concentrates.* 2. The effect of the protein content of the concentrates.

BALCH, C. C., BALCH, D. A., BARTLETT, S., HOSKING, Z. D., JOHNSON, V. W., ROWLAND, S. J. and TURNER, J. 3. The effect of variations in the amount and physical state of the hay and a comparison of the Shorthorn and Friesian breeds. *J. Dairy Res.*, 1954, 21, 165-171; 172-177. [Nat. Inst. Res. Dairying, Univ. Reading.]

For Part 1 see Abst. 1375, Vol. 22.

2. Twenty cows, 14 Shorthorn, 1 Guernsey and 5 Friesian, mostly in early lactation, were in 4 groups given one of 5 treatments in the experimental period of a study which lasted 13 weeks in all. For 2 preliminary control weeks all cows got 18 lb. hay with 4 lb. per gal. of a concentrate mixture, of decorticated groundnut cake 3, flaked maize 10 and weatings 7 parts by weight and 2 per cent. of a mineral mixture. The period of weeks 3 to 9 was experimental with one group A continuing as control. In the remaining 4 groups all cows received only 4 lb. hay with additional 6 lb. concentrates to compensate for the reduction and of these, 2 groups, B and C, were given a mixture which was high and the other 2 groups, D and E, one which was low in protein. The constituents of these mixtures, in parts by weight and with the high protein mixture quoted first, were, barley meal, 3, 3; decorticated groundnut cake 6, 1; flaked maize 6, 12; maize gluten feed, 3, 0; weatings 3, 3; protein contents were 22.3 and 11.6 per cent., respectively. For weeks 7 to 9 cows in groups C and D were given daily 1 lb. crude fibre as 10 lb. delignified straw pulp. During weeks 10 and 11 all returned to the treatment given in the first period, and the experiment ended with observations made during a 2-week period of grazing.

In the period of low intake of hay loss of appetite was common for the first few days but in only 3 cows did it persist for more than 4 days. Effects on yield were slight and not statistically significant; only the change to grazing resulted in an increase of production. Reduction in intake of hay was followed by a fall in both percentage and yield of fat, but with the concentrate mixture high

in protein the fall was slower than with the low-protein mixture. The addition of the straw pulp led to no increase in milk fat production. There was evidence that the fall in fat percentage in milk was less the more advanced the stage of lactation of the cow.

3. In an experiment which lasted for 14 weeks 16 cows were given for the first 3 weeks 16 lb. hay daily with the control concentrate mixture as in Part 2. Of the 7 weeks of experimental period 3 were spent in changing the diets gradually, by which time groups A, B, C and D, each of 3 Shorthorn cows, were receiving 12, 8 and 4 lb. long hay and 8 lb. ground hay, respectively, and the fifth group E with 4 Friesians, 4 lb. long hay. All continued to get the control concentrate mixture which contained 16.1 per cent. protein and, to compensate for the reduction in hay, another mixture of barley meal, dried brewer's grains, dried sugar beet pulp, flaked maize and weatings, 3, 1, 1, 3 and 2 parts by weight and with protein content 10.1 per cent., was prepared and given at rates of 4, 6, 8, 6 and 8 lb. to groups A to E, respectively. For the last 3 weeks of the experiment hay was restored to the 16 lb. level and the giving of the second concentrate mixture was stopped. Only the fat content of the milk was estimated.

Changes in diet did not produce noticeable changes in rates of decline of milk yield. Reduction of the hay to 12 lb. did not affect to any appreciable extent the fat percentage of the milk but changes to less than that amount resulted in its falling. Fat yield also fell in groups B to E by amounts estimated, from comparison with the control group, to be 28.4, 29.3, 55.2 and 36.2 per cent., respectively. The fall in fat yield was greater with ground than with the same amount of long hay. The fall in fat content of the milk of the Friesian cows given 4 lb. hay was greater than, but not significantly different from, that in the corresponding group of Shorthorn cows.

D. Harvey.

1371

SPRAIN, D. G., SMITH, V. R., TYLER, W. J. and FOSGATE, O. T. The effect on milk and fat production of injections of oxytocin at alternate 14-day periods during lactation. *J. Dairy Sci.*, 1954, 37, 195-201. [Dept. Dairy Husb., Univ. Wisconsin, Madison.]

Oxytocin was administered intravenously to 7 Holstein cows. Each cow was milked through 10 control and 10 experimental periods. Mean daily milk production was 3.6 lb. higher during the treatment periods than during the control periods. The greatest increases were obtained from cows which had shown lack of persistency in previous lactations. Treatment had no significant effect on butterfat percentage.—J. N. Aitken.

1372

THOMAS, J. W., COPLAND, D. V., KEYES, E. A. VAN HORN, A. G. and MOORE, L. A. **Effects on economy and efficiency of milk production when thyroprotein is fed for a short period of time to milking cows.** *J. Dairy Sci.*, 1954, **37**, 877-888. [Dairy Husb. Res. Branch, U.S. Dept. Agric., Washington, D.C.]

Thyroprotein was given at the rate of 15 g. per head daily, for 60 days to 26 Holstein and Jersey cows. During this time the production of fat-corrected milk by treated cows increased while that of a group of control cows decreased. When thyroprotein was withdrawn milk production fell to below normal. Giving extra grain to cows receiving thyroprotein did not greatly increase persistency. In some cows turned out to pasture immediately after the withdrawal of thyroprotein there was no decrease in milk production. The butterfat percentage of treated cows increased during the experimental period. All treated cows lost weight. There was no increase in roughage consumption by the treated cows.

The efficiency of production of the treated cows whose milk yields fell below normal after the withdrawal of thyroprotein was less than that of the controls when total production over the experimental and post-experimental periods was considered.—J. N. Aitken.

1373

SEN, K. C., PREMACHANDRA, B. N., MURTHY, G. K., DASTUR, N. N. and NARAYAN, D. **The effect of feeding iodinated casein on yield and composition of milk.** *Indian J. Dairy Sci.*, 1954, **7**, 49-63. [Indian Dairy Res. Inst., Bangalore.]

Iodinated casein was given, for 10 weeks during the declining phase of lactation, at the rate of 25 g. per 1000 lb. bodyweight to 3 Gir, 3 Sindhi and 8 Ayrshire × Sindhi cows. After a rest period of 9 weeks, 4 of the cows were given a repeat dose for a further period of 5 weeks. The ration consisted of 30 lb. Guinea grass, 20 lb. Rhodes grass, 5 lb. ragi straw and a concentrate mixture at the rate of 1 lb. for 3 lb. of milk produced. Bodyweights, milk, butterfat and solids-not-fat production were recorded.

Bodyweights declined during treatment and increased when iodinated casein was withdrawn.

Milk production increased during treatment when compared with either the pre-treatment yield or the estimated normal yield. The increase reached a peak after 3 weeks of treatment and then decreased. The rate of decrease was accelerated when iodinated casein was withdrawn.

Butterfat and solids-not-fat percentages and total fat yield increased during treatment. Cows given a second dose of iodinated casein in late

lactation gave a better response in milk yield and butterfat percentage than when treated earlier in lactation. The response of the Ayrshire × Sindhi cows was better than that of the other breeds.

J. N. Aitken.

1374

MAQSOOD, M. **Galactopoietic action of thyroxine in cattle kept in subtropical countries.** *Nature*, 1954, **174**, 185. [Dept. Physiol., Punjab Coll. Animal Husb., Lahore, Pakistan.]

A buffalo and a cow received by mouth daily for 4 weeks 15 g. thyroprotein containing 0.75 per cent. L-thyroxine, during October and November in West Pakistan. Two comparable animals were selected as controls. The tests were started 8 weeks after calving in the buffaloes and 20 weeks in the cows. All 4 animals were milked twice daily and the milk yields and rectal temperatures were recorded.

Atmospheric temperatures ranged from 63.0° to 93.9° F. during October and from 50.0° to 82.0° F. in November, and humidity was from 56 to 69 per cent. Average daily yields of milk from the control and treated buffaloes were 22.7 ± 0.027 and 27.1 ± 0.018 lb., respectively. Statistical analysis showed that the increase due to treatment was highly significant. The average daily milk yields of the control and treated cows were 12.0 ± 0.11 and 13.7 ± 0.24 lb., respectively, an increase not statistically significant. The body temperatures of the control and treated animals showed no difference. It is suggested that the thyroxine treatment of the cows might have had greater effect if started earlier in lactation.

B. W. Simpson.

1375

JUCKER, H. **Zur Mineralstoffversorgung beim Rindvieh. [Supplying minerals to cattle.]** *Schweiz. Landwirtsch. Ztschr. Die Grüne*, 1954, No. 1, 3-8. [Inst. Haustierernährung ETH, Zürich.]

Physiological reasons for supplying minerals are briefly outlined and the common feedingstuffs are reviewed as sources of Ca and P and compared in a diagram. The proper salts to balance rations are defined; every animal should have salt (NaCl) daily and AIV silage should be neutralised by 50 to 100 g. of a mixture of 75 per cent. calcium carbonate and 25 per cent. soda.—I. Leitch.

1376

DAVIS, R. F., WILLIAMS, C. and LOOSLI, J. K. **Studies on sulfur to nitrogen ratios in feeds for dairy cows.** *J. Dairy Sci.*, 1954, **37**, 813-818. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

Representative samples of 21 feedstuffs used in preparing concentrate mixture for dairy cows were analysed for the usual constituents. Total S and

N.A. and R., January 1955

the N : S ratio were also estimated. The results are presented in tables. In an experiment with 19 Holstein cows the addition of sodium sulphate to a concentrate mixture containing urea did not increase the production of fat-corrected milk.

J. N. Aitken.

1377

ZELTER, Z. Le rôle nutritionnel, chez la vache en lactation, des acides acétique et butyrique formés au cours de l'ensilage. [Nutritional role in the lactating cow of acetic and butyric acids formed during ensiling.] *Ann. Zootech.*, 1953, 2, No. 2, 105-147; No. 3, 197-224; No. 4, 303-364. [Lab. Recherches, Inst. Nat. Agronom., Paris.]

Part 1 of this Mémoire gives an extensive review of the literature relating to the derivation and formation of milk fat and Part 2 reviews techniques applicable to the problem in hand. It includes feeding standards for dairy cows, analytical methods for feedingstuffs and milk, and the interpretation of metabolism experiments. In Part 3 experiments are described with 2 groups, each of 7 carefully matched Normandy cows, given a basal diet of either half-sugar beet or silage in 3 successive periods on the plan : Group 1, beet, silage, beet; Group 2, beet, beet, silage. The beet was given, 45 kg. daily, with 4 kg. meadow hay and a concentrate mixture of linseed and groundnut cake, wheat bran, barley, oats and a mineral mixture, according to individual needs. The silage was of sugar beet pulp and tops and it replaced the half-sugar beet weight for weight. In each group the silage period showed a milk yield above expectation, and fat production rose more than yield. The results are statistically analysed and are judged on the slope of a theoretical line of decline of lactation.

Possible explanations are discussed. There was at all times a supply of energy surplus to needs for maintenance and milk produced, and the cows put on weight. Protein was present also in excess of needs, but digestible fat was not at any time above the minimum required for maintenance of mammary function, "seuil minimum indispensable," i.e. about 0.5 g. per kg. liveweight. The effect of silage is therefore attributed to the ingestion with the silage of 499 or 464 g. acetic and 351 or 333 g. butyric acid.

In a second experiment the same or similar cows, after 63 days' preliminary records, were divided into 3 groups, of which 1 was control and the others had Ca acetate and butyrate added to the basal diet or again had beet replaced by silage. The control group had an addition of CaCO_3 , 250 g. to balance the Ca in the ration with fatty acids, which contained 237 g. Ca acetate and 214 g. Ca butyrate. Again the fatty acids and silage each gave a yield of milk and fat in excess of expectation.

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For instance, the milk yield of the control group in the second period was 23.8 per cent. and fat production 24.6 per cent. less than in the first period; those of the fatty acid group were only 6.4 and 7.1 per cent. less and of the silage group, 10.6 and 11.0 per cent. less.

Individual performances and possible explanations are discussed.

A third similar experiment compared the effects of acetic acid alone, butyric acid alone and butyric and pyruvic, or acetic and butyric, acids together. Acetic acid (400 g. Ca acetate) had an immediate effect, arresting the decline of yield, and there was a slight increase in percentage of fat. Butyric acid alone had no detectable effect, but butyric acid with pyruvic acid had a small effect and with acetic acid an effect comparable with that of acetic acid alone.

In summary the effect is assessed as chiefly on yield, less on percentage fat in milk, and this is attributed to a minimum fat requirement not supplied by the basal ration. An addendum condemns beet as a feed for milk production on account of its lack of fat.—I. Leitch.

1378

HUFFMAN, C. F. and DUNCAN, C. W. The nutritive value of corn silage for milking cows. *J. Dairy Sci.*, 1954, 37, 957-966. [Dept. Dairy Chem., Michigan State Coll., East Lansing.]

The effect on fat-corrected milk production of cows of replacing part of the hay, in an all-hay ration, with maize silage was studied in 23 trials. Milk production increased when maize silage was given. It was concluded that maize silage supplies the unidentified grain factor(s) needed to balance the total digestible nutrients in roughage (Abstr. 3036, Vol. 22).—J. N. Aitken.

1379

HUFFMAN, C. F., DUNCAN, C. W., DEXTER, S. T. and CHANCE, C. M. The feeding value of red clover conserved as hay and as silage in respect to milk production. *Quart. Bull. Michigan Agric. Exp. Stat.*, 1954, 36, 391-400. [Dept. Dairy.]

A crop of 90 per cent. red clover, 5 per cent. timothy and 5 per cent. brome grass was cut and each alternate windrow was made into silage, the remainder into hay. Molasses was added to the silage at the rate of 50 lb. per ton. The contents of protein and crude fibre in both fodders were approximately the same when compared on the dry basis but silage had a higher percentage of ether extract. The coefficients of digestibility of the dry matter, crude fibre and N-free extract were in good agreement. The protein coefficient was higher for the hay than for the silage. The reverse was true for ether extract. There was no

significant difference between the fodders in digestible protein or total digestible nutrients when compared on the dry basis. Silage had a higher content of carotene.

The results from a 30-day double reversal trial with 2 groups of 4 cows fed during alternate periods on either hay or silage supplemented with equal amounts of maize showed that there was no significant difference in the amounts of fat-corrected milk produced or in the amount of total digestible nutrients consumed. The fodders proved equal for milk production when grain was not included in the ration. Since previous reports (Absts. 3036, Vol. 22; 3657, Vol. 23) had shown that mature hay was deficient in an unidentified lactation factor, it was concluded that in this case both fodders were of equal value as sources of this factor.—J. N. Aitken.

1380

MARKOVA, K., AL'TMAN, A. and SIMON, E. Korn-
lenie korov sakharnoi svekloi i sostav moloka.
[Feeding sugar beet to cows and the composition
of their milk.] *Mol. Prom.*, 1954, 15, No. 4,
38-39. [All-Union Sci. Res. Inst. Animal
Breeding.]

Cows producing milk with a high butterfat content react better to sugar beet feeding than do cows producing milk with a low butterfat content. In one experiment both yield and butterfat content rose when the cows were given sugar beet. In 2 experiments sugar beet led to a decrease in the size of the fat globules and an increase in the number of small globules. Giving potatoes to cows had little effect on the average diameter of the fat globules. From experimental results it is assumed that not all animals respond equally to the introduction of sugar beet into the ration. Of the 2 breeds of cows in an experiment the fat content of the milk produced by Latvian Brown cows increased to a considerably higher degree than did that of the other breed when both were given sugar beet.—H. Scherbatoff.

1381

BREIREM, K. Heimeavlet for til stôrfe. [Home-
grown fodder for cattle.] *Tidsskr. norske
Landbruk*, 1954, 61, 173-210.

This is a review prepared for a conference arranged by FAO, OEEC and EAAP in March 1953. It covers briefly the economic importance of cattle, fodder as the basis of feeding, the evaluation of fodder, standards for the requirements of energy and protein, effect of plane of nutrition on milk production, the usefulness of standards in practice, the bulk and net energy value of feeds, the maximum use of homegrown fodder and corresponding need for concentrates for milk and for

meat, the balancing of rations that contain much homegrown fodder, and fodder production.

I. Leitch.

1382

HOLMES, W. High milk yields per acre from grass-
land. *J. Brit. Grassland Soc.*, 1954, 9, 17-27.
[Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Potential milk yields per acre are considered in the light of evidence obtained from experiments on small grass plots of varying basic fertility and clover content, and from a dairy cow grazing trial. The increase in yield per acre of herbage dry matter, starch equivalent and protein was found to be almost linearly related to the supply of up to 300 lb. elemental N in fertiliser per acre. At this level, under the conditions of climate and soil, it is suggested that 50 cwt. starch equivalent per acre should be obtainable with good methods of utilisation by conservation and grazing. Results from the grazing trial showed that this level of production was achieved on heavily fertilised pastures which received 568 lb. of fertiliser N over 3 years. The yields, on average, were about 50 per cent. above that of pastures receiving light dressings totalling 159 lb. of fertiliser N over 3 years. Total N supply was estimated to be increased considerably by the animals' excreta. From these experiments, and calculations on the productivity of different grass farming systems, the inter-relationships between available N, yields of dry matter and starch equivalent per acre, and carrying capacity and milk yield per cow and per acre are expressed graphically. Higher production per acre can be obtained either by raising milk yield per cow or by increasing grass yield. From examination of the graph the latter course is considered to be the more effective.—J. L. Corbett.

1383

BERGE, S. Mjølkeavdrått på landbrukshøgskolens
gårdsbruk 1858-1953. [Milk yield on the
college farm 1858-1953.] *Meld. Norges Land-
brukshøgsk.*, 1954, 34, 345-372. English sum-
mary.

The records cover number and liveweight of cows, feed consumption, total milk produced and yield per cow, and, less completely, fat and solids-not-fat of milk. The herd began with 20 Ayrshires and 20 Telemark cows, but its subsequent history, in terms of breed, is not described. Cows have increased in weight; fat percentage has risen only since about 1940, and yield per cow has about doubled since the beginning of the century. Cost of production in terms of feed units per kg. milk does not seem to have changed.—I. Leitch.

1384

HANCOCK, J. Studies of grazing behaviour in
relation to grassland management. 1. Varia-

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tions in grazing habits of dairy cattle. *J. Agric. Sci.*, 1954, 44, 420-433. [Ruakura Animal Res. Stat., N.Z. Dept. Agric.]

Ten sets of lactating twin cows grazed on different pastures and their grazing behaviour is described over 4 periods of 14 days. Grazing times were short with an abundant supply of high-quality grass and increased when the grass was longer or the supply decreased; long when the grass was abundant but of mixed quality, and longest when the grass was very short, whether of good or poor quality. Ruminating time was short on good quality grass even when the supply was scanty, and was prolonged by poor quality grass.

Change of pasture was followed by rapid adjustment of grazing habits. Weather had little effect.

A. Hepburn.

1385

PUHAČ, I. and PRIBIČEVIĆ, S. [A contribution to the study of cattle grazing behaviour in natural conditions.] *Acta vet., Belgrade*, 1954, 4, No. 2, 17-26. [Inst. Vet. Hyg.] In Russian: English summary.

See also Absts. 241, 255, 259, 504, 857.

REPRODUCTION

1386

BANE, A. Studies on monozygous cattle twins. 15. Sexual functions of bulls in relation to heredity, rearing intensity and somatic conditions. *Acta Agric. scand.*, 1954, 4, 95-208. [Dept. Obstet., Royal Vet. Coll., Stockholm.]

The literature is reviewed. Six pairs of identical twin bull calves of the Swedish Red and White breed were reared to 1½ years on high, medium or low planes of nutrition. After that time they all received equal amounts of feed. Study of sexual activity began at 1½ years when semen collections were made once a week and measurements were made of volume, sperm concentration, sperms per ejaculate, initial sperm motility, duration of motility and sperm morphology. State of health

was closely watched and post-mortem examination made of sex organs, pituitary, thyroid, parathyroid, adrenal and bones of the sacro-iliac joint.

The rearing ration for all planes was of milk, concentrates, roots and hay, the higher planes receiving more concentrates, and supplied 1601, 2176 or 2634 feed units daily. Owing to accident one pair of calves had to be destroyed at 28 months, 3 pairs were used for 50 to 58 months, and 2 pairs for 82 to 89 months.

Higher feeding intensity was reflected in increased rate of growth during the rearing period to 18 months, but at 36 months this difference had disappeared.

There was no significant linear regression between rearing intensity and any sperm characteristic, but there was a tendency to higher frequency of abnormal sperm heads with increasing feed intensity. There were large genetic differences between pairs in sperm characteristics.

Rearing intensity had no effect on mating behaviour. Impotence occurred in 3 pairs at the same age for twins of the same pair.

High rearing intensity showed an increase in size of the testicles and epididymides in 3 of the pairs and of the seminal vesicles in 5. The lower weight of the adrenals in the high-plane group is attributed to decreased activity of the thyroid.

J. S. Thomson.

1387

KÁBET, J. and ŠTOURAČ, J. Výsledky pokusů s krmením býků s ohledem na jakost semene. [Results of experiments on the feeding of bulls with regard to the quality of sperm.] *Spisy fak. vet.*, 1953, 22, 77-87. [Inst. Diet., Vet. Fac. Agric., Univ. Brno.]

Increasing the amount of minerals in the feed of bulls caused an increase in the vitality of the sperm even if the animals had received during the preceding period a sufficient amount of minerals. A supplement of vitamin C had a similar effect.

M. Prokšová (Czechoslovakia).

See also Abst. 352.

SHEEP

1388

BLAXTER, K. L. and GRAHAM, N. M. Plane of nutrition and energy utilization by sheep. *Proc. Nutrition Soc.*, 1954, 13, vii-viii. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

1389

BUOY, L. L., GARRIGUS, U. S., FORBES, R. M., NORTON, H. W. and JAMES, M. F. Arsenical supplements in lamb fattening rations. *J. Animal Sci.*, 1954, 13, 668-676. [Dept. Animal Sci., Univ. Illinois, Urbana.]

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In trials involving 160 feeder lambs, supplements of arsenic acid were given at levels of 0-002, 0-004, 0-006, 0-012 and 0-024 per cent. of the total ration and potassium arsenite and arsenic acid at similar levels of arsenic content. None of these compounds added to high- or low-quality rations consistently increased weight gains, nor did they reduce the numbers of coccidia. Treatment did not appear to affect rumen microflora, prothrombin time, wool growth, liver, kidneys or adrenal glands. No toxic effect or influence on appetite was noted.

J. C. Gill.

1390

WHITING, F., CLARK, R. D. and ALLEN, C. E. Synthetic estrogen in lambs. 1. The effect of diethylstilbestrol on weight gains and carcass grades of feeder lambs.

ELLIS, P. J., ALLEN, C. E. and WHITING, F. 2. The diethylstilbestrol content of treated lamb tissues. *Canad. J. Agric. Sci.*, 1954, **34**, 288-291; 292-298. [Exp. Stat., Lethbridge, Alta.]

1. Two groups of feeder lambs, average weight 57 lb., were used, one group having an implant of 12 mg. diethylstilbestrol subcutaneously. After 106 days on a ration of alfalfa hay and grain to appetite the treated group showed the greatest daily liveweight gain, 0.50 lb. as against 0.40 lb. for the control, the highest carcass weight, 51.2 lb. as against 50.2 lb., but the lowest dressing percentage, 46.4 per cent. as against 49.9 per cent. Feed efficiency based on feed consumption per 100 lb. liveweight gain was best in the treated group, but there was no difference between the groups when efficiency was expressed per 100 lb. carcass gain. In the treated group the moisture content of the round of leg was 55 per cent. and in the control 50.8 per cent.; corresponding figures for ninth and tenth rib portion were 38.8 and 35.1 per cent. It is concluded that the increase in bodyweight after diethylstilbestrol treatment is due to increased moisture content of the tissues and to a greater amount of offal.

2. Estimation of residual oestrogen activity of kidney fat, shoulder muscle, and liver 15 weeks after implantation of diethylstilbestrol showed, from changes in the uterine weights of weanling rats after injection, that the amounts did not exceed 7.1 μ g. per 100 g. kidney fat, 2.8 μ g. per 100 g. shoulder muscle and 4.0 μ g. per 100 g. liver.

J. S. Thomson.

1391

KEITH, T. B., LEHRER, W. P. (Jr.) and HEDEGAARD, M. T. Peas—a source of protein for sheep. *Univ. Idaho Agric. Exp. Stat. Res. Bull.* No. 24, October 1953, pp. 15.

Five groups of ewe lambs weighing 65 to 100 lb. were fed to appetite for 63 days on a low-protein roughage and a concentrate of barley and oats with (1) Austrian peas (*Pisum arvense*), (2) Austrian peas plus 0.3 per cent. DL-methionine, (3) Alaska peas (*Pisum sativum*), (4) Alaska peas plus DL-methionine. A fifth group had a concentrate of cereals and soya bean oilmeal. Average daily gains, in the above order, were: 0.38, 0.38, 0.30, 0.40 and 0.34 lb., and feed consumption per 100 lb. gain 784, 778, 907, 762 and 841 lb. Similar results were obtained in paired feeding trials.

It is concluded that Alaska peas are deficient in methionine. When such a supplement is added they have a feeding value equal to that of Austrian peas.—J. S. Thomson.

1392

KEDROVA, S. I. O skarmivanii karakul'skim ovtzam izmel'chennykh grubosteb'chatykh kormov. [Feeding finely-chopped coarse-stalked fodder to Karakuls.] *Karakul. Zverovodstvo*, 1953, **6**, No. 6, 31-34. [All-Union Sci. Res. Inst. Karakul Management.]

Hay made from these fodders was chopped and some of it ground to a fine meal. If of necessity sheep had to be given this kind of fodder during the winter without concentrates, it was eaten more readily when chopped and ground than in the form of hay. When the sheep need a more nutritious feed the meal should be mixed with concentrates. Less energy is required to chew and digest the chopped hay or meal and therefore the sheep put on more weight than with whole hay. It is concluded that the amount of fodder eaten depends not only on its composition, but also on the method of its preparation and feeding.

H. Scherbatoff.

1393

JORDAN, R. M. and WEAKLY, H. Feeding Dakota lambs. Results of feeding trials at the Newell Field Station. *S. Dakota Agric. Exp. Stat. Bull.* No. 403, June 1950, pp. 7.

Results of lamb feeding trials over 6 years showed that mortality, average daily gain, average daily feed consumption and efficiency of feed conversion were not affected by the number of lambs per group or the area allotted per lamb or by feeding twice compared with 3 times daily. Lambs self-fed on 70 per cent. maize and 30 per cent. chopped alfalfa had a higher death rate but made higher average gains and were more efficient in feed utilisation than lambs fed on 70 per cent. barley and 30 per cent. chopped alfalfa. Lambs hand-fed on maize and alfalfa were more efficient and made gains equal to or greater than those of lambs hand-fed on barley and alfalfa. Death losses were equal. Chopped hay showed no advantage over long hay.—J. C. Gill.

1394

MCCLYMONT, G. L. Intensive hand feeding for growing and fattening sheep. *Agric. Gaz. N.S.W.*, 1954, **65**, 301-305. [Nutrit. Res. Lab., Vet. Res. Stat., Glenfield, N.S.W.]

The intensive hand-feeding of drought-stunted lambs would appear to have commercial possibilities in Australia. Two experiments are reported, in one of which the hand-feeding of alfalfa chaff alone for 56 days produced liveweight gains of 16.8 lb. as compared with 1.9 lb. with wheat chaff, and a mixture of alfalfa chaff and oat grain produced gains of 20.5 lb. as compared with 10.6 lb. with wheat chaff and oats.—J. S. Thomson.

N.A. and R., January 1955

1395

- LEWIS, C. J. **Observations on the production of fat lambs in Anglesey 1952 and 1953.** *Dept. Agric. Econ., Univ. Coll. Wales, Aberystwyth*, 1954, pp. 42. Price 3s.

An increase in sheep population since 1945 and heavier stocking than in 1939 are reported. The flying flock system is the basis of the industry, and the crossbred lambs produced are fattened on grass only. Marketing analyses are reported in detail and show that in 1952 and 1953 18.7 and 24.6 per cent., respectively, of the total sales of fat lambs were graded at 41.7 lb. estimated dead weight (E.D.W.) and 39.5 lb. E.D.W., respectively, during June, i.e., 1 lb. heavier than the average for each of these years. Lambs sold after June would have made more profit if they had been sold earlier. Average E.D.W. of lambs fell from mid-July to mid-November. Data are included of a sample of 28 Anglesey flocks which show that there is a high ewe mortality and that "high margin" farms produce a higher percentage of lambs to ewes tupped and sell heavier lambs than "low margin" farms.—J. C. Gill.

1396

- JORDAN, R. M. and SHAFFHAUSEN, D. D. **Effect of Somatotropin on milk yield of ewes.** *J. Animal Sci.*, 1954, **13**, 706-710. [S. Dakota Agric. Exp. Stat.]

Six ewes given an intramuscular injection of 25 mg. Somatotropin once daily for 6 consecutive days produced, on the seventh day, 40 per cent. more milk than 6 control ewes. A highly significant increase occurred in the percentage of fat in the milk of the treated animals and a non-significant decrease in the non-fat solids. In a second trial 4 ewes milked twice weekly over a 3-week period of daily injections gave an increase of 22 per cent. in milk yield and of 2.3 in percentage units of fat. Both increases were highly significant. Feed consumption of 3 of the ewes increased during treatment. In both trials milk yield and fat percentage returned to pre-treatment levels 3 to 10 days after treatment was completed.

J. C. Gill.

1397

- WHITING, F., SLEN, S. B., BEZEAU, L. M. and CLARK, R. D. **The sulphur requirements of mature range ewes.** *Canad. J. Agric. Sci.*, 1954, **34**, 261-268. [Exp. Stat., Lethbridge, Alta.]

Ninety-six mature grade Romney ewes were used in an 8-month trial in which rations were given containing sulphur at levels of 0.08 per cent. (basal ration), 0.13 and 0.17 per cent. (basal and organic sulphates), 0.13 and 0.17 per cent. (basal and elemental S) and 0.13 per cent. (basal and methionine). There was no significant difference

between ewes on the different levels in respect of weight gain, wool production, lamb production and sulphur content of blood serum, colostrum or wool. Results indicated that 0.1 per cent. total S in the ration supplies sufficient for mature ewes to produce normal lambs and fleeces.—J. C. Gill.

1398

- AYER'YANOV, I. YA. **Kachestvo karakulya v zavisimosti ot uslovii kormleniya i soderzhaniya ovetz.** (Opyt perevoda karakul'skikh ovetz iz Kazakstana v Turkmeniyu.) [Karakul quality in relation to conditions of feeding and management. (An experiment in transferring Karakul sheep from Kazakhstan to Turkmenistan.)] *Karakul. Zverovodstvo*, 1953, **6**, No. 4, 9-15. [All-Union Sci. Res. Inst. Karakul Management.]

The improvement in the quality of the wool when sheep were moved to Turkmenistan is attributed very largely to improved feeding. The pastures of Turkmenistan provide more continuous and better feeding than do the Kazakhstan pastures which are quite good in summer and autumn but deteriorate in the late winter. On the Turkmenistan sovkhos the winter deficiencies of the pasture were made up by giving the sheep coarse fodders and concentrates. It is therefore essential that under Kazakhstan conditions both coarse fodders and concentrates should be given, particularly during the second half of the winter when the feeding value of the pastures is low.

H. Scherbatoff.

1399

- FERGUSON, K. A. **Prolonged stimulation of wool growth following injections of ox growth hormone.** *Nature*, 1954, **174**, 411. [Dept. Animal Pathol., Milton Rd., Cambridge.]

Wool growth in 2 Romney Marsh and 2 Suffolk ewes, injected daily for a fortnight with an extract of ox anterior pituitary, was significantly greater than in controls during the first week of injections. A significant increase was maintained for 14 weeks after injections had stopped. In a second experiment 4 ewes received 5 mg. ox growth hormone for 5 weeks. A significant increase in wool growth over controls resulted during the injection period and for the following 29 weeks. In this trial the increase was greater in the Suffolk than in the Romney Marsh ewes. In Lincoln ewes wool growth was stimulated during the injection period only.—J. C. Gill.

1400

- CLARK, G. L. and BUHRKE, V. E. **Effect of elemental sulfur in the diet on load-extension hysteresis in single wool fibers.** *Science*, 1954, **120**, 40. [Dept. Chem., Univ. Illinois, Urbana.]

An apparatus was designed especially for measuring, under suitably comparable circumstances, the elongation of single wool fibres produced by the application of known loads. Reproducibility of stress-strain curves was good with both addition and removal of weights.

Wool samples were obtained from sheep fed to appetite on a basal ration with 0.05 per cent. S. Powdered S was added in 6 amounts from 0.20 to 0.70 per cent. With no S added the loop of tension

and relaxation was extremely narrow; with increase in S the area of the loop increased and at the 0.7 per cent. level it was 3 times that at the 0.2 per cent. level. It is concluded that the additional S was metabolised and added to the disulphide linkages between the keratin molecules of the fibres.

The apparatus and findings are to be described elsewhere in more detail.—D. Harvey.

See also Absts. 350, 351.

PIGS

1401

NATIONAL RESEARCH COUNCIL, U.S.A. Nutrient requirements for domestic animals. 2. Nutrient requirements for swine. Publ. No. 295, revised August 1953, pp. 28. Price \$0.50.

This publication is a revision of an edition published in 1950 (Abst. 3093, Vol. 22). The tables of nutrient requirements have been extended to include 25-lb. pigs. Crude protein requirement has been reduced for growing pigs and lactating adult sows, but increased for pregnant adult sows. For breeding stock and several weight groups of market stock both Ca and P requirement have been increased. For market stock carotene requirements have been halved, and for breeding stock they have been reduced by one-sixth. All vitamin D and riboflavin requirements have been raised. Pantothenic acid requirement for breeding stock has been added, as have choline and vitamin B₁₂ requirements for young pigs.

Data are included for the first time in this edition on essential amino-acid requirements for weanling pigs, and there is also a table giving the approximate amino-acid composition of some pig feeds. Much more information is given on requirements of certain trace minerals, and a new table of tentative quantitative recommendations for Cu, Fe, I and Mn has been added. There is a new paragraph giving a summary of experimental findings on the usefulness of dietary antibiotics for all classes of pigs, with data on rates of inclusion in the ration. The table of clinical signs of dietary deficiencies has been extended to include choline and vitamin B₁₂, and choline has been included in the table of composition of feeding-stuffs. The list of feedingstuffs in this second table has also been extended. Photographs have been added to show typical signs of calcium, pantothenic acid and lysine deficiencies.

I. A. M. Lucas.

1402

CLAUSEN, H. and THOMSEN, R. N. 42. Beretning om sammenlignende forsøg med svin fra statsanerkendte avlscentre 1952-53. [42nd

Report on comparative tests with pigs from state recognised breeding centres 1952-53.] *Forsøgslab. København Beretn.* No. 273, 1954, pp. 141.

The work at 3 new pig testing stations is described. The pigs are individually fed on barley and skimmed milk with 1.5 g. cod liver oil daily, providing 3000 I.U. vitamin A and 300 I.U. vitamin D, and 5 to 10 g. daily of a mixture of 80 per cent. chalk and 20 per cent. salt. A table details the allowances of milk and barley at weights from 13 to 15 to 88 to 92 kg. Only best quality Danish barley is used. Its composition month by month is shown. The milk is sampled daily and analysed twice a month.

Points of interest from the report are: the distribution curves of measurements of backfat (p. 20) show the reduction both of mean thickness and of dispersion since 1926-27 and 1935-37. The present mean for Landrace test pigs is 3.43 cm.; the ideal is believed to be 3.25 which, from the distribution, will give the greatest number of pigs in Class 1. Since the thickness of backfat depends on genetic capacity to produce lean, on weight at slaughter and inversely on body length, selection should be for capacity to produce meat and for length. The target may easily be overshoot, but an additional 2 cm. to 95.5 cm. length might be safe.

Tables show the growth rates of Landrace and Yorkshire pigs from 1923-24 and mean feed consumption in feed units at intervals from 1909-10. Daily increase in weight has increased from 597 to 665 g. for Landrace and from 595 to 654 for Yorkshire. Feed consumption has decreased from 3.77 for Landrace and 3.89 for Yorkshire to 3.06 and 3.09 feed units per kg. weight gain.—I. Leitch.

1403

BECKER, D. E. and TERRILL, S. W. Various carbohydrates in a semipurified diet for the growing pig. *Arch. Biochem. Biophys.*, 1954, 50, 399-403. [Dept. Animal Sci., Univ. Illinois, Urbana.]

During one experiment which began when the

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pigs were 9 weeks old and lasted for 39 days, the diets contained 50 per cent. of either glucose, lactose, sucrose, dextrin or maize starch. Pigs with lactose in their diet ate less feed and grew more slowly than those on the other treatments ($P < 0.01$) but there was no statistically significant difference in feed required per kg. liveweight gain.

A second experiment began when the pigs were 16 weeks old and also lasted for 39 days. To the diet was added 6.25, 12.50, 25.00 and 50.50 per cent. lactose, and each level was given with and without an antibiotic supplement. Only the 50 per cent. level had a marked depressing effect on feed intake, growth rate and efficiency of feed conversion. Antibiotics tended to suppress these ill effects on feed intake and growth rate, but did not affect feed conversion efficiency. During both experiments moderate diarrhoea was associated with high levels of lactose in the diet.

A comparison of results previously obtained by 2 of the authors with those presented showed that the lactose tolerance of the pig decreases with age, but the ability to utilise sucrose increases with age.—I. A. M. Lucas.

1404

BECKER, D. E., ULLREY, D. E., TERRILL, S. W. and NOTZOLD, R. A. Failure of the newborn pig to utilize dietary sucrose. *Science*, 1954, 120, 345-346. [Dept. Animal Sci., Univ. Illinois, Urbana.]

In continuation of work already reported (Abst. 3929, Vol. 24), 4 groups of newborn pigs were given, for 9 days, the same synthetic milk diet with D-glucose, sucrose, D-fructose or invert sugar constituting 57 per cent. of the dry matter. Survival and growth rates were best in the D-glucose and invert sugar groups; of 7 and 6 pigs, respectively, in them, 1 died in each group and the average weight gains by survivors over the period were 1.12 and 0.49 kg. In the sucrose and D-fructose groups each with 7 pigs, 6 and 5 died and for these groups the averages for weights at death or at termination of the experiment were 0.32 and 0.31 kg., respectively, less than the average initial weight. With either sucrose or D-fructose diarrhoea was severe after 18 hr. and became progressively worse; with invert sugar it was moderate and with glucose it did not occur.

It is concluded that the baby pig is unable to hydrolyse the glycosidic bond of sucrose because, it may be, of the absence of intestinal sucrase.

D. Harvey.

1405

LEROY, A. M. Variation des besoins alimentaires des porcs en fonction de la saison. [Variation in feed requirements of pigs according to season.] *Ann. Zootech.*, 1953, 2, No. 1, 1-9. [Dept. Zootech., Inst. Nat. Agronom., Paris.]

Vol. 25, No. 1

This statistical study was made on the records of Large White pigs at the Bois-Corbon experimental station, and in particular of the weight changes and feed consumption of fattening pigs from 25 to 100 kg. in weight.

Summer and autumn were the best seasons for fattening pigs and winter the worst, but in the youngest animals, from 25 to 35 kg. in weight, summer was the worst time for growth. Pigs weighing more than 65 kg. obtained less benefit from the warm months than did those of 35 to 65 kg. Pigs weighing less than 55 kg. were more sensitive to the cold season than older animals. Less feed was required per kg. liveweight gain between June and November than between December and May. It is considered that the micro-climate of the piggery may have an important influence on the economics of production of fat pigs.—D. Duncan.

1406

PONOR, R. Contribution à l'étude de l'alimentation du porc. Les aliments composés équilibrés. [Study of pig nutrition. Balanced compound feeds.] *Thesis, École Nat. Vét. Alfort*, 1953, pp. 92.

1407

KRÜGER, L., BIEDERMANN, F. and PETZOLD, E. Zwei Jahre hessische Schweine-Mastleistungsprüfung auf dem Oberen Hardthof bei Giessen. [Two years of fattening tests with Hessian pigs at Upper Hardthof near Giessen.] *Der Tierzüchter*, 1953, No. 2.

Records before the war showed that, between the liveweights of 30 and 90, or 40 and 100 kg., pigs might eat anything from 2.8 to 6 kg. fattening ration per kg. weight increase. The saving in feedingstuffs that would be procured by using only the more efficient pigs would be enormous. Post-war litter testing at the Oberen Hardthof, the farm of the Animal Breeding College at Giessen, is briefly described. Up to 1944 the records show a range from 363 to 909 g. weight gain daily and from 2.86 to 5.76 kg. feed per kg. weight gain. Post-war the standard of performance for approved litters has been not more than 3.8 kg. of the prescribed ration per kg. weight gain from 40 to 110 kg. liveweight and a daily increase of at least 650 g. Of 49 groups tested, 28 attained that standard. The mean performance of this approved group, and the range for the whole lot of litters, were: feed, kg. per kg. weight gain, 3.53 and 2.94 to 4.22; daily weight gain 720 and 507 to 873 g.; age in days at 110 kg. 205 and 180 to 258.—I. Leitch.

1408

BECKER, D. E., LASSITER, J. W., TERRILL, S. W. and NORTON, H. W. Levels of protein in

practical rations for the pig. *J. Animal Sci.*, 1954, 13, 611-621. [Univ. Illinois, Urbana.]

Three experiments are reported. In experiment 1, weanling Duroc pigs were fed from 42 to 100 lb. liveweight on maize, vitamin, mineral and antibiotic diets supplemented with solvent-extracted soya bean oilmeal (44.6 per cent. protein) or Menhaden fishmeal (62.5 per cent. protein) to bring the protein up to 10, 12, 14 and 16 per cent. From 100 to 200 lb. liveweight the pigs were re-randomised and fed on similar diets containing 10, 12 or 14 per cent. protein. Experiment 2 followed the same pattern except that before 100 lb. the levels of protein studied were 12, 14, 16 and 18 per cent. and after 100 lb. 8, 10 and 12 per cent. In both experiments an equalised feeding technique was used. In experiment 3, pigs were full-fed from 40 to 100 lb. on supplemented maize and soya bean oilmeal diets containing 10, 12, 14 and 16 per cent. protein.

For growth from 42 to 100 lb. liveweight there was no advantage in any experiment of raising the protein level of the maize and soya bean oilmeal diets above 14 per cent., but 16 per cent. protein was better than 14 per cent. in the maize and fishmeal diets. From 100 to 200 lb. liveweight the type of supplementary protein was without effect. In experiment 1, there was no significant difference between the 10, 12 and 14 per cent. protein levels, but in experiment 2 the difference in favour of 12 per cent. protein over 8 or 10 per cent. was significant.

It is stated in the discussion that lower total protein levels might be satisfactory when derived from low-protein maize and a higher proportion of soya bean oilmeal. It is suggested that tryptophan is the limiting amino-acid necessitating the slightly higher total protein percentage in maize and fishmeal diets before 100 lb. liveweight and also that the amino-acid requirements of the weanling pig are lower than is currently recognised. In the experiments reported the lysine, tryptophan and methionine content of the rations which supported satisfactory performance was 0.63, 0.13 and 0.23 per cent. from 40 to 100 lb. and 0.52, 0.10 and 0.21 per cent., respectively, from 100 to 200 lb.

I. A. M. Lucas.

1409

TERRILL, S. W., BECKER, D. E., NORTON, H. W., WARDEN, W. K. and ADAMS, C. R. Some plant and animal sources of crude protein for weanling pigs fed in drylot. *J. Animal Sci.*, 1954, 13, 622-629. [Univ. Illinois, Urbana.]

In experiment 1, there was no advantage to pigs between 36 and 100 lb. liveweight of increasing the protein content of a diet of soya beans, maize, vitamins, minerals and antibiotic from 16 to 18 per cent. When a similar diet contained meat-and-bone scraps instead of soya bean, with the

total protein kept at 18 per cent., there was a significant advantage from additional supplementation with DL-tryptophan. There were significant differences between the growth rates of pigs on diets of maize, minerals, vitamins and antibiotic supplemented with a blend of 5 samples of extracted soya bean oilmeal, a new process-extracted soya bean oilmeal or a blend of 4 samples of meat-and-bone scraps. The average daily gains adjusted to equal feed consumption were 1.19, 1.09 and 0.96 lb., respectively.

In experiment 2, 16 pigs were fed individually on semi-purified diets containing about 11 per cent. crude protein derived from dried skimmed milk, blended soya bean oilmeal, new process-extracted soya bean oilmeal or blended meat-and-bone scraps. On the basis of rate of liveweight increase and efficiency of feed conversion there was no significant difference between the protein qualities of the soya bean meals, but the protein of dried skimmed milk was better than that of soya bean oilmeal, which was better than that of meat-and-bone scraps.—I. A. M. Lucas.

1410

HIRONAKA, R. and BOWLAND, J. P. Antibiotic feed supplements in western Canadian swine ration. *Canad. J. Agric. Sci.*, 1954, 34, 343-352. [Dept. Animal Sci., Univ. Alberta, Edmonton.]

Two experiments are reported. In the first, 7 groups of 6 Yorkshire weanling pigs were each self-fed with one of the following supplements added to 1 lb. basal ration: (1) none, (2), (3) and (4) 9 mg. aureomycin hydrochloride to 75, 125 and 200 lb. liveweight, respectively, (5), (6) and (7) 1 mg. procaine penicillin to 75, 125 and 200 lb. liveweight, respectively. All pigs were slaughtered at 200 lb. From weaning to 75 lb., pigs receiving aureomycin grew significantly faster than both the controls and those receiving penicillin. From weaning to 125 lb. or to 200 lb. there was no significant difference in growth between treatments, but the fastest growth rates were in groups (3) and (4). Although in the early stages of growth efficiencies of feed conversion of some groups receiving antibiotics were better than for the controls, there was no significant difference between groups over the whole experimental period. Giving antibiotic supplements only to 75 or 125 lb. affected neither carcass grade nor score, but giving them to slaughter tended to reduce carcass length. The carcasses from all groups receiving antibiotics shrank significantly more during chilling than the controls.

In the second experiment all-vegetable protein rations containing 17, 15 or 13 per cent. crude protein were given to weanling pigs with and without 2 mg. procaine penicillin per lb. From 110 to 200 lb. liveweight these pigs all received a 13 per cent. protein ration without antibiotic.

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There were 2 replicates of the experiment. In replicate A, all pigs receiving penicillin grew significantly faster than those on the basal rations, and this advantage was maintained from 110 to 200 lb. liveweight. The response to antibiotic increased with protein level, but feed efficiencies were not appreciably affected by antibiotic. In replicate B, penicillin did not improve liveweight gain or feed efficiency, and when antibiotic was removed from the diet after 110 lb. liveweight there was a check in the growth of pigs previously given the 15 and 13 per cent. protein levels.

In replicate A, but not in B, backfats were thicker and areas of the "eye of lean" were smaller in carcasses from antibiotic-fed pigs. In both replicates there was increased carcass shrinkage on cooling in the antibiotic groups. Differences in carcass quality between replicates may have been a reflection of the different growth responses obtained.—I. A. M. Lucas.

1411

AMSCHLER, J. W. and WALASEK, E. Fütterungsversuche mit Antibiotika. Mastversuche normaler Schweine und Kümmerer mit Aureofac-2A unter Berücksichtigung der Freilandhaltung und verschiedener Stufen tierischen Eiweisses. [Feeding experiments with antibiotics. Fattening experiments with normal and unthrifty pigs with Aureofac-2A taking into account outside runs and level of animal protein (in rations).] *Bodenkultur*, 1953, 7, 239-250. [Inst. Tierzucht, Hochsch. Bodenkultur, Vienna.]

Two groups of pigs were selected from a lot of 100, aged 3 to 6 months, bought in open market, 32 "Kümmerer", weight 18 to 33 kg., average 25.0 kg., and 50 "normal" pigs, weight 21 to 47 kg., average 35.2 kg. They were similarly fed and managed except that the subnormal pigs had Aureofac-2A for the first 57 days, to supply per head daily 1.482 mg. aureomycin. During the first 27 days both groups had as part of their ration a silage of poorest quality. Of this the control group ate much more than the subnormal, had diarrhoea and put on no weight. Most of the advantage of the Aureofac group accumulated during this phase. In the second part of the experiment, 36 days, the groups were combined but weighed separately; Aureofac was omitted. There was no difference between the weight increases.

In a similar experiment 26 Kümmerer again had Aureofac and there were 44 controls without. For the first 57 days all had fishmeal, thereafter only plant protein. The Aureofac group had a slight advantage in the first stage; they overtook and passed the control group in the plant protein stage to finish at an average weight of about 90 kg. in 49 days. The controls took 76 days so that the

average daily gains were: Aureofac 696 g. and control 440 g.—I. Leitch.

1412

SHIRLEY, R. L., WALLACE, H. D. and DAVIS, G. K. Effect of dietary aureomycin and different levels of protein on several phosphorus and nitrogen compounds in hams. *J. Agric. Food Chem.*, 1954, 2, 830-832. [Dept. Animal Husb., Univ. Florida, Gainesville.]

Fifty-four pigs were divided into 6 groups and fed on maize and soya bean rations containing 14.3, 17.6 or 20.9 per cent. crude protein. Each protein level was given with and without aureomycin at the rate of 20 g. per 100 lb. feed. After slaughter at about 191 lb. liveweight the meat was separated from the skins and bones of hams from several pigs in each group, and was analysed for total solids, 4 nitrogen fractions and 4 phosphorus fractions. Neither protein level nor the presence of aureomycin significantly affected the concentrations of acid-soluble and nucleic P, nucleic acid and ammonia N, and total solids in the meat. Lipid P was significantly increased only when aureomycin was given with the 17.6 per cent. protein diet, and phosphoprotein P was significantly increased by aureomycin only when given with the 2 highest protein levels. The percentages of protein and phosphoprotein N in the hams were highest in the group on rations containing the largest amount of crude protein.

It is suggested that the interaction effect of protein and aureomycin on the lipid P might be associated with the greater backfat thickness of pigs given aureomycin, and that the dietary protein effects on phosphoprotein P and N point to phosphoprotein metabolism as determining the amount of total protein found in the hams.

I. A. M. Lucas.

1413

McKAY, W. M. The feeding of antibiotics to farm animals. *Brit. Vet. J.*, 1954, 110, 329-334. [Spillers, Ltd., London.]

Results are briefly given of extensive trials in different farms in Scotland, England, Wales and the Channel Islands with some 2000 pigs, on the value of giving antibiotics to pigs under different environmental and climatic conditions.

The regular provision of aureofac 2A from about 3 weeks of age up to 100 lb. liveweight gave better results at slaughter than its provision at several other times during that period.

The addition of an antibiotic containing appreciable amounts of vitamin B₁₂ to an all-vegetable ration gave growth results as good as those obtained on a ration containing fishmeal, and efficiency of feed conversion was improved. Antibiotic up to weaning at 8 weeks prevented a post-weaning check in growth.

The administration of aureomycin to pigs suffering from scours was curative, and mortality from paratyphoid infection was reduced by 50 per cent.

J. S. Thomson.

1414

CHILDS, G. A. and CUTHBERTSON, W. F. J. The effect of procaine penicillin on the growth of weaned pigs. *J. Sci. Food Agric.*, 1954, 5, 330-335. [Glaxo Labs., Ltd., Greenford, Middlesex.]

The effect of procaine penicillin on the growth of pigs was tested at 6 farms in the United Kingdom under conditions typical of British pig rearing practice. The pigs were from home-reared litters and rations normally used at each farm were employed.

The average daily weight gain was 1.156 lb. for controls and 1.273 lb. for pigs receiving penicillin at the rate of 5 or 15 mg. per ton of feed, and there was no significant difference in the rate of gain at these levels. Feed efficiency was 4.08 and 3.70 lb. per lb. gain for the control and supplemented groups. It is suggested that a level of penicillin lower than 5 mg. per ton may prove satisfactory.

The results were in close agreement with those reported by the Agricultural Research Council (see Abst. 1324, Vol. 24).—J. S. Thomson.

1415

KROFF, D. H., PEARSON, A. M. and WALLACE, H. D. Observations on the use of waste beef fat in swine rations. *J. Animal Sci.*, 1954, 13, 630-637. [Dept. Animal Husb., Florida Agric. Exp. Stat., Gainesville.]

Four experiments covering 73 pigs are reported and, for all, the control rations were of maize, soya bean oilmeal and meat-and-bone scraps. In experiments 1 and 2 there were 2 dietary treatments, (1) a control and (2) a diet in which 10 per cent. of ground waste beef fat replaced some maize. In experiment 3 the diets were: (1) and (2) as in experiment 1; (3) control plus 10 per cent. beef fat plus 7 B vitamins and (4) hand-fed beef fat plus a self-fed protein supplement. In experiment 4, diets were (1) control; (2) as in experiment (3), diet 3; (3) control plus 10 per cent. beef fat plus 3 B vitamins and (4) control plus 15 per cent. beef fat plus 7 B vitamins. Pigs of average liveweight 115 to 120 lb. were used in experiments 1 and 2, and weanlings were used for experiments 3 and 4.

In the first 2 experiments, pigs given diets containing fat grew as fast as the controls and used slightly less feed per 100 lb. gain. In experiments 3 and 4 it was only when additional B vitamins were added to the diets containing fat that growth rates significantly faster than those of the controls were achieved. This may have indicated a vitamin deficiency in the control diet. Efficiency of feed

conversion was better in groups on diets containing fat, but the hand-feeding of fat and the self-feeding of protein supplement resulted in scouring and slow and inefficient growth. The inclusion of fat in the diet had no significant effect on the dressing percentages, carcass measurements or iodine numbers of depot fats, but animals hand-fed with fat and self-fed with protein supplement were longer and leaner and had lower dressing percentages. These effects may have been related to the slow growth of these pigs.—I. A. M. Lucas.

1416

ILANČIĆ, D., JEŽIĆ, J. and ŠMALCELJ, I. Djelovanje pivskog i pekarskog kvasca na stimulaciju tova starijih svinja. [The effect of brewer's and baker's yeasts on growth stimulation in fattening older pigs.] *Veterinaria*, 1953, 2, 288-298. English summary.

Pigs 12 to 15 months old received a basal ration of ground maize. In the first group the feed was moistened and fermented with baker's yeast. The second group received dry brewer's yeast. The third group was a control. Good results were recorded in the second group, 672 g. daily gain, good appetite and high feed utilisation. There was no difference between the control group and the group on moistened and fermented feed. This was possibly due to poor multiplication of yeasts in the moistened feed.—S. Pribičević (Yugoslavia).

1417

FÉVRIER, R., LEROY, A. M. and ROCHE, J. Influence du mode de séchage sur la valeur alimentaire de la levure de distillerie. [Effect of method of drying on the nutritive value of distiller's yeast.] *Ann. Zootech.*, 1952, 1, No. 4, 1-10. [Stat. Recherches Élevage, C.N.R.Z., Jouy-en-Josas.]

Yeasts grown in beet juice and on molasses were dried in 3 different ways: beet yeast emulsion was dried to powder in a current of air at 140° [presumably °C.]; emulsions of both kinds were dried on rollers at 130° for 10 sec., forming flakes; and both kinds were dried at 60° for 30 to 45 min. and slowly shaken, forming granules. The nutritive values of the dried products were compared in experiments on groups of 7 or 8 pigs with growing and fattening rations.

All beet yeasts gave better weight gains than the molasses yeasts, but the experimental conditions were not identical. The difference in value between the 3 beet yeasts was not significant, but the molasses yeast roller-dried at 130° was slightly inferior to that dried at the lower temperature. Such differences in growth as appeared were due to differences in feed consumption, which were greatest with the "atomised" beet yeast. The results are not considered to be conclusive.

D. Duncan.

N.A. and R., January 1955

1418

CRAMPTON, E. W. and LLOYD, L. E. The use of malt sprouts in the bacon hog ration. *J. Animal Sci.*, 1954, 18, 638-647. [Fac. Agric., McGill Univ., Macdonald Coll., Que.]

In the hope of decreasing growth rate and thus improving carcase quality, malt sprouts were included as a source of fibre in rations for pigs self-fed from 115 to 200 lb. liveweight; but although the addition of 20, 30 and 40 per cent. wheat bran to a diet of barley plus protein and a mineral supplement did reduce rate of gain and improve carcase quality, the addition of 8, 12 and 16 per cent. malt sprouts resulted in stimulation of appetite and higher growth rates. When growth rates were adjusted to the test average daily feed intake they still increased with increasing level of malt sprouts, despite parallel increases in crude fibre content of the diet.

A second experiment planned to extend this observation was discontinued because of scour among the pigs, but there was a much lower incidence of scour among pigs fed on diets containing 12 per cent. malt sprouts than among pigs on the control diet or the control supplemented with 2 g. procaine penicillin and 3 mg. vitamin B₁₂ per ton.

The second experiment was later repeated with pigs from weaning to 200 lb. liveweight. Before 115 lb. liveweight 12 per cent. malt sprouts in the diet stimulated growth, but not so much as a supplement of 5 g. terramycin per ton of feed. When pigs were given the control diet, or the control supplemented with terramycin, before 115 lb., the inclusion of malt sprouts in the fattening diet produced no significant growth response from 115 to 200 lb. liveweight, an observation at variance with the first experiment. When pigs were given a diet containing both terramycin and sprouts before 115 lb., the removal of the sprouts from then on did not affect growth, but when pigs had received sprouts but no terramycin the removal of the sprouts from the fattening diet caused a decline in feed intakes and growth rates. There was therefore a similarity between the effects of malt sprouts and antibiotic, in pig rations. No dietary treatment in the second experiment influenced carcase grading.—I. A. M. Lucas.

1419

LEROY, A. M. and ZELTER, S. Z. Recherches sur l'efficacité alimentaire des marcs de pomme fermiers. 3. Effet de la consommation d'un marc de pomme ensilé sur la croissance du porc. Incidences sur l'utilisation nutritive de la ration. [The feeding value of cider apple residues. 3. Effect of ensiled apple residue on the growth of pigs. Notes on the utilisation of

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the nutrients in the ration.] *Ann. Zootech.*, 1954, 3, No. 2, 109-124. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

See Abst. 5330, Vol. 24.

There were 4 groups of 20 pigs, half of them Large White and half Large White × Normandy crosses. The control rations were those used in the experimental piggery at Bois-Corbon, a relatively high-protein mixture to 60 kg. weight and one with less protein thereafter. It was provided to appetite. The first experimental group had 2 kg. apple silage, barley to appetite and 0.6 kg. of a high-protein mixture; the second had 2 kg. apple silage, 2 kg. steamed potato silage, barley to appetite and 0.6 kg. protein supplement; and the third had apple silage to appetite, barley to appetite and the same allowance of the protein mixture, which was of barley 25, meatmeal 10, fishmeal 7, distiller's yeast 5, groundnut cake 45 and salt mixture 8. A vitaminised oil provided 2500 I.U. vitamin A and 250 I.U. vitamin D₃ daily.

The rations were given mixed, but the pigs separated the parts and ate the concentrate part first, the potatoes second and the apple silage last. The group given apple silage to appetite increased its consumption to 3.28 kg. daily but at that level appetite suffered and barley had to be rationed to maintain apple silage at a high level. Apart from this effect on appetite, there was no sign of intolerance. In composition the rations were almost identical except for crude fibre, which was higher in proportion to the amount of apple silage eaten.

Rates of growth in the experimental groups with rationed apple silage and fibre contents of their rations of 8.9 and 9.1 per cent. (controls 6.1 and 5.2) were the same as or not significantly different from those of the corresponding control pigs. But the high-silage group, fibre 10 per cent., put on only 607 g. daily, or 89.3 per cent. of what the control pigs put on. This is interpreted to mean that the fibre is not responsible, but the physical nature of the apple residue.

Consumption of concentrates was reduced by 13 per cent. in the groups given apple silage and by 34 per cent. in that given both apple and potato. Quality of all carcasses was satisfactory.—I. Leitch.

1420

WHATLEY, J. A. (Jr.), GARD, D. I., WHITEMAN, J. V. and HILLIER, J. C. Meat-type hog production: influence of breeding and energy content of the ration on pork carcasses. *Oklahoma Agric. Exp. Stat. Bull.* No. B-398, May 1953, pp. 11. [Stillwater, Okla.]

Groups of 4 pigs were selected from each of 12 litters, which represented 7 different breeding lines. Each group was subdivided into 2 lots of two. Both lots were self-fed from weaning to 140 lb.

liveweight on identical high-energy rations. From 140 to 225 lb. liveweight one lot was self-fed on a diet containing 1.52 therms metabolisable energy per lb. and the other lot was self-fed on a more fibrous diet containing 1.42 therms metabolisable energy per lb. All pigs were taken off feed for 20 to 24 hr. before slaughter.

From 140 to 225 lb., pigs on the high-energy ration gained 1.96 lb. and those on the low-energy ration 1.38 lb. daily. There were also significant differences in rate of gain between breed groups. No data are given for efficiency of feed conversion between 140 and 225 lb., but from weaning to slaughter pigs on the high-energy ration ate 357 lb. feed per 100 lb. gain and those on the low-energy ration ate 433 lb. Part of this difference was attributed to waste of the unpalatable low-energy diet. For feed conversion efficiency differences among breeds were not significant.

Pigs on the low-energy ration from 140 to 225 lb. produced the longer, meatier and leaner carcasses, but at slaughter their intestinal tract was 2 lb. heavier than that of pigs on the high-energy ration and they dressed out 2 per cent. lower. Gilts produced leaner carcasses than castrated males and had a higher percentage of lean cuts but a slightly lower dressing percentage.

Although there was no significant difference in length or dressing percentage between breed groups there were significant differences in fat measurements and yields of lean cuts. It is concluded that it is more economical and easier to produce

pigs of meat type by proper breeding than by modifying the diet.—I. A. M. Lucas.

1421

FÉVRIER, R. Premières observations sur le comportement alimentaire des porcs. [Food behaviour in pigs.] *Ann. Zootech.*, 1952, 1, No. 3, 63-69. [Stat. Recherches Élevage, C.N.R.Z., Jouy-en-Josas.]

Eight groups of pigs weighing between 40 and 85 kg., accustomed to a standard ration, had their diet suddenly changed to another of similar composition but prepared from different materials. Feed consumption was estimated for 4 days after the change and compared with consumption before the change and after the return to the original diet. Average consumption during the period of change was 2.23 kg. per day as compared with 2.96 kg. on the average before the change and after reversion to the original diet. Consumption by pigs weighing 60 kg. was least affected by the change, but for pigs weighing over or under this amount there was a graded reduction in consumption.—J. S. Thomson.

1422

PUHAČ, I. and PRIBIČEVIĆ, S. [Contribution to the study of pig's behaviour and grazing habits. First report.] *Acta vet., Belgrade*, 1954, 4, No. 2, 65-69. [Inst. Vet. Hyg.] In Russian: English summary.

See also Absts. 489, 505, 858.

GOATS, RABBITS AND OTHER MAMMALS

1423

NATIONAL RESEARCH COUNCIL, U.S.A. Nutrient requirements for domestic animals. 8. Nutrient requirements for dogs. Publ. No. 300, December 1953, pp. iii + 30.

Requirements are complicated by variety of size, body conformation, hair coat, activity and disposition. From a review of the literature it is suggested that the dry type diet should contain 8 to 10 per cent. moisture, 18 per cent. protein for growth or 13.5 per cent. for maintenance, up to 70 per cent. carbohydrate for growth or 75 per cent. for maintenance, 4.5 per cent. fat, 1.0 per cent. Ca, 0.8 per cent. P (the last 2 values being minimum), 1.4 per cent. NaCl and 0.8 per cent. K. Suggested amounts of nutrients required per lb. bodyweight daily for adult maintenance and for growth are: energy 50 and 100 Cal. for 5-lb. dogs, 42 and 84 Cal. for 10-lb. dogs, 35 and 70 Cal. for 15-lb. dogs, 32 and 64 Cal. for 30-lb. dogs and 31 and 62 Cal. for dogs of 50 lb. or over; protein 1.7 and 4.5 g.; carbohydrate 8.0 and 14.7 g.; fat 0.6 and 1.1 g.; Ca 120 and 240 mg.; P 100 and 200

mg.; Fe 0.6 and 0.6 mg.; Cu 0.075 and 0.075 mg.; NaCl 170 and 200 mg.; K 100 and 240 mg.; Mg 5 and 16 mg.; Mn 0.05 and 0.1 mg.; Zn 0.05 and 0.19 mg.; I 0.015 and 0.015 mg.; vitamin A 45 and 90 I.U.; vitamin D 3 and 9 I.U.; vitamin E 1 mg. for growth; vitamin B₁₂ 0.25 and 0.5 µg.; vitamin B₁ 0.008 and 0.015 mg.; vitamin B₆ 0.02 and 0.04 mg.; pantothenic acid 0.025 and 0.045 mg.; nicotinic acid 0.11 and 0.18 mg. and choline 15 and 25 mg. Further tables show estimated food intakes required by dogs of different sizes, energy and feed requirements for dogs of different weights, minimum protein requirements for N equilibrium and amino-acids required to maintain normal plasma protein regeneration.

The amounts listed above would appear to be adequate, but there are frequently no data to show whether they are as low as they might be.

J. S. Thomson.

1424

NATIONAL RESEARCH COUNCIL, U.S.A. Nutrient requirements for domestic animals. 7. Nutrient requirements for foxes and minks. Publ.

N.A. and R., January 1955

No. 296, November 1953, pp. 30. Price \$0.50.

The literature has been reviewed and tables of requirements have been compiled which are subject to revision in the light of further experimental work.

For male foxes the daily requirements for growth at 7, 19 and 35 weeks are given as: protein 15, 53, 28 g., vitamin A 101, 367, 257 I.U., vitamin B₁ 0.06, 0.24, 0.16 mg., riboflavin 0.12, 1.7, 1.2 mg., nicotinic acid 0.6, 2.1, 1.5 mg., vitamin B₆ 0.06, 0.24, 0.16 mg., folic acid 0.012, 0.042, 0.030 mg., Ca 0.4, 1.3, 0.9 g., P 0.4, 1.3, 0.9 g.

For male mink corresponding data at 7, 19 and 31 weeks are: protein 10, 12, 13 g., vitamin A 78, 133, 140 I.U., vitamin B₁ 0.05, 0.08, 0.09 mg., riboflavin 0.09, 0.15, 0.16 mg., pantothenic acid 0.36, 0.61, 0.65 mg., nicotinic acid 0.45, 0.76, 0.81 mg., vitamin B₆ 0.05, 0.08, 0.09 mg., folic acid 0.009, 0.015, 0.016 mg., Ca 0.18, 0.32, 0.36 g., P 0.18, 0.32, 0.36 g.

Allowances for females of the species were somewhat less. Tables of composition of feedingstuffs are appended along with basic formulae for fox and mink diets.—J. S. Thomson.

1425

KAEMMERER, K. Messungen an Ziegenböcken. [Measurements of buck goats.] *Ztschr. Tierzücht. Züchtungsbiol.*, 1954, 63, 71–86. [Inst. Anat. Haustiere, Univ. Bonn.]

1426

GEORGIDZE, V. K. Opyt kormleniya mekhovykh serebristo-chernykh lisitz po umen'shennym normam. [The feeding of silver foxes by reducing the standard amount of ration.] *Karakul. Zverovodstvo*, 1953, 6, No. 6, 42–45. [Bakurian Animal-Sovkhov.]

Feeding fox cubs on reduced rations hastened the maturity of the fur and improved the skins. This reduction to near starvation level caused the animals to shiver and become weak, and they should be transferred to a suitable diet under veterinary supervision.

The rations were reduced from the middle of September from a daily average of 600 Cal. to 350 Cal., and were further reduced in November to 300 Cal. per head, the control group receiving 600 Cal. during the corresponding period in September and 500 Cal. in October and November.

Underfeeding diminishes the layer of fat under the skin and the increasing cold stimulates the growth of fur. The more rapid maturing of the fur diminishes the number of defects in the skin and improves the colour of the fur.—H. Scherbatoff.

1427

RYASHCHENKO, L. P. Kormovye ratziony dlya tyelay pyatnistykh oleney. [Rations for spotted

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deer calves.] *Karakul. Zverovodstvo*, 1953, 6, No. 5, 46–48. [Supporting Point of VNILZO.]

The usual daily amounts given to deer calves during the winter are 1 kg. coarse fodder, 0.3 kg. succulent fodder and 0.5 kg. concentrates. When separated from their dams they are generally given larger rations of both concentrates and succulent fodder, up to 1 kg. of concentrates per head. In order to check the validity of these methods of feeding an experiment was staged with 3 groups of 15 calves, with a preliminary preparation period from 6 December to 19 January and the main period from 20 January to 8 May.

The first group received up to 1.1 kg. mountain hay and 0.64 to 0.74 kg. concentrates per head daily; the second group up to 0.84 kg. hay, 0.15 kg. lespedeza leaves, 0.53 to 0.64 kg. concentrates; the third group up to 0.85 kg. hay, 0.05 to 0.15 kg. lespedeza leaves, 0.53 to 0.75 kg. fodder beet and 0.51 to 0.53 kg. concentrates. The nutrient values for the first group were 0.91 feed unit and 0.11 to 0.13 kg. digestible protein, the second group 0.88 to 0.95 feed unit and 0.12 kg. digestible protein and the third group 0.87 to 0.93 feed unit and 0.10 to 0.11 kg. digestible protein per head. The nutrient values were estimated for the part of the ration eaten.

In the third group the increase in weight was 27.3 per cent. greater than in the first, although the third group was receiving 23.5 per cent. less concentrates than the first group. In the males of the second and third groups development of the horns was better than in the first group. Increase in weight both during the winter and when at pasture was progressively better in the second and third groups, the least increase being in the first group.—H. Scherbatoff.

1428

GUSEV, V. M. Materialy po pitaniyu solongoya (Kolonoos Altaica Pall.) v del'te r. Ili. [Materials for the nutrition of *Kolonocus altaica* Pall. in the delta of the river Ili.] *Zool. Zh.*, 1953, 32, 539–548. [Vses. Nauch.-Issled. Inst. Ohlot. Prom. i Lab. Minzdrava SSSR.]

The basic food of the alpine weasel, *Kolonocus* [now *Mustela*] *altaica*, in the delta of the Ili river during all seasons is rodents of the mouse family, the amount varying with the season from 58 to 81 per cent. of food eaten; the next in order of importance is small birds, particularly during autumn and spring, when they form about 14 per cent. of the food, and fish in winter. Other foods eaten are shrews, sand hare, pheasants' or other birds' eggs, and insects, but these are of secondary importance. At times when, as the result of competition from other predators, there are not

enough mice, *Kolonocis* is compelled in the autumn to eat, up to 9 per cent. of its total food, fish, which it usually does not touch at this season, and in winter to eat 29 per cent. fish and to supplement this with other food normally of secondary importance. Compared with males the females

show a preference for larger animals, e.g., water rats instead of mice. Because it destroys disease carriers *Kolonocis* serves a useful purpose. Cases of its attacking valuable animals are exceptional and do not justify its being killed.—W. Hughes.

See also Abst. 264.

POULTRY

GROWTH AND FATTENING

1429

TRENCH, H. and HEUSER, G. F. Ultimas conquistas en la ciencia del la alimentación de las aves. [Recent scientific discoveries in poultry nutrition.] *Zootechnia*, 1954, 3, 157-163. [Lab. Biol. Animal, Pondo, Canelones, Uruguay.] English and German summaries.

A review without references.

1430

NATIONAL RESEARCH COUNCIL, U.S.A. Nutrient requirements for domestic animals. 1. Nutrient requirements for poultry. Publ. No. 301, revised January 1954, pp. 27. Price \$0.50.

This new edition adheres to the pattern previously used in these publications. Nutrient requirements are, however, now presented without any "margin of safety" to allow for losses during the preparation and storage of mixed rations. It is considered that individual manufacturers can best determine margins suitable for their own particular conditions.

Estimates for folic acid requirements have now been included. For starting chicks, laying hens and breeding hens these are 0.25, 0.11 and 0.16 mg., respectively, per lb. feed. In arriving at these estimates more account has been taken of experiments in which starch and not sucrose has formed the main dietary carbohydrate; with the latter, requirements are higher.

A tentative figure of 0.004 mg. per lb. is given as an allowance of vitamin B₁₂ in a chick starting ration, but it is emphasised that the chick's requirement of this vitamin depends to a great extent on the diet received by the breeding flock, and on the other components of the chick ration.

Figures are also included for the amino-acid requirements of laying hens and for the total feed requirements of laying hens differing in bodyweight and level of egg production; for example, the daily requirement of a 4½-lb. bird laying 200 eggs per year is given as approximately 4 oz.

K. J. Carpenter.

1431

FISHER, H. and SCOTT, H. M. The essential amino acid requirements of chicks as related to their proportional occurrence in the fat-free carcass.

Arch. Biochem. Biophys., 1954, 51, 517-519. [Dept. Animal Sci., Illinois Agric. Exp. Stat., Urbana.]

From data reported elsewhere in the literature, for many of the essential amino-acids the requirement of the chick as a percentage of its ration (*y*) and its concentration in the body as a percentage of a 4-week-old carcass (*x*), closely fit the equation $y = 0.256 - 0.034x - 0.027x^2$.

The usually accepted figures for methionine and lysine are not in agreement with this, but for each a figure has been reported by other workers which is in close agreement. The only other amino-acid which is off the curve to a greater extent than could be explained by possible experimental error is phenylalanine, but there is some confusion about the activity of the D-isomer present in the samples used to obtain the original data.—K. J. Carpenter.

1432

BALDINI, J. T., ROSENBERG, H. R. and WADDELL, J. The protein requirement of the turkey poult. *Poultry Sci.*, 1954, 33, 539-543. [Stine Lab., Grasselli Chem. Dept., E.I. du Pont de Nemours and Co., Inc., Newark, Del.]

Groups of 10-day-old Jersey Buff turkey poults were housed in batteries and given their all-mash rations, containing 0.2 per cent. DL-methionine, to appetite. In experiment 1, 2 basal rations of maize and soya bean oilmeal with alfalfa meal containing 20 and 28 per cent. protein, respectively, were given for the 4-week experimental period. Supplements of 0.30 per cent. L-lysine hydrochloride were given with the 20 per cent. protein ration. This addition improved chick growth, total feed efficiency and protein utilisation.

Experiment 2 was of factorial design with variables of 0.3 per cent. L-lysine hydrochloride, 3 per cent. condensed fish solubles and 1 per cent. complete vitamin concentrate as supplements to the 20 per cent. protein basal ration; a 28 per cent. protein ration was included as a control. The lysine supplement significantly improved growth and feed efficiency during the 3-week experimental period. The increase due to condensed fish solubles approached significance at the 5 per cent. level but that due to the vitamin concentrate was not significant.

N.A. and R., January 1955

Male poultz only were used in experiment 3. The variables were 0.2 per cent. DL-methionine, 0.3 per cent. L-lysine hydrochloride, 220 units procaine penicillin G per 100 g. feed and 3 per cent. condensed fish solubles with the 20 and 28 per cent. protein basal rations. The methionine supplement improved growth by 11 and 6 per cent., respectively. Improvements in growth and feed efficiency due to lysine and condensed fish solubles were significant at a 5 per cent. level and were additive, but the penicillin supplement had no effect on growth and only a slight positive effect on feed efficiency. Protein was most efficiently utilised from the low-protein rations, and utilisation was improved by the addition of lysine and methionine.—M. J. Head.

1433

SMITH, A. H., WILSON, W. O. and PACE, N. **The effect of high altitude on the growth of turkeys.** *Growth*, 1954, 18, 27-35. [Dept. Poultry Husb., Univ. California, Davis.]

1434

BLAYLOCK, L. G., HUNT, J. R., ZIEGLER, F., PATTERSON, E. B. and STADELMAN, W. J. **The effect of energy level of the diet on growth, feed efficiency and degree of fattening of turkeys.** *Poultry Sci.*, 1954, 33, 864-866. [Dept. Poultry Sci., Washington State Coll., Pullman.]

Duplicate groups of 50 male and female 8-week-old Broad Bronze turkeys were given the following rations: (1) high-energy pellets with whole maize, (2) high-energy pellets with whole barley or (3) low-energy pellets with whole maize. The high-energy pellets consisted mainly of maize and soya bean oilmeal and supplied 96.3 therms per 100 lb. feed, 20 per cent. protein and 2.5 per cent. fibre; the low-energy pellets were of mixed grain supplying 67.7 therms per 100 lb., 20 per cent. protein and 7.2 per cent. fibre. The energy value of maize is given as 114 and of barley as 81 therms per 100 lb. There was no difference between groups in liveweight but the greatest feed efficiency was obtained in both toms and hens on ration (1) and the least on ration (3). After dressing, there was no difference on a quality basis between the carcasses of hens from the 3 groups, but the carcasses of toms from group 3 were of poorer quality than those from the other 2 groups. The birds in groups 2 and 3 tended to decrease their fibre intake by selecting different ratios of grain to pellet.—M. J. Head.

1435

CARVER, D. S. and JOHNSON, E. L. **Further studies of the unidentified chick growth factors in unsaturated fats.** *Poultry Sci.*, 1954, 33, Vol. 25, No. 1

543-548. [Dept. Poultry Husb., Iowa State Coll., Ames.]

In a series of chick growth trials materials were tested as supplements to a basal ration of "Dracket industrial protein-220" 25, DL-methionine 0.64, choline chloride 0.15, minerals 5.5, cellulose 5, crystalline vitamins (in at least three times the allowances usually recommended) and dextrose to 100.

Duplicate groups, each of 10 chicks, fed to 2 weeks of age on the basal ration alone had a mean weight of 90 g., as did groups receiving the same ration with a supplement of the known fat-soluble vitamins. Groups receiving 2 per cent. of wheat germ oil or 1 per cent. of an oleic acid concentrate as supplements finished with mean weights of 102 and 100 g., respectively.

In further trials growth on the basal ration alone varied very much from one experiment to another, but there was a consistent response to the addition of maize oil, soya bean oil, wheat germ oil, an oleic acid concentrate or a pork liver residue, and to both the saponifiable and the non-saponifiable fraction of cottonseed oil. Commercially hydrogenated soya bean oil and butter showed little growth-stimulating activity. Responses to methyl linoleate, methyl linolenate and methyl oleate were inconsistent. The addition of 5 per cent. of lard to the basal ration depressed growth, and mortality was high.

Striking differences were noted in the fat and protein content of the carcasses between the chicks receiving growth-stimulating supplements and those receiving the basal ration alone.

K. J. Carpenter.

1436

FOX, T. W. and BOHREN, B. B. **An analysis of feed efficiency among breeds of chickens and its relationship to rate of growth.** *Poultry Sci.*, 1954, 33, 549-561. [Purdue Univ., Lafayette, Ind.]

In each of a series of 4 trials, 4 breeds of chicks were caged individually from 4 weeks of age and fed on a commercial broiler ration for 6 weeks; altogether 384 birds were used.

The New Hampshire birds had the heaviest mean finishing weight and also the highest feed conversion efficiency, 0.351; the White Leghorns were the lightest and had the lowest feed conversion efficiency, 0.297; the Dark Cornish and Dominant Whites were intermediate. Within each breed the males were heavier than the females and also had the higher efficiency of feed conversion; finally, regression analyses for each breed and sex showed a close positive correlation between feed conversion efficiency and average bodyweight over the experimental period.

On the basis of these and further statistical

analyses it is concluded that there is little justification for breeders of birds intended for meat production to practice selection on the basis of economy in feed conversion in addition to the simpler criterion of rapid early growth.—K. J. Carpenter.

1437

FANGAUF, R. and BARLÖWEN, G. v. Dorschlebermehl im Kükenfutter. [Cod liver meal in chick rations.] *Arch. Geflügelk.*, 1954, 18, 203-205. [Lehr-Versuchsanst. Kleintierzucht, Kiel, Steenbek.] English summary.

Cod liver meal is used less in Germany than in some other countries because of its price. Some of it is of poor quality and when it contains much free fatty acid it may be poisonous to poultry. A sample of such meal contained 25.5 to 28.3 per cent. crude fat and 13 to 14 per cent. free fatty acids. Two groups of 30 New Hampshire day-old chicks were given a normal mixed ration with 5 per cent. of a liver meal of low fat content or of that described above. At the age of 4 weeks the chicks had eaten 414.3 g. (high fat) or 481.1 g. (low fat) food; weighed 187.1 g. and 244.8 g., and ate, per 100 g. weight increase, 198 g. or 164 g.

I. Leitch.

1438

FANGAUF, R. Die Anwendung von Ölkuchen-Extraktionsschrot im Kükenfutter. [Use of extracted oilcake meal in chick rations.] *Arch. Geflügelk.*, 1954, 18, 237-241. [Lehr-Versuchsanst. Kleintierzucht, Kiel, Steenbek.] English and French summaries.

Eight-week experiments on day-old chicks showed that waste meals from coconut, palm kernel and earlnut were as valuable as soya bean extracted meal, when used in the proportion of 8 per cent. in a ration which contained 8 per cent. of cod fishmeal. The results obtained with rapeseed meal were somewhat doubtful, and when 8 per cent. of linseed or cottonseed meal was given, the experiments had to be discontinued after 4 weeks, because of the severe losses of birds. A table is given showing the maximum quantities of vegetable protein substances recommended for the rations of chicks and laying hens.

M. B. Richards.

1439

FANGAUF, R. and BARLÖWEN, G. v. Mohnsaatmehl im Kükenfutter. [Poppy seed meal in chick rations.] *Arch. Geflügelk.*, 1954, 18, 205-207. [Lehr-Versuchsanst. Kleintierzucht, Kiel, Steenbek.] English summary.

Three groups each of 30 New Hampshire day-old chicks were given a normal mixed ration including 15 per cent. oatmeal, or 10 per cent. oatmeal and 5 per cent. poppy seed meal or 5 per cent. oatmeal and 10 per cent. poppy seed. The poppy seed meal contained per cent.: water 5.42, crude protein

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of these negative findings, which are contrary to the findings of other authors, could not be established.—M. B. Richards.

1446

HILL, C. H. and KELLY, J. W. **The effect of fish meal on the response of chicks to high levels of penicillin.** *Poultry Sci.*, 1954, **33**, 657-658. [Dept. Poultry Sci., N. Carolina State Coll., Raleigh.]

Six groups, each of 30 chicks, were fed from day-old to 4 weeks of age in battery cages where the room and equipment had recently been cleaned, steamed and fumigated.

The control ration consisted of soya bean meal 47, methionine 0.3, minerals 4.5, vitamins, and maize meal to 100. The groups that received this ration alone or supplemented with 9 or 90 p.p.m. of procaine penicillin finished with mean weights of 404, 385 and 398 g. Parallel groups receiving similar rations, but with 5 per cent. of fishmeal, added at the expense of soya bean meal and maize meal so as to keep the total protein content of the diets constant, finished with mean weights of 389, 398 and 420 g., respectively.

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1447

SLINGER, S. J. and PEPPER, W. F. **Effect of penicillin on the growth and feed consumption of turkey poults.** *Poultry Sci.*, 1954, **33**, 746-753. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

Broad Breasted Bronze poults were caged in groups of 40 and fed from day-old to 28 days of age on a ration made up of fishmeal 2, meatmeal 2, soya bean oilmeal 43, alfalfa meal 3, minerals 4, soya bean oil 1, yellow maize meal 15, oat groats 5, methionine, a vitamin mixture (including vitamin B₁₂) and ground wheat to 100. At 28 days of age a group receiving this ration to appetite had a mean weight of 471 g., and a similar group that had received a dietary supplement of 15 p.p.m. procaine penicillin G a mean weight of 533 g. Two further groups that received the ration alone or with a penicillin supplement each were given a daily weight of their diet equal to that eaten by the non-supplemented "ad libitum" group on the previous day, and finished with mean weights of 446 and 452 g., respectively. Feed to gain ratios for the 4 groups were 1.76, 1.66, 1.74 and 1.71. Similar results were obtained in a second trial of similar design.

From analysis of "daily feed consumption per unit of bodyweight" and growth rate expressed as a percentage of bodyweight it is concluded that most, though perhaps not quite all, of the growth-promoting activity of penicillin for poults comes from stimulation of their appetite in the first 6 days of life.—K. J. Carpenter.

1448

LINDGREN, N. O. **Studies in the growth promoting action of antibiotics in poultry nutrition.** 3. *Nord. Vet.-Med.*, 1954, **6**, 701-706. [State Vet. Med. Inst., Stockholm.] German and Swedish summaries.

A group of 60 White Leghorn cockerels was kept in a wire-floored cage from hatching to 4 weeks of age and fed on a ration of fishmeal 7.5, meatmeal 3.5, oilseed meals 13, wheat germ 0.5, alfalfa meal 3, a vitamin concentrate (rich in vitamins A and D and in riboflavin) 5, cod liver oil 1, minerals 1.5, wheat bran 24, yellow maize meal 15, and dredge maize to 100. Their mean finishing weight was 238 g.

A second group received the same diet with a dietary supplement of *Bacterium coli* as previously used (*Proc. 15th Internat. Vet. Congr.*, 1953, 913) and finished with a mean weight of 228 g. Further groups that received, respectively, 5 p.p.m. procaine penicillin, penicillin and *Bact. coli*, and 5 p.p.m. neomycin and *Bact. coli*, weighed 246, 255 and 254 g. The failure to obtain a growth stimulus with a dietary supplement of *Bact. coli* alone is in disagreement with the author's earlier findings.

Serial samples of droppings and of crop contents were taken from the birds in the different groups, and serial dilution, plating and counting methods were used to measure their content of coliform organisms. The day-to-day variations were extremely high and the counts bore no obvious relation to the diets.—K. J. Carpenter.

1449

LINDBLAD, G. S., SLINGER, S. J. and MOTZOK, I. **Effect of aureomycin on the calcium and phosphorus requirements of chicks and poults.** *Poultry Sci.*, 1954, **33**, 482-491. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

In the first experiment, groups of 15 day-old Columbian Rock female chicks were given a maize and soya bean ration deficient in Mn (18 p.p.m.) and supplemented with all combinations of 0.4, 1.0 and 1.8 per cent. Ca and 0.2, 0.4 and 0.6 per cent. inorganic P in the presence and absence of 25 p.p.m. aureomycin hydrochloride. The effects of the antibiotic, Ca and P levels and the interactions of Ca and P on the liveweight gain were significant at $P < 0.01$. Maximum liveweight was obtained with 1.0 per cent. Ca and 0.4 per cent. inorganic P in the presence of the antibiotic, but in its absence inorganic P had to be raised to 0.6 per cent. The presence of the antibiotic tended to reduce the incidence of perosis, except in the presence of high amounts of Ca. It is suggested that bone calcification alone is not a suitable criterion for the evaluation.

tion of mineral requirements when antibiotics are included in the ration. Aureomycin supplements produced a clear increase in bone ash with 0.4 per cent. Ca ration and a decrease when the ration contained 1.0 and 1.8 per cent. Ca.

Experiment 2 was similar to experiment 1 except that the basal ration contained 55 p.p.m. aureomycin and the supplements were 1.0 and 1.8 per cent. Ca and 0.40 and 0.6 per cent. inorganic P. On the basis of liveweight gain the effects of inorganic P and aureomycin were significant at $P < 0.01$; the effects of Ca and all interactions were non-significant. The effects of aureomycin on the Ca and P levels required for maximum growth were similar to those in experiment 1, but there was no consistent effect on bone ash.

In experiment 3, groups of 20 day-old Barred Plymouth Rock male chicks were used in an experiment similar to No. 1, with supplements of 1.0 and 1.4 per cent. Ca and 0.4 and 0.6 per cent. inorganic P. On a liveweight basis, only the effect of the aureomycin was significant. The maximum weight was obtained with rations containing 1.0 per cent. Ca and 0.6 per cent. inorganic P in the presence of the antibiotic and 1.0 per cent. Ca and 0.4 per cent. inorganic P without it, the effect being opposite to that observed in experiment 1 when females were used.

In experiment 4, groups of 9 males with 9 female day-old Broad Breasted Bronze turkey poult were given an adequate ration containing all combinations of 2.0 and 2.5 per cent. Ca and 0.4, 0.55 and 0.85 per cent. inorganic P in the presence and absence of 25 p.p.m. aureomycin hydrochloride. The effect of antibiotic supplements was significant on a liveweight basis for all poult, but was greater for males than for females. With or without antibiotic, optimum growth of males was obtained with a level of 0.55 per cent. inorganic P at either level of Ca; with females the levels were 0.4 per cent. inorganic P and 2.0 per cent. Ca. Raising the Ca level from 2.0 to 2.5 per cent. had an adverse influence on the feed to gain ratio.

In the last experiment groups of 8 male with 8 female poult were given an adequate ration with supplements of 1.0 per cent. Ca and 0.4 per cent. inorganic P and all combinations of 1.5 and 2.0 per cent. Ca and 0.3, 0.4 and 0.5 per cent. inorganic P with and without 25 p.p.m. aureomycin hydrochloride. The liveweight data indicated that the effects of aureomycin and sex and their interaction were significant at $P < 0.01$, and the effect of P was significant at $P < 0.05$. Males responded to the antibiotic to a greater extent than females. In the absence of antibiotic, maximum growth was obtained with 1.0 to 1.5 per cent. Ca and 0.4 per cent. inorganic P; with antibiotic the corresponding levels were 2.0 per cent. Ca and 0.5 per cent. inorganic P.—M. J. Head.

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1450

MORRISON, A. B., HUNSAKER, W. G. and AITKEN, J. R. Influence of environment on the response of chicks to growth stimulants. *Poultry Sci.*, 1954, 33, 491-494. [Poultry Div., Central Exp. Farm, Ottawa.]

Eight groups of 50 New Hampshire \times Barred Plymouth Rock day-old chicks were given to appetite a basal ration of 34.3 per cent. maize-meal, 34.3 per cent. ground wheat, 20 per cent. soya bean oilmeal, 4 per cent. meatmeal and 2.5 g. grassmeal with mineral and vitamin supplements. Supplements of 10 g. procaine penicillin, 90 g. 3-nitro-4-hydroxy-phenylarsonic acid, 90 g. arsenic acid or 2 lb. ethomid C/15 (a surface-active agent) per ton were given to duplicate groups of chicks. One group from each pair was housed in new starting batteries with raised wire floors in a building disinfected since it was previously used; the other group was brooded in floor pens in a large brooder house used for other chicks immediately before the experiment.

At 4 weeks of age in the old environment only penicillin produced significantly heavier birds. At 6 weeks of age, it produced significantly heavier birds in both environments, but the effect was greater in the old. The arsenic acid compound produced a growth response equal to that of penicillin in the old environment but was without effect in the new. Neither of the other growth stimulants produced a growth response in either environment. There was also evidence that the sexes responded to the different rations and environments in different ways.

Efficiency of feed utilisation was greater for chicks in the old environment, and penicillin or 3-nitro-4-hydroxy-phenylarsonic acid improved the efficiency in the old but not in the new environment.—M. J. Head.

1451

FERRANDO, R. Hormones, antihormones et antibiotiques dans l'alimentation des volailles. [Hormones, antihormones and antibiotics in the feeding of poultry.] *Ann. Nutrit. Alimentation*, 1954, 8, 359-388 (with discussion 388-392). [École Nat. Vét., Lyons.]

1452

MCDONALD, M. W. and GREENAWAY, B. W. Arsanilic acid fails to replace penicillin for stimulating chicken growth. *Agric. Gaz. N.S.W.*, 1954, 65, 249. [Poultry Exp. Stat., Seven Hills.]

1453

VUKINA, R. and ZELENKO, F. Utjecaj krmlnih smjesa na razvitak težine, ekonomiku ishrane i rentabilitet proizvodnje pilića. [Influence of different feed mixtures on weight increase,

economy of feeding and profitable production of chickens.] *Veterinaria*, 1953, 1, 56-80. English summary.

An experimental study of the feeding value of different mashers.—S. Pribićević (Yugoslavia).

1454

POTTER, G. C. and KUMMEROW, F. A. Chemical similarity and biological activity of the saponins isolated from alfalfa and soybeans. *Science*, 1954, 120, 224-225. [Dept. Food Technol., Univ. Illinois, Urbana.]

Saponins extracted from alfalfa leaf meal were hydrolysed and 3 genins were separated on an alumina column. A sample of soyasapogenol B was prepared by the method of Ochiai *et al.* (*Ber.*, 1937, 70B, 2083) and from its infrared spectrum it appeared to be closely related to the first of the 3 alfalfa genins.

Purified saponins from both alfalfa and soya beans inhibited growth in chickens, but their genins did not. Part of the growth depression in chickens and the occurrence of bloat in cattle may be caused by soyasapogenols; with cooking these would be hydrolysed to non-toxic genins. The process of dehydration is too mild to hydrolyse the saponins of alfalfa.—D. Harvey.

1455

ATKINSON, J. C., BOUCHER, R. V. and CALLENBACH, E. W. Weight and moisture content of carcasses from poults fed added sodium chloride. *Poultry Sci.*, 1954, 33, 656. [Pennsylvania State Univ., State College.]

Two groups of 10 day-old White Holland turkey poults were given similar rations, one with 2 per cent. NaCl. At 25 days of age the poults given 2 per cent. NaCl were significantly heavier than the controls, 115 g. compared with 104 g. The respective moisture contents of the carcasses were 79.8 and 77.2 per cent.—M. J. Head.

EGG PRODUCTION

1456

LEROY, A. M. and DELAGE, J. L'alimentation de la poule ponduse. [The feeding of the laying fowl.] *Ann. Nutrit. Alimentation*, 1954, 8, 209-238 (with discussion 239-245). [Inst. Nat. Agronom.]

1457

ROMIJN, C. and VISSCHEDIJK, A. H. J. Untersuchungen über künstliche Bebrütung von Hühnereiern. [Artificial incubation of hen eggs.] *Arch. Geflügelk.*, 1954, 18, 242-258. [Lab. Vet. Physiol., Rijksuniv., Utrecht.] English and French summaries.

A study of temperature and ventilation.

1458

SUNDE, M. L., CRAVENS, W. W., BIRD, H. R. and HALPIN, J. G. The effect of complete and

incomplete growing diets on subsequent performance of the laying hen. *Poultry Sci.*, 1954, 33, 779-784. [Dept. Poultry Husb., Univ. Wisconsin, Madison.]

Groups of 60 Single Comb White Leghorn chicks were given a basal maize and soya bean oilmeal ration with or without 0.05 per cent. penicillin supplement (Merck 626) and 3 per cent. condensed fish solubles; these rations were termed "complete" and "incomplete". Cockerels were removed at 6 to 8 weeks of age and the pullets culled to about 24 per group. All pullets received a similar laying ration from 20 weeks of age.

The complete ration gave more rapid growth than the incomplete ration. The difference between the growth rates was maximum at 8 weeks of age, but continued until the birds were housed for laying trials. The feed to gain ratio indicated that the complete ration gave the best results to 8 weeks of age and the incomplete ration thereafter. No difference in egg production, mortality or overall feed consumption was found between the groups. Sexual maturity of the birds reared on the incomplete ration was 10 to 12 days later than in the other birds and egg size was initially larger.—M. J. Head.

1459

OLOUEFA, M. M. Influence of thyroprotein and darkness on Egyptian chicken during summer. *Poultry Sci.*, 1954, 33, 649-652. [Coll. Agric., Univ. Cairo, Giza.]

Groups of forty-five 2- to 3-year-old Egyptian hens were housed in concrete rooms at night and in an open yard in the daytime. One group received a supplement of 5 g. thyroprotein per 100 lb. feed, a second group was housed in the dark for 2 hr. at midday at a temperature 18° to 23° F. below the surroundings, while the third group acted as control.

Over the 3-month experimental period thyroprotein significantly stimulated egg production (13 per cent.) but had no effect on egg weight; the hens lost bodyweight steadily. Group 2 produced significantly more eggs, 6.2 per cent., than the controls, but there was no effect on egg weight. The hens of this group lost bodyweight continuously during the experiment; the controls did not.—M. J. Head.

1460

FRENCH, M. H. and LEDGER, H. P. The deep-litter system. *East African Agric. J.*, 1954, 20, 40-44. [Joint Animal Indust. Div., East African Agric. Forestry Res. Organiz.]

Three groups of pullets were placed, a month before laying began, in deep-litter houses (1) and were given a dry mash of maize meal 44, pollards 30, alfalfa meal 10, meatmeal 10, cottonseed meal 10, salt 1, limestone 3, bonemeal 2 and dried

yeast 2 parts. They also received a daily grain feed of equal parts of oats, millet and barley, scattered on the litter. Three comparable groups were in deep-litter houses and had access to grass runs (2); and 3 further groups were in houses with bare-earth floors with access to grass runs (3). During the growing season green grass was hung in the intensive deep-litter houses, and during the dry season kale was hung in all pens.

Over a laying period of 12 months the mean egg yields in houses 1, 2 and 3 were 146, 146 and 162, respectively. There was no difference in feed consumption between the groups.

Variations in egg production through the year could not be related to the prevailing weather. The 3 groups used for each system of housing were one of Cambars, one of Legbars and one of Welsummers, and there was a suggestion that the breeds differed in their adaptability to deep litter.

K. J. Carpenter.

1461

CHARLET, P., CHARLET-LÉRY, G. and LEROY, A. M. Utilisation de levure de distillerie dans l'alimentation des volailles. [Use of distiller's yeast in poultry feeding.] *Ann. Zootech.*, 1952, 1, No. 4, 33-42. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

A group of 10 laying birds received to appetite for 12 months a ration of dried distiller's yeast 12, oilseed meals 23, wheat germ 3, miller's offals 8, alfalfa meal 5, bonemeal 4, ground limestone 5.5, barley 20 and maize meal 20 parts; this ration contained 21.5 per cent. of crude protein. In addition, they received 30 g. oats for every 70 g. of the mixed ration consumed. Their mean egg production was 110. A second group similarly fed had 8 parts of distiller's yeast from the mixed ration replaced by only 6 parts of meatmeal to maintain the total crude protein content at the same level; their mean production in the same time was 108 eggs. The fertility and hatchability of the eggs were similar.

A group of chicks was reared on a ration of cereals, fine bran, alfalfa meal and oilseed meals, supplemented with 3 per cent. of lactalbumin and 9 per cent. of mixed blood-, meat- and fishmeal. They also received cod liver oil and an allowance of sprouted oats. At 60 days of age 13 cockerels had a mean weight of 800 g. and 16 pullets of 760 g. per head. In a parallel group receiving 14 parts of dried distiller's yeast in place of the 9 parts of mixed animal protein concentrates in the ration the mean weights at 60 days were 880 and 770 g. for cockerels and pullets, respectively. The group receiving yeast appeared to grow feathers more rapidly and more evenly.

In a further trial chicks were reared to 60 days on a good commercial starting ration supplemented with 10 per cent. of either dried brewer's or dried

distiller's yeast. The performance of the chicks was equally good with either supplement.

K. J. Carpenter.

1462

BALLOUN, S. L. Effect of high level aureomycin feeding on rate of egg production. *Poultry Sci.*, 1954, 33, 867-869. [Dept. Poultry Husb., Iowa State Coll., Ames.]

New Hampshire pullets were housed in wire-floored cages in groups of 9 to 12. One group which was fed on an all-vegetable ration supplemented with vitamin B₁₂ gave 35 per cent. production in the second 8-week period of the trial, and 36 per cent. in the third period. Two similar groups gave a mean of 37 per cent. production in the second period, and in the third period, when their ration was supplemented with 110 mg. aureomycin per kg., a mean of 46 per cent. Further groups received 3 other rations which included 2 per cent. of fish solubles; their egg production after receiving aureomycin was also generally higher than that of unsupplemented birds, but the differences were less than in the groups receiving the all-vegetable ration.

K. J. Carpenter.

1463

HØIE, J. and SANDVIK, Ø. Forsøk med kokte poteter, potetsurfer og potetgrøpp til verpehøner. [Experiments with cooked potatoes, potato silage and potato meal for laying hens.] *Meld. Norges Landbrukshøgsk.*, 1954, 34, 81-129. [Norges Landbrukshøgskole.] English summary.

Experiments were made with duplicate groups each of 40 or 42 pullets in the 3 years 1949-51 with steamed potatoes, silage of steamed potatoes and silage from raw potatoes, and in 1951 with single groups of 25 pullets with silage of raw potatoes steamed before use and pulped raw potatoes dried in a herringmeal drier. The controls had daily 40 to 50 g. whole grain, 50 g. sour skimmed milk and a mixture of cereal meal, extracted oilseed meal, herringmeal, grassmeal, yeast, cod liver oil and minerals, to appetite. The experimental groups received about 33 g. potato dry matter daily with about 20 g. whole grain, 50 g. sour skimmed milk and a still richer concentrate mixture to appetite.

Egg production was slightly higher in the controls than in any of the potato groups and less in the group with silage of raw potatoes than in the others. When the data for feed consumption were computed to the same liveweight and egg production, the value of potatoes for hens was estimated to be, in terms of Scandinavian feed units per 100 kg. potato dry matter: steamed 90, silage from steamed potatoes 92, silage from raw potatoes 57, steamed silage from raw potatoes 76 and dried potatoes 89.—I. Leitch.

OTHER BIRDS

1464

GROMOV, I. M. and EGAROV, O. V. Materyaly po pitaniyu i khozyaistvennomu znacheniyu filina yostochnogo Pamira i Kopet-Daga. [Data on diet and economic significance of the eagle owl of the Eastern Pamir and Kopet-Dag.] *Zool. Zh.*, 1953, **32**, 964-978. [*Zool. Inst., Acad. Sci. SSSR.*]

This study of the diet of the eagle owl (*Bubo bubo*) in these regions was made in connection with the protection of birds that prey on harmful rodents and in order to establish the proportion of

harmful and useful animals in the diet of these birds. Investigation of a considerable number of droppings in both regions showed that it was impossible to generalise about the proportion of harmful to useful animals, as this varied from one district to another. In the Eastern Pamir the percentage of useful animals in the diet of the eagle owl was 70.48 per cent. and of harmful ones 9 per cent.; in Kopet-Dag the percentage of useful animals was 3.72 per cent. and that for harmful ones 91.31 per cent.—H. Scherbatoff.

FOOD ECONOMICS AND STATISTICS

1465

WHALEN, F. T. World food production problems. *J. Austral. Inst. Agric. Sci.*, 1954, **20**, 76-82. [*Div. Agric., Food and Agric. Organiz.*]

1466

WYLLIE, J. Land requirements for the production of human food. A study of the experience of the United Kingdom during the years 1936/9 to 1949/50. *Wye Coll., Dept. Agric. Econ.*, 1954, pp. 38. Price 4s.

Reasonable calorie values are assumed per unit weight of crop and livestock products used for human foods, and are applied to the official statistics of U.K. Agricultural Output for the 3-years 1936-39 and for each year from 1939-40 to 1949-50 inclusive. In relating this calculated total yearly calorie output as human food to the utilisation of land, deductions are made from the total acreage of crops and grass (rough grazings are estimated to contribute only 1 per cent. of calorie output) for the areas of "industrial" (e.g., flax) and non-edible crops (e.g., flowers and nursery stock). Deductions are also made for hay (300,000 acres), barley and oats not for human food (200,000 acres) and certain other crops, much of which must have been used for feeding the livestock whose output of human food calories is included in the output calculations. No allowance is made for "imported acreage", as the imports of feeding-stuffs which again contribute to human food calorie output from livestock may be termed. [Thus the calculations of the acreage required to supply the one million Cal. estimated to be the mean annual requirements per head of population are likely to be low.] The figures given are 1.78 acres of crops and grass in 1939-40, only 1.15 acres in 1943-44, 1.54 acres in 1947-48 and 1.28 acres in 1948-49-50.

Crops contributed 47 per cent. of annual calorie production in 1939-40, 71 per cent. in 1943-44 and 59 per cent. in 1949-50, and it is concluded that maximum calorie production depends largely on a large acreage of high-yielding crops of wheat, potatoes and sugar beet. Thus the rather lower calorie production per acre in 1949-50 is associated with a smaller wheat acreage and an increase in the number and milk yield of dairy cows. Under these circumstances the cost per million Cal. is higher, but the "quality" of the output is improved (i.e., greater output of protein, vitamins, etc.). This should be considered in deciding the optimum combination of crops and livestock for national food production.

Calorie production per man has increased over the years (apart from the poor harvest year of 1947-48), a peak of 149 being achieved in 1943-44 (1936-39 = base 100). In 1948-49-50 the production per man averaged 137. This increase is believed to be mainly due to more efficient farming methods including greater use of mechanisation and fertilisers.—J. L. Corbett.

1467

BARKER, A. S. Fertility and grassland productivity. *J. Brit. Grassland Soc.*, 1954, **9**, 47-51. [Imperial Chemical Industries, Ltd., Central Agric. Control.]

Productivity of grassland is measured by the amount effectively utilised in commercial farming and is more useful in practice than measures of herbage yield, which reflect fertility, the degree to which a soil can sustain the growth of plants. Figures are presented to show the relation between the intensity of the use of grass in feeding dairy cows and the cost of feeding, average milk yield and profit margin per cow. At higher levels of grass feeding, yield and profit margins are reduced,

but the investment return on the total cost of production remains a constant percentage. More information is needed to decide what levels of grassland fertility and productivity are optimum on a farm and national scale.—J. L. Corbett.

1468

CRAWFORD, J. G. **Australia's agricultural programme.** *J. Austral. Inst. Agric. Sci.*, 1954, 20, 97-104.

1469

STIEGER, R. Entwicklungsgang in der schwedischen Landwirtschaft. [Developments in Swedish agriculture.] *Bodenkultur*, 1953, 7, 292-302.

A review which covers briefly geography, rural population, size of holding, recent changes in practice, changes in stock population, changes in yield and value, and mechanisation in relation to improvement of productivity.—I. Leitch.

1470

BREIMYER, H. F. **Sources of our increasing food supply.** *J. Farm Econ.*, 1954, 36, 228-242. [U.S. Dept. Agric.]

The population of the United States has increased from 96 million in 1910-14 to 152½ million in 1950 and agricultural production has more than kept pace with this increase. Although the average amount of food consumed per person has decreased by 2 per cent, the quality of the diet has improved considerably, particularly as regards minerals and vitamins. The Bureau of Agricultural Economics index, which combines quantity of food consumed with price weights, shows that total consumption expanded by 77 per cent. during the above period. This increase in production is allocated to the following major factors: increase in area of cropland harvested 10 per cent., acres of cropland freed from non-food crops 2.5 per cent., feed obtained from pasture 4.4 per cent., reduction in number of horses and mules 14.8 per cent., yield of crop per harvested acre 43.5 per cent., rate of output per ton of feed 15.2 per cent., shift in consumption from butter to margarine 2.5 per cent.

Forecasts of population in 1975 range from 199 to 221 million and the possibilities for further increase in agricultural production to meet new demands are discussed. By a process of elimination it is suggested that further increase in agricultural production can come only from increased productivity of the land now under cultivation.

J. S. Thomson.

1471

ASHEBY, A. W. **The seasonality of milk sales in England and Wales from 1936-7 to 1951-2.** *J. Agric. Sci.*, 1954, 44, 274-287. [Dept. Agric. Econ., Univ. Nottingham.]

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Sales were examined for each of the 11 marketing districts and for the country as a whole. During the 16 years under study, total milk sales off farms increased from 990 million gal. in 1936-37 to 1530 million gal. in 1951-52. An examination of milk prices, daily sales and number of calves born daily showed that there was little correlation between the extent of seasonal variations in milk values and milk sales; farmers got their cows to calve when prices were rising or at their highest, even though higher milk prices in winter did not make winter milk production more profitable.

W. Thomson.

1472

SMITH, H. L. **Report on costs of milk production for the year ended 30th September 1953.** *Edinburgh and East of Scotland Coll. Agric., Dept. Econ., Bull.* No. 43, March 1954, pp. 38.

Forty-nine herds in the south-east of Scotland were surveyed. Average herd size was 51 cows, milk production 778 gal., 47 per cent. being produced during the winter half-year, when costs were 11d. (50 per cent.) more per gal. Feed accounted for 61 per cent. of gross costs, labour for 19 per cent. and herd maintenance for 5 per cent. High-yielding herds gave the greatest profit. Mean herd replacement during the year was 25 per cent. Costs per cow have risen over the 3-year period from 1950-51 largely because of a 3 per cent. increase in feed costs, and these were only partly offset by increased yields and not at all by higher milk prices. Compared with 1936-37 the average yearly milk yield of cows in surveyed herds has increased by only 11 gal. Profit per gal. increased 10 times since, while cost per gal. increased by 172 per cent. and income per gal. increased by 251 per cent. Greater use was made of home-produced concentrate foods, grazing and silage, and less of purchased foods and of roots.

J. L. Corbett.

1473

AGARWALA, O. P. **System of costing milk and milk products.** *Indian J. Vet. Sci.*, 1954, 24, 119-127. [Allahabad Agric. Inst.]

1474

GODFREY, D. **Breeding cattle costs 1952-1953.** *North of Scotland Coll. Agric., Agric. Econ. Dept. Econ. Rep.* No. 40, April 1954, pp. 15.

Forty-two farms, grouped according to location (at average altitudes from 180 to 650 feet above sea level and from 3½ to 16½ miles from the north-east coast of Scotland) and the system of wintering cattle, were surveyed. Outwintered herds were mainly Galloway or Highland breed. Winter-housed herds were Shorthorn and Aberdeen-Angus. Feed cost for the winter period was 48 to 55 per cent. of the total cost per cow per year.

Housed cattle ate 94 to 118 cwt. turnips and swedes, 12 to 18 cwt. oat straw, 1 to 4 cwt. oats plus miscellaneous feedingstuffs per head from November to early May. Outwintered herds ate 15 to 41 cwt. turnips and swedes, 1 to 15 cwt. straw, up to 3 tons silage or 10 cwt. hay per head, plus small quantities of miscellaneous feedingstuffs.

J. L. Corbett.

1475

KELLY, J. H. and OWEN, W. F. Beef production in north eastern New South Wales. *Agric. Gaz. N.S.W.*, 1954, 65, 282-288; 289.

The area contains about 600,000 beef cattle or about one-quarter of the beef cattle population of New South Wales. The cattle industry is based on natural pasture. There is little attempt to improve pasture and supplementary feeding of stock is not practised. If the problems of winter starvation and deficiencies in pasture could be overcome it is estimated that beef production could be improved by 20 to 30 per cent.

J. S. Thomson.

1476

JOUBERT, D. M. Breeding for beef in tropical and sub-tropical climates, with special reference to the continent of Africa. *Colonial Plant Animal Prod.*, 1954, 4, 1-13. [Sch. Agric., Cambridge.]

Although potential agricultural production in tropical Africa is enormous, present production per unit of land or per animal is much lower than in temperate countries. Prospects for increasing animal products are discussed and the difficulties are emphasised, chief among which are problems of animal adaptation to climate, scarcity of pasture in certain areas and the variation in the nutritive value of pasture. The best policy would appear to lie in improvement of indigenous stock by selection, and the advantages of the Afrikaner, with its slower growth and maturing characters, are pointed out.—J. S. Thomson.

1477

DIAZ, C. Further studies on the economic side of pork operation. *Philippine J. Animal Indust.*, 1952, 13, 33-45. [Animal Products Div., Bur. Animal Indust.]

This is a brief history of the meat industry in the Philippines.—J. S. Thomson.

1478

NEUVIK, O. and PATERSON, D. G. Marketing lambs. Comparison of liveweight method and carcass weight and grade method. *S. Dakota Agric. Exp. Stat. Bull.* No. 416, December 1951, pp. 12.

Results of this preliminary study showed that lambs of greater than average carcass weight tended to be underestimated by liveweight graders

and those below average to be overestimated. Errors were greater in estimating carcass weight than in estimating grade, but because of price differentials between grades, grade and weight errors had about the same influence on financial returns. Differences of up to \$3 per cwt. in returns to producers occurred when actual carcass grades and weights were used instead of the buyer's estimate of grade and weight.—J. C. Gill.

1479

MATZEN, E. H. Trends in the competitive position of poultry products relative to red meats. *Poultry Sci.*, 1954, 33, 682-686. [Res. Div., Poultry Branch, P.M.A., U.S. Dept. Agric.]

Compared with the years 1935-39, consumption of turkeys per head in U.S. in 1950-52 increased by 96 per cent. and of chickens by 58 per cent. compared with an increase in beef and veal consumption of only 6 per cent. Prices paid to poultry producers increased by 71 to 99 per cent. as compared with an increase of 291 per cent. for beef and 244 per cent. for lamb producers. The retail price for chickens increased only by 76 per cent., that for beef by 181 per cent. It is concluded that efficiency of production has increased more for poultry than for livestock.—J. S. Thomson.

1480

ENGLER, H. Importance de l'aviculture sur le plan mondial. [Importance of poultry on the world plane.] *Ann. Nutrit. Alimentation*, 1954, 8, 21-51 (with discussion 51-52). [Div. Agric., FAO, Rome.]

1481

JEAN-BLAIN, M. La production du poulet de table. [The production of table poultry.] *Ann. Nutrit. Alimentation*, 1954, 8, 331-353 (with discussion 354-357). [École Vét., Lyons.]

1482

PROTIN, R. État actuel et importance économique de l'aviculture française. [Present state and economic importance of the poultry industry in France.] *Ann. Nutrit. Alimentation*, 1954, 8, 53-68.

1483

SWART, F. W. J. Verwerkingsmogelijkheden voor dierlijke vetten. [Possibilities of using animal fats.] *Tijdschr. Diergeneesk.*, 1954, 79, 601-607. [Hoogland.] English, French and German summaries.

The effective demand for animal fat is less than the supply and because of its natural lack of antioxidants transport is difficult and wastage high. It could be used more extensively in industry, e.g.,

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to make plastics pliable and in the manufacture of anticorrosives and synthetic rubber, and it could be used in stock feeding. Cattle can take up to 4 per cent. of the dry matter of rations and poultry 8 per cent. The surplus fat in the United States would be used up if 1 per cent. were added to the rations of beef cattle. Rancidity should be prevented by addition of anti-oxidants and mixing in rations and absorption made easier by addition of surface-active agents.—I. Leitch.

1484

RICHER, S. Les animaux et leurs sous-produits dans le commerce. [Animals and their by-products in commerce.] *Rev. d'Oka*, 1954, 23, 87-109.

1485

COOPER, M. M. Grassland. *J. Farmers' Club*, 1954, No. 3, 32-39. [Dept. Agric., Wye Coll., Univ. London.]

DIET IN ETIOLOGY OF DISEASE

GENERAL

1486

EVANS, W. C., EVANS, E. T. R. and HUGHES, L. E. Studies on bracken poisoning in cattle. 1. *Brit. Vet. J.*, 1954, 110, 295-306. [Dept. Agric. Chem., Univ. Coll. N. Wales, Bangor.] An account is given of experiments made during 1949 and 1950.

In the first experiment a daily feed of 11 lb. hay and 5 or 6 lb. bracken (433 lb. bracken eaten over 80 days) had no toxic effect on heifers. In a second experiment cattle fed to appetite on recently harvested green bracken alone died of bracken poisoning similar to that found naturally. Two oz. dried yeast added daily to the same feed had no effect on the disease, nor had the parenteral administration, after the onset of signs, of glucose and vitamin B₁ or a vitamin B complex containing vitamin B₁, riboflavin, nicotinamide, pantothenic acid, pyridoxine, inositol, biotin, *p*-aminobenzoic acid, folic acid and choline chloride. A fall in leucocytes occurred before the appearance of clinical signs and the erythrocyte level fell in the terminal stages of the disease.

For the third experiment 6-month-old calves were fed as in the previous experiment. The parenteral administration of vitamin B₁ with or without the vitamin B complex during the whole experiment did not affect the onset of the disease. Pronounced leucopenia was seen in calves dying from bracken poisoning. Addition of 1 to 2 lb. molasses to the bracken either dry or after steaming prevented the disease.—A. Hepburn.

1487

CORDY, D. R. Nigropallidal encephalomalacia in horses associated with ingestion of yellow star thistle. *J. Neuropathol. Exp. Neurol.*, 1954, 13, 330-342. [Univ. California Sch. Vet. Med., Davis.]

A study was made of 16 cases of a nervous disease of horses, occurring in Northern California and becoming more commonly recognised, known locally as "chewing disease". All occurred on dry weedy pastures in which yellow star thistle

(*Centaurea solstitialis*, L.) provided most of the available forage, and ceased when horses were moved to better pastures or given hay. No case has been reported in a ruminant.

The onset is sudden, with a variable impairment of eating or drinking, a fixed or "wooden" facial expression due to hypertonia of the muscles of the muzzle and face, but no flaccid paralysis. The animals remain standing drowsily, and chewing. Movements are made even when there is no food in the mouth. There is no excitement, loss of appetite or pyrexia. The course varies from a few days to a few weeks.

At post mortem no transmissible agent was demonstrated, the outstanding lesions being focal necrosis in the anterior portions of the pallidum and substantia nigra. Their distribution was usually bilaterally symmetrical. Three horses fed on yellow star thistle developed typical signs, and in 2 of them the distinctive nervous lesions were found at post mortem. The pathogenesis of the disease is discussed at length, and it is suggested that the lesions may result from damage to the neurons consequent upon anaemic hypoxia.

W. A. Greig.

1488

JENSEN, R., CONNELL, W. E. and DEEM, A. W. Rumenitis and its relation to rate of change of ration and the proportion of concentrate in the ration of cattle. *Amer. J. Vet. Res.*, 1954, 15, 425-428. [Sch. Vet. Med., Colorado Agric. and Mech. Coll., Fort Collins.]

In the first experiment 95 fattening cattle from 12 to 18 months of age were divided into 5 groups. All received a basal fattening ration providing, per head daily, maize 8 lb., barley 4 lb., linseed meal 1 lb., alfalfa 4 lb. and maize silage 10 lb. Two groups received also 1 lb. CaCO₃ per head daily. At the beginning of the experiment all the cattle were fed on alfalfa only, and the change to the fattening ration was made gradually over 12 or 30 days. Four cattle from each of 4 groups were killed after 35 days and the rest after 133 days.

In all the groups there were animals with rumen inflammation, but the extent was significantly

greater in the groups which changed to the fattening ration in 12 days. CaCO_3 did not protect. The rumen inflammation was acute in animals killed after 35 days and chronic in those killed later.

In the second experiment 37 Hereford steers aged 14 months were divided into 5 groups and received different proportions of alfalfa and the fattening ration. They were killed at about the same weights, after 192 to 213 days. The group which received 1 part alfalfa to 3 parts concentrates had significantly more rumen inflammation than those in which the ratio was between 1:2 and 2:1.—D. Duncan.

1489

DOUGHERTY, R. W. and MEREDITH, C. D. **Anti-foaming (defrothing) agents in the treatment and prevention of bloat.** *J. Amer. Vet. Med. Assoc.*, 1954, 124, 474-475. [Dept. Physiol., New York State Vet. Coll., Cornell Univ., Ithaca.]

1490

WORDEN, A. N., BUNYAN, J. and PICKUP, J. A **fatal hypocalcaemia-like syndrome in dairy cows following the excess consumption of fodder-beet.** *Vet. Rec.*, 1954, 66, 133-134. [Cromwell House, Huntingdon.]

At a dairy farm in southern England it was the practice to balance lush spring grass by giving mangolds at pasture. When the mangolds were suddenly replaced by fodder beet, the whole herd of 50 Guernsey cows was found with typical signs of hypocalcaemia within 24 hr. Despite treatment with calcium borogluconate, 6 animals died, and on post-mortem examination the rumen in each case was found to be heavily impacted, with actual separation of the mucosa and associated haemorrhage. Blood samples from other affected animals confirmed the existence of hypocalcaemia.

W. A. Greig.

1491

REDA, H. and OLOUFA, M. M. **Incidence of diseases and mortality among the Egyptian cattle and buffaloes.** *Brit. Vet. J.*, 1954, 110, 157-160. [Dept. Animal Breeding, Fac. Agric., Giza, Egypt.]

From a survey made in Egypt during the years 1943 to 1952, and covering 261 buffaloes and 394 cattle, it was concluded that the incidence of disease was significantly higher in cattle than in buffaloes, although the mortality rate was about the same in both species. The chief causes of disease were enteritis, metritis, mastitis, pneumonia and impaction, tympanites and indigestion. The authors suggest that the preference for buffaloes in Egypt may be due not only to the higher butter-fat content of their milk but also to the greater freedom from disease.—W. A. Greig.

1492

BEVERIDGE, W. I. B. and JOHNSTONE, I. L. **Sheath-rot, non-contagious posthitis or chronic ulceration of the prepuce of sheep. 3. Curative effect of reduced food consumption or surgical measures.** *Austral. Vet. J.*, 1954, 30, 1-6. [Div. Animal Health Prod., C.S.I.R.O., McMaster Animal Health Lab., Sydney.]

Because sheep affected with sheath-rot usually recovered when brought from the field to the laboratory, it was thought that recovery might be due to the enforced starvation during transit or to voluntary semi-starvation on arrival when they were offered an unaccustomed diet. Other possible explanations were the altered diet and the changes of environment.

A series of laboratory and field experiments demonstrated that fasting had a definite curative effect on both internal and external posthitis lesions. There was some evidence that the factor responsible was the change from an alkaline to an acid urine which followed fasting; drenching with sodium bicarbonate maintained the urine alkaline, and there was a high mortality among animals treated in this way. On the other hand, ammonium chloride, while it induced an acid urine, was less effective than fasting. Further trials indicated that reduced water intake was not responsible, and the mechanism was not completely elucidated.

A few cases did not respond to fasting, and in these a surgical method was devised for alleviating the condition. See Abst. 3991, Vol. 24.

W. A. Greig.

1493

HARTLEY, W. J. **"Stiff lamb disease" in New Zealand.** *N.Z. Vet. J.*, 1953, 1, 137-142. [Wallaceville Animal Res. Stat., Dept. Agric., Wellington.]

A specific myopathy affecting lambs aged from 6 days to 6 weeks, which die after approximately one week, has occurred in New Zealand either spontaneously, following the driving of ewes and lambs off lush clover pastures or, over a period, in lambs whose mothers were grazing a predominantly red-clover sward. The signs and lesions closely resembled the "stiff lamb disease" as it occurs in Britain and the U.S. The chief lesions at post mortem were gelatinous oedema of the subcutaneous tissues and the appearance of gross focal or diffuse pale areas in the muscles, particularly those of the hind legs. Cardiac lesions, chiefly a focal gray discolouration of the endocardium of the right ventricle, or chalky sub-endocardial plaques, were frequently seen. The single specimen of urine examined for creatinine and creatine contained excessive quantities. Histologically, the muscle lesions were necrosis, often with calcification. Widespread vacuolation of the hepatic

parenchyma and dilatation of Bowman's capsule and lesions in the glomeruli and the convoluted and collecting tubules of the kidney were common.

It is considered highly probable that the pathological process is similar to that of "stiff lamb disease", but that under New Zealand conditions, with a plentiful supply of green feed, an uncomplicated vitamin E deficiency seems unlikely.

W. A. Greig.

1494

RAGAB, M. T., ASKER, A. A. and KADI, M. R. Some factors affecting mortality in Ossimi and Rahmani lambs. *Indian J. Vet. Sci.*, 1954, 24, 89-92. [Dept. Animal Breeding, Fac. Agric., Univ. Cairo, Giza.]

1495

LUCIFERO, M. Le pecore "rintontite". [The "stupid" ewe.] *Riv. Zoolec.*, 1954, 27, 232-233.

A disease known as "twin lamb disease" in Britain.

1496

THOMAS, G. and EDEN, A. A peculiar nutritional dermatitis in pigs. *Nature*, 1954, 174, 553. [Nat. Agric. Advisory Serv., E. Province, Anstey Hall, Trumpington, Cambridge.]

Pigs of 10 to 12 weeks of age frequently developed characteristic dermatitis with acute irritation. Appetite and gain of weight were impaired and recovery was slow. This condition was found only when the pigs were dry-fed, even when water was freely available, and was not controlled by oil or powder dressings, dipping, bathing or spraying with insecticide. The inclusion of fodder beet or potatoes in the feed produced an improvement, and wet-feeding rapidly cured the condition.

A. Hepburn.

1497

LUDVIGSEN, J. Undersøgelser over den såkaldte "muskeldeneration" hos svin. 1. [Studies of so-called "muscle degeneration" in pigs. 1.] *Forsøgslab. København Beretn.*, 1954, No. 272, pp. 105. English summary.

"Muscle degeneration" is defined as a condition in pigs in which the skeletal muscles lose colour so as to resemble chicken or fish flesh, and have a high water content and a sour smell; the muscle is easily teased into its component bundles and fibres. When all or nearly all groups of muscle are affected, the disorder is described as "total muscle degeneration"; clinical signs are dullness, high temperature, dyspnoea, cyanosis, trembling and weakness, but most affected pigs show no sign in life.

At slaughter the pH of muscle is low, about 5.3 instead of 6.4; the liver is enlarged and there are haemorrhages in both liver and kidney. External muscles are more affected than internal. The

heart muscle is usually light in colour and of abnormal texture. Microscopically the muscles are oedematous with fluid between the fibres, and often ruptured. There may be infiltration of leucocytes and connective tissue cells where fibres have ruptured. Otherwise no great change is found except in the thyroid, where the alveoli are filled with colloid, the cells are flat and the nuclei small and stain heavily. Death is preceded by severe haemorrhages in all parenchymatous and endocrine tissues.

The incidence, as measured at slaughterhouses, is higher in summer than in winter and deaths are most frequent in July and August. The disorder is not more common in one area than in another. In the year 29 September 1952 to 1 October 1953, out of 12,724 pigs delivered at co-operative slaughterhouses, 3.4 per cent. had "total muscle degeneration".

Experiments based on the post-mortem findings in the thyroid showed that muscle changes resembling those in this disorder could be produced by giving pigs methylthiouracil and prevented by giving iodinated casein. Further experiments with a pig herd which had been badly affected showed that iodinated casein prevented the disorder where controls from the same litters were all severely affected.

Biochemical findings in blood and muscle are described. Serum K rises and Na falls. The cause of death is thought to be shock. [It is not anywhere suggested that the pigs suffering from this disorder were given methylthiouracil.]—I. Leitch.

1498

INNES, J. R. M. and YEVICH, P. P. So-called nutritional muscular dystrophy as a cause of "paralysis" in rabbits. *Amer. J. Pathol.*, 1954, 30, 555-565. [Med. Labs., Chem. Corps, Army Chem. Centre, Md.]

In routine pathological examinations of more than 100 rabbits special attention was given to the skeletal muscles. In 24 animals there were lesions of the paravertebral muscles and in 16 of these there were macroscopic lesions, haemorrhagic streaks intermingled with pallid spots and areas of necrosis, sometimes accompanied by wasting and impaired locomotor activity. In the other 8 there were only microscopic histological lesions and the rabbits appeared plump and healthy. All the rabbits had been kept for weeks or months on a stock rabbit pellet supposed to contain all the constituents essential for rabbits.

It is suggested that such spontaneous lesions may occur frequently. They are indistinguishable from the lesions described in so-called experimental nutritional muscular dystrophy and may be a source of error in clinical interpretation of results.

D. Duncan.

1499

ARGUTINSKAYA, S. V. K voprosu ob obrazovanii mochevykh kamnei u norok. [The formation of stones (in the bladder) in mink.] *Karakul. Zverovodstvo*, 1953, 6, No. 4, 47-53. [All-Union Sci. Res. Lab. Fur Animals.]

A study of animals suffering from the disease throughout the several sovkhoses led to the conclusion that deaths were caused by phosphatic and not by urate stones. The overall mortality was low, 1 per cent. of the total mink population, but on some sovkhoses it was as high as 64 per cent. of the entire herd and 50 per cent. of the pups. The highest mortality was among the females towards the end of pregnancy and among the very young pups.

The stones consisted of Ca and Mg phosphate, carbonates of Ca and Mg, a small amount of sulphates, silicic acid and ammonium magnesium phosphate. Their composition showed that they were formed in the alkaline medium of the urine, and it is recommended that the acidity of the ration should be increased. Their formation is ascribed to a breakdown in metabolism during growth, pregnancy and lactation and it is considered that feeding can have only a predisposing effect. Possible conditions favouring stone formation could be an increased alkalinity of the ration and an excess of mineral matter in the food.

H. Soherbatoff.

1500

COFFIN, D. L. and HOLZWORTH, J. "Yellow fat" in two laboratory cats: acid-fast pigmentation associated with a fish-base ration. *Cornell Vet.*, 1954, 44, 63-71. [Angell Mem. Hosp., Boston, Mass.]

Post-mortem examinations were made of two 7-month-old littermate cats, one male and one female, which had been maintained from the age of 6 weeks on a commercial canned cat food said to consist of a fish base with supplements of cereals, grassmeal, groundnut and linseed meals, molasses and salt. When 5 months old, the male had shown symptoms of anorexia, oedema of the legs and body, and weight loss, but had recovered after injections of liver extract and feeding on horse-meat and milk. The female had also lost weight at about the same time, showing in addition stiffness in the joints, but had recovered spontaneously. Both made poor weight gains, however, and shortly before death they developed nervous disturbances, chiefly opisthotonos and muscular spasms. Coma followed.

The findings in both were similar, the features being rough dry fur, pale mucous membranes and loss of subcutaneous fat. This fat, and also that in the mesenteric, omental and retroperitoneal regions, showed striking changes, being soft in consistency and deep yellow or light rusty-brown in

colour, with bright red or red-brown streaks and flecks. Histologically, the fat was seen to contain a yellowish pigment of a strongly acid-fast character, often in islands scattered among normal adipose areas, which resisted ordinary fat solvents. Globules of fatty material had been broken down into small masses which had become phagocytosed, and in some places amorphous precipitated material was also present.

Because of the similarity of these changes to those observed in several other species fed on diets containing large amounts of unsaturated acids but low in vitamin E, it is suggested that the adipose discolouration had a similar etiology.—W. A. Greig.

DEFICIENCY DISEASES

1501

BAUER, H. Mangelschäden bei landwirtschaftlichen Nutztieren in Baden. Ursachen und Bekämpfung vom Standpunkt des Tierarztes, Züchters und Landwirts. [Deficiency diseases in farm animals in Baden. Causes and combating, from the point of view of the veterinary officer, the breeder and the farmer.] *Schriftenreihe über Mangelkrankheiten*, 1953, No. 3, pp. 152. English summary.

This publication is both a broad review of the whole subject of deficiency diseases and the outcome of practical and scientific work during many years of investigations in the State of Baden. It has been produced at the request of a subcommittee of the German Society for Agriculture which was set up to consider means of combating deficiency diseases.

After an outline of the economic losses due to deficiency diseases in Baden, the occurrence of different types of such diseases in different areas in the State as reported by veterinary practitioners is tabulated and shown on a map. The different types of soils, their underlying geological formation and their possible influence on the occurrence of deficiency diseases due to the low quality of the flora and grazing herbage are discussed. The use of fertilisers and their influence on animal health through their effect on the quality of the crop are also considered. Information in the literature on the selective feeding habits of different classes of stock is reviewed, and 48 medicinal plants with their main constituents are listed.

Individual deficiency diseases and their possible causes and treatment are then discussed. Amongst these are rickets and osteomalacia, tetany in cows, licking disease (pica), "tongue-playing" in cattle, Darre, Hinsch- and Semperkrankheit, which appear to be similar or allied diseases possibly due to cobalt deficiency, growth disturbances in young animals due to inadequate feeding (mineral and vitamin deficiencies), goitre, *haematuria vesicalis bovis*, and acetonæmia in cows.

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The whole problem of feeding errors and the losses arising therefrom and proposals for their remedy are considered in a further chapter and directions are given for the supplementary feeding of minerals, including trace elements and vitamins, where necessary, to farm animals.—W. Godden.

1502

RIEHM, H. *Étude et traitement du mal du "Hinsch" dans une ferme du nord de la Forêt-Noire. Essai sur le rôle du cobalt à l'état de traces. [Treatment of "Hinsch" disease on a farm to the north of the Black Forest. Role of traces of cobalt.] Ann. agronom., 1954, 5, 349-359. [Inst. Nat. Exp. Recherche Agronom., Augustenberg, Baden-Württemberg.]*

The disorder was studied in cattle on a mountain farm near Baden-Baden, where rearing of young stock was impossible because of this disease. The signs were loss of appetite, pica, loss of weight and poor milk production, progressive weakness and often death of young animals. The cattle were housed for a long winter season and fed only on home-produced hay.

The farm lay on the north face of a granite hill; 2 neighbouring farms on different soils were not affected. The total Co content of soil samples from the affected farm ranged from 0.4 to 0.6 p.p.m., in samples from the other farms from 0.4 to 6.22 p.p.m. Lactate-soluble Co in samples from the 3 farms showed mean values of 0.053, 0.143 and 0.140 p.p.m., respectively, and on the affected farm 21 out of 24 samples contained less than 0.06 p.p.m. Samples of hay from the 3 farms were analysed in 3 successive years, and the mean Co content was 0.039 p.p.m. on the affected farm and 0.101 and 0.100 on the others. Values for Mo, Cu, Zn, Fe and Mn were all within the normal range.

Five cows slowly improved when given 0.5 kg. molasses, making up their total Co intake to 0.9 mg. daily, but a young heifer failed to improve. Spectacular improvement occurred when this heifer received 2.0 mg. Co as sulphate daily, and in 2 other animals given 1.0 mg. daily in the drinking water.

It is concluded that the disease is an uncomplicated cobalt deficiency.—D. Duncan.

1503

OSBORNE, A. D., FEATHERSTONE, J. and HERDAN, G. *Cobalt deficiency in Herefordshire and Worcestershire. 1. Field observations.*

TRIBE, D. E. and OSBORNE, A. D. *2. Laboratory investigations. Vet. Rec., 1954, 66, 409-413; 413-414. [Univ. Bristol Vet. Sch., Langford, Somerset.]*

1. On 9 farms in north-west Worcestershire and

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north Herefordshire, where soil analyses showed a low Co content, groups of lambs were given cobalt sulphate equivalent to 14 mg. Co every fortnight during the summer and autumn. Both treated and control lambs were treated against worms. On 6 of the farms Co gave an advantage in improving the growth of the lambs; the difference in male lambs was significant in 3 successive years, in females only in the last year, 1953. In 1949, a dry summer, no result was significant.

2. Four pining lambs from one of the farms included in the above experiment were studied in the laboratory. One lamb received 100 µg. vitamin B₁₂ by intramuscular injection 3 times weekly and showed an immediate increase in appetite and in bodyweight. Two responded rapidly when given Co by mouth at the rate of 7 mg. weekly. The fourth lamb was untreated and maintained its bodyweight throughout the experiment but failed to grow. The deficiency was considered to be "borderline".—D. Duncan.

1504

BROOKSBANK, N. H. *Anaemia in piglets associated with a copper deficiency. Vet. Rec., 1954, 66, 322-324. [Vet. Invest. Centre, Sutton Bonington.]*

Two litters of pigs aged 4 to 5 weeks affected with severe anaemia responded poorly to intramuscular Fe. The 8 piglets of a second-litter sow were then treated with intramuscular Fe on the fourth and tenth days of age. Growth rate continued satisfactorily for a fortnight, but the Hb concentration dropped steadily, and did not improve even when FeSO₄ was given by mouth. The anaemia was hypochromic, with a number of nucleated red cells but very few reticulocytes in the peripheral blood. CuSO₄ by mouth, with or without FeSO₄, was introduced at 26 days, and continued for 5 days; 3 days later clinical and haematological improvement was apparent, and the blood picture soon became normal.

The anaemia was associated with an abnormally high lymphocyte : neutrophil ratio. This remained unaffected by Fe, but was corrected by Cu.

W. A. Greig.

1505

CUNNINGHAM, U. J. *Molybdenum and animal health in New Zealand. N.Z. Vet. J., 1954, 2, 29-36. [Wallaceville Animal Res. Stat., Dept. Agric., Wellington.]*

Trials are in progress all over New Zealand to discover in which areas molybdenum may be beneficial to pasture and arable land. The role of Mo in peat scours of cattle is discussed: the condition is considered to be Mo intoxication associated with pasture levels of Cu not in themselves low enough to account for Cu deficiency, but where the Cu is rendered unavailable by the antagonistic

effect of Mo. Experiments are reported which demonstrate that on most New Zealand types of soil a small dressing of Mo materially increases the Mo content of the pasture. Mo should therefore be used with great caution on soils known to produce pastures low in Cu, and always in the smallest effective amounts.—D. Duncan.

1506

BLAXTER, K. L., ROOK, J. A. F. and MACDONALD, A. M. The origin of tetany in magnesium deficiency. *Proc. Nutrition Soc.*, 1954, 13, ii-iii. [Hannah Dairy Res. Inst., Kirkhill, Ayr.] Experiments with calves.

1507

MATHEU, M. Observations sur les effets de la carence phosphorique en Beauce. [Observations on the effects of phosphorus deficiency in Beauce.] *C.R. Acad. Sci.*, 1954, 239, 648-650.

Cattle on the chalky soil of Beauce, which contained about 0.11 per thousand of assimilable P_2O_5 and 8 per thousand of exchangeable CaO, showed osteomalacia, pica and poor production. Two groups of 4 cows in milk received similar rations of local feeds, but the crops supplying one group were grown on land topdressed with superphosphate. The intakes of dry matter, N and Ca were similar, but the crops from topdressed land contained about twice as much P as the others. The cows receiving more P were cured without other treatment and their milk yields were 44 per cent. greater than those of the cows with low P intake; 2 of the latter had osteomalacia and the others were in poor condition.—D. Duncan.

1508

TODD, J. R. The phosphorus status of cattle in part of Central Province, Kenya. *East African Agric. J.*, 1954, 20, 66-68.

Values as low as 0.13 per cent. P_2O_5 in the grass dry matter have been recorded during the dry season in Kenya. Contents of 0.5 per cent. or over are rare. Pica in cattle, mainly earth eating, is widespread. Estimations of the inorganic P content of the blood of 202 native-owned cattle showed that while none fell below 2 mg. P per 100 ml., 25 per cent. had less than 4 mg. per cent. and were considered subnormal. Animals in good condition had the lowest content, P supply probably being adequate for maintenance in poor condition but not for the demands of production also. It is suggested that for increased animal production in this area P supplements must be provided.—J. L. Corbett.

1509

ROSE, A. L. Osteomalacia in the Northern Territory. *Austral. Vet. J.*, 1954, 30, 172-177.

1510

SUOMELA, H., KÄMÄRÄINEN, P. and PALOHEIMO, L. Kokeita ns. Promeca-rehulia. [Experiments with Promeca food mixture.] *Maataloust. Aikakausk.*, 1954, 26, 112-115. [Dept. Animal Husb., Univ. Helsinki.] English summary.

Promeca is a patented food mixture containing 4 per cent. calcium chloride, 46 per cent. beet molasses and 50 per cent. wheat bran and is recommended as protection against low blood Ca. In feeding experiments with chickens and ewes no harmful effect was noted even when large amounts of Promeca were given.—J. S. Thomson.

1511

ALLCROFT, R., SCARNELL, J. and HIGNETT, S. L. A preliminary report on hypothyroidism in cattle and its possible relationship with reproductive disorders. *Vet. Rec.*, 1954, 66, 367-371. [Vet. Lab., Minist. Agric., Weybridge, Surrey.]

Thyroid glands from 5 aborted foetuses were examined histologically and chemically; 3 were heavier than normal. In some there was evidence that stimulation had occurred and in others that their I contents were either below or near the critical level of 0.03 per cent. of fresh weight suggested by Marine and Lenhart (*Arch. Int. Med.*, 1909, 4, 440) as that below which hyperplasia might occur.

Estimations of blood iodine were made in a number of herds in which abortion was a problem and in a number of suitable control herds. A breed difference was found for the amount of protein-bound I in plasma; ranges and mean values in μg . per 100 ml. were for 23 Guernsey cows 3.2 to 4.0, 3.42, for 20 Ayrshires 2.8 to 3.6, 3.12, and for 20 Friesians 2.4 to 3.2, 2.90. In affected herds of 2 of these breeds corresponding data were for 23 Guernseys 1.6 to 3.2, 2.22 and for 7 Friesians 0.8 to 1.6, 1.09; these means were lower by amounts statistically significant.

During the investigation some remarkably high values for total I in blood plasma were encountered, but they were found to exist in cows which had been given seaweed meal in their production ration, or, in one case, where the animal had had an intra-uterine injection of I solution. Less spectacular increases were seen in heifers which had been receiving a mixture of concentrates containing KI. In each of these groups the increases were almost entirely in the inorganic fraction; protein-bound I in the plasma was raised only slightly.

The water supply used by each herd was analysed for I and hardness. The difference between the mean values per litre, 3.25 μg . I for control herds and 2.87 μg . for affected herds, was not

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statistically significant. Findings for milk yields, reproductive efficiency and incidence of abortion and calving abnormalities are tabulated.

Work is being continued to test further the association of reproductive disorders with low levels of blood I in cows and with the thyroid characteristics in foetal calves.—D. Harvey.

1512

STAUB, H. Die Behebung der Aufzuchtverluste bei Ferkeln mit Hilfe von Infrarot-Strahlern. [Reduction of losses of young pigs with the help of infrared rays.] *Berl. Münch. tierärztl. Wochenschr.*, 1954, 67, 281-285. [Vet. Hyg. Inst., Justus Liebig Hochsch., Giessen.] English summary.

By the use of infrared rays breeding losses among young pigs were reduced to a minimum. Even in cold, wet housing conditions, where the yearly losses had previously amounted to 35.5 per cent. (46.7 per cent. in winter), the losses after infrared ray treatment were reduced to 1.3 per cent. In moderate housing conditions (cold, but relatively dry) the losses were reduced from 17.5 to 1.3 per cent., and in good housing conditions from 11.5 to 1.1 per cent. After 3 weeks the infrared rays could be partly shut off, and after 4 weeks removed altogether; the young animals then continued to thrive.—M. B. Richards.

DISEASES OF METABOLISM

1513

INGLIS, J. S. S., WEIPERS, M. and MARR, A. Some observations on bovine hypomagnesaemia. *Vet. Rec.*, 1954, 66, 353-354; 355. [Vet. Sch., Univ. Glasgow.]

Six deaths occurred among 22 suckling cows continuously grazing during mild weather in winter. No feeding supplement had been available. Blood samples from 8 of the remaining cows showed values ranging from 0.58 to 1.27 mg. per cent. Mg. The protein content of the herbage was low, but Mg and Ca were normal. Two lb. hay and the equivalent of 2 oz. MgO given daily prevented further death, and serum Mg rose by about 80 per cent. after 5 weeks.

Four cattle grazing without supplementary feeding from the end of July showed no difference in serum Mg from 4 cattle kept inside and fed on hay and small amounts of concentrates until mid-October. The Mg level in the grazing cattle then fell significantly to 1.05 mg. per cent. after 3 weeks. Giving hay rapidly raised the Mg to a safety level. Weather was concluded to have no direct effect on serum Mg.—A. Hepburn.

1514

ALLCROFT, R. Hypomagnesaemia in cattle. *Vet. Rec.*, 1954, 66, 517-522. [Minist. Agric., Vet. Lab., Weybridge.]

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1515

MAPLESDEN, D. C. Propylene glycol in the treatment of ketosis. *Canad. J. Comp. Med.*, 1954, 18, 287-293. [Dept. Med., Ontario Vet. Coll., Guelph.]

Routine cases of bovine ketosis, 8 primary and 2 with slight metritis, were given twice daily by mouth 250 g. (7 cows) or 125 g. (3 cows) propylene glycol for 4 days.

Response to treatment was significant in all cases. One cow relapsed 8 days after the end of treatment but recovered completely after re-treatment. The higher level of propylene glycol produced more rapid recoveries than the lower level, which was considered too slow for routine farm practice.—A. Hepburn.

1516

JOHNSON, R. B. The treatment of ketosis with glycerol and propylene glycol. *Cornell Vet.*, 1954, 44, 6-21. [Live Stock Sanit. Serv. Lab., Univ. Maryland, College Park.]

Since it is now known that the ruminant absorbs little glucose as such, but depends for its energy supplies on the products of rumen fermentation, the problem of the treatment of ketosis may be regarded as one of finding an inexpensive glucogenic material which is not destroyed by rumen micro-organisms and which does not leave undesirable residues upon oxidation.

A number of substances were considered, including propionic acid, tripropionin, glycerol, propylene glycol and sodium propionate. Of these, propylene glycol was regarded as the most satisfactory. Glycerol also was effective but expensive. Nine dairy cows with ketosis were treated with glycol, 7 with propylene glycol and 2 with both, response being judged by appetite, milk yield and plasma glucose and ketone body levels, which were measured at intervals. An initial dose of 2.25 kg. glycerol, followed by up to 1 kg. daily, was expensive but gave generally excellent results; so also did daily doses of 200 to 800 g. propylene glycol, which was much cheaper. Propionic acid is considered unsatisfactory because in large doses it causes acidosis and irritation, tripropionin is immiscible in water, unpalatable and expensive, and adequate doses of sodium propionate raise the animals' CO₂ capacity, with resulting loss of appetite, owing to the excessive liberation of sodium ions.

W. A. Greig.

1517

MILLER, W. J., TYZNICK, W. J., ALLEN, N. N. and SORENSSEN, D. K. The treatment of ketosis in dairy cows by oral administration of sodium acetate. *J. Amer. Vet. Med. Assoc.*, 1954, 124, 291-294. [Dept. Dairy Husb., Univ. Wisconsin, Madison.]

Because of the fact that sodium acetate in the rumen is rapidly absorbed and can be converted into carbohydrate, its value as an aid to the treatment of ketosis was tested on 49 cows showing clinical signs. In 34 of these blood sugar and blood urine ketones were measured before treatment and at intervals thereafter.

Sodium acetate was given in amounts varying from $\frac{1}{2}$ lb. to 1 lb. daily. Of the 34 cows, 18 recovered with no other treatment, 16 of them within 2 weeks. Six developed complications, and 10 failed to respond. Of the 10, only one responded to any other treatment. The 15 other cows with clinical signs of ketosis also were treated with sodium acetate, and made satisfactory clinical recoveries.

It is admitted that controls without treatment were not used, as they were not available, but if the acetate treatment was not beneficial then the frequency of spontaneous recovery from ketosis may be so high as to obviate the justification for any routine treatment whatever.

Other points in favour of sodium acetate as a treatment for ketosis are that it is inexpensive, is readily obtainable, is not unpalatable, appears to have a stimulating effect on appetite, is non-toxic, is compatible with other treatments, and by increasing the alkali reserve of the blood, may contribute to the relief of any accompanying acidosis.—W. A. Greig.

1518

McLINTOCK, J. and WILKINSON, G. T. Acetonaemia in a litter of Samoyed puppies. *Vet. Rec.*, 1954, 66, 416-417. [Norwich.]

Severe ataxia accompanied by nodding movements of the head and muscular tremors was seen in six 4-week-old puppies. All had diminished pedal reflexes, bloated abdomen and breath smelling of acetone. The acetonaemia diagnosed was traced to a high fat intake and consequent fatty infiltration of the liver. A diet of glucose, water and NaHCO_3 , and the injection of glucose, saline and vitamin B_{12} cured 4 puppies.

A. Hepburn.

1519

TALSMA, D. De behandeling van acetonaemie met een A.C.T.H.-preparaat met geprolongeerde werking. [Treatment of acetonaemia with an ACTH preparation with prolonged action.] *Tijdschr. Diergeneesk.*, 1954, 79, 620-623. [Lab. Med. Vet. Chem., Rijks Univ., Utrecht.] English, French and German summaries.

Results were not better than with the usual methods of treatment of *post partum* acetonaemia in cows.—I. Leitch.

1520

ARNOLD, R. M. Manchester wasting disease. A disease of ruminants manifested by metastatic

calcification especially of the cardio-vascular system. *West Indian Med. J.*, 1954, 3, 1-8. See Abst. 2996, Vol. 20.

POISONS OCCURRING IN FOOD

1521

OGILVIE, D. D. "Chronic" copper poisoning of sheep. *Vet. Rec.*, 1954, 66, 279-282. [I.C. (Pharmaceuticals), Ltd., Wilmslow, Manchester.]

An outbreak occurred among sheep grazing under controlled conditions on 85 acres of orchard which had at intervals been sprayed with cuprous oxide equivalent to 10 lb. Cu per acre. The flock was not allowed access until at least 14 days after spraying, but 27 deaths occurred at intervals between 2 weeks and rather more than 2½ months after spraying ceased. Post-mortem examinations were made of 3 sheep, of which one had died between 24 and 36 hr. earlier and for it the findings were of little value because of decomposition. The second had marked signs of disease and was examined 3 hr. after death and the third, which had no sign of disease, was killed and underwent immediate examination.

The second sheep appeared not to have lost appetite, was deeply jaundiced and showed almost complete degeneration of the liver. The third was in excellent condition. Fe, As, Cu, Co, Pb and Zn were estimated in liver, kidney, rumen contents and small intestine of both animals; these data are tabulated. The Cu content of the liver of sheep 3 was in fact higher than for sheep 2, but in the kidneys the reverse was true, sheep 2 having between 3 and 4 times the amount in sheep 3.

The Cu content of the pasture was estimated in 4 paddocks; 2 months after spraying it ranged between 80 and 250 p.p.m. and after 5 months between 10.3 and 15.0 p.p.m. Control pastures averaged 8 p.p.m. It was calculated that 2 months after spraying the intake must have been about 1 g. Cu daily.

The description "chronic" refers only to the time taken for signs to appear and, depending on the copper status before ingestion of the increased amounts, this may range between 20 and 100 days. Once signs develop the disorder is acute and death results in 1 to 4 days.—D. Harvey.

1522

SCHMIDT, H. J., NEWELL, G. W. and RAND, W. E. The controlled feeding of fluorine, as sodium fluoride, to dairy cattle. *Amer. J. Vet. Res.*, 1954, 15, 232-239. [Stanford Res. Inst., Calif.]

In an area in Arizona where cattle are naturally exposed to a high level of F in their drinking water, it was found that the safe borderline level of ingestion of soluble F by cattle is about 1 mg. F

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per kg. bodyweight daily. This estimate is in accord with conclusions derived from a study of the literature.

To extend knowledge of the effects of long-term ingestion of soluble F, an experiment is being conducted with cattle over a period of 5 to 6 years; this paper is an interim report. Four groups of 4 cattle are being given sodium fluoride in their grain rations at rates providing total F intakes of from 1.0 to 2.5 mg. per kg. bodyweight daily. A fifth group, receiving no NaF supplement, has an intake from natural sources of from 0.15 to 0.3 mg. F per kg. bodyweight daily, and serves as a control.

So far it has been found that only slight mottling or staining of the fourth pairs of incisors, with no wear, has occurred in the 1 mg. group. At the 1.5 mg. level, mottling and staining were more evident, but at the 2 higher levels severe, and there was also wear. Lesions were less frequent and less intense in the third pairs of incisors, and only one cow has developed any change in the first and second pairs of incisors.

Slight exostosis has developed in 3 of the 4 cows at the 2.5 mg. level, but in none of the others. None of the animals has lost weight or developed diarrhoea, rough coat, "lapping of water", or elongation of the toes, and milk production has not diminished. General health has been satisfactory, although at the peak of milk production there has been a transitory unthriftness in cows of the 2.5 mg. group.

Urinary excretion of F has reflected the level of intake.—W. A. Greig.

1523

NEELEY, K. L. and HARBAUGH, F. G. Effects of fluoride ingestion on a herd of dairy cattle in the Lubbock, Texas area. *J. Amer. Vet. Med. Assoc.*, 1954, 124, 344-350. [Dept. Animal Husb., Texas Technol. Coll., Lubbock.]

Forty cows in an area where the water supply had a fluorine content of 4 to 5 p.p.m. were examined for signs of fluorosis. It was calculated that the average daily ingestion of F was 0.52 mg. per kg. bodyweight over 3 years, and 1.69 mg. per kg. bodyweight during the succeeding 3 years, the increased amount resulting from the introduction of a commercial feed.

Mottling, staining and abnormal wear were evident in the incisor teeth of all of the cows, most severe in teeth which were being formed at the time of the rise in F intake. In cows ingesting large quantities of F over 6 years, the dental lesions were very marked and were similar to those generally accepted as being caused by fluorosis. However, there was no skeletal lesion, stiffness, diarrhoea or elongation of the hoofs, and no abnormality in milk and butterfat production or in

breeding efficiency, which could be attributed to the high fluorine intake.—W. A. Greig.

1524

PETRO, A. W. Studies on fluorosis of sheep. 2. The toxicity of waterborne fluoride for mature grazing sheep. *Austral. J. Agric. Res.*, 1954, 5, 545-554. [Div. Biochem., C.S.I.R.O., Univ. Adelaide, S. Australia.]

During a 26-month trial, 3 groups of mature Merino wethers on pasture were given drinking water with F concentrations of 0.3, 10 and 20 p.p.m., respectively. Groups receiving water containing 10 and 20 p.p.m. F drank only 0.5 litre per head daily in winter, with negligible F intake, and 3 to 4 litres per head daily in summer, 0.4 and 0.8 mg. F per kg. bodyweight for the 2 groups, respectively. No significant difference was found between the 3 groups with regard to health, bodyweight or weight of wool. In no group was any mottling or uneven wear of the teeth seen. F concentrations in bones and teeth were 0.04 to 0.06 per cent. on the dry fat-free tissue in the control group, and 0.08 to 0.13 per cent. and 0.09 to 0.18 per cent., respectively, in the groups given water with 10 and 20 p.p.m. F. Results of indoor trials with younger sheep are compared and discussed.—J. G. Gill.

1525

TOWERS, K. G. Chronic fluorine poisoning associated with industry. *Vet. Rec.*, 1954, 66, 355-358 (with discussion 358).

1526

HARVEY, J. M. Flock management to control fluorosis of Merino sheep in Queensland. *Queensland J. Agric. Sci.*, 1953, 10, 127-159. [Biochem. Sect., Chem. Lab., Div. Plant Indust.]

Four groups of 20 Merino lambs aged 3 months were treated for 30 months as follows: (1) continuously on water containing 10 p.p.m. F, (2) 3 months on water with 10 p.p.m. F and 3 months on F-free water alternately, (3) 6 months on and 3 months off the F-containing water, and (4) 6 months on and 6 months off the water. The sheep were fed on poor quality alfalfa hay. Monthly inspection of the incisor teeth showed that damage by fluorine was greatest in groups 1 and 3. Mild fluorosis occurred in group 2 and only in this group was there no uneven wear of the molars or premolars. Six sheep from each group were slaughtered at the end of the experiment, and photographs of the incisor teeth and X-ray plates of the femur, tibia and mandible of these were shown. No abnormality was detected in the bones. Analyses of these bones, teeth and the

kidney showed F concentration to be lowest in group 2. There was no difference between groups in liveweight gain or wool growth. A rotation is recommended to allow young sheep protection from fluorinated water for at least 3 months and exposure for no longer than 3 months. Sheep over 30 months and breeding sheep may be kept on fluorinated water (concentration up to 10 p.p.m. F) but lambs must be given F-free water. See Absts. 1408, 2674, Vol. 24.—J. C. Gill.

1527

HALLGREN, W., KARLSSON, N. and WRAMBY, G. Molybdenförgiftning ("molybdenos") hos nötkreatur i Sverige. [Molybdenum poisoning, "molybdenosis", in cattle in Sweden.] *Nord. Vet.-Med.*, 1954, 6, 469-480. [Vet. Forsöks-avd., Skara.] English and German summaries.

The occurrence is described of molybdenum poisoning on a farm in the direction of the prevailing wind and on a pasture only 100 metres distant from the chimney of an iron-smelting factory which uses molybdenum in the smelt. Cattle grazing this pasture became severely ill with acute diarrhoea; convulsions also occurred.

The blood serum of 2 cows contained 0.7 and 1.0 mg. Mo per litre about a week after removal from the contaminated pasture; 2 samples of grass contained 231 and 204 mg. per kg. dry matter, and the blood serum of 2 horses, still grazing on the pasture but perfectly healthy, 1.1 and 1.4 mg. Mo per litre. Normal values from a farm where the pasture contained only 0.4 p.p.m. of dry matter, the average of samples over 2 years, were for a cow about 0.03 and for a horse 0.02 mg. per litre. The normal value of Swedish pasture, from the results of a wide survey (Karlsson, unpublished) is 1.5 mg. per kg. dry matter. Samples from the contaminated pasture in the following summer, when it was not grazed, gave 159, 81 and 74 p.p.m.

It was computed that the chimney emitted about 50 kg. ash daily, containing MoO_3 and MoS_3 .

In an experiment, a heifer and a dry cow from a farm 7 km. from the chimney were given a single intravenous injection of 0.5 g. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ($\equiv 0.13$ g. Cu) and were then put to graze on the contaminated pasture. Serum Mo values were: initially 0.02 and 0.02 mg. per litre; after 8 days 2.1 and 2.1, and after a month 2.0 and 1.9. A month later still, when brought in, both were still healthy. The Cu content of this pasture was normal or above normal, 9.3 p.p.m. in 1952.

Post-mortem examination of one heifer that died after treatment with Ca, Mg, sugar and B vitamins showed congestion in the intestine and mesenteric lymph glands, subendocardial haemorrhages in the left heart and fatty liver.—I. Leitch.

1528

DOUGHERTY, R. W. and CELLO, R. M. Studies of the toxic factors in rumen ingesta of cows and sheep. 2. *Proceedings Book*, 1952, 130-137. [Dept. Physiol., New York State Vet. Coll., Ithaca.]

For part 1, see Abst. 5783, Vol. 19.

The introduction of 3 or 4 lb. of cracked cereal grains into the rumen of sheep caused atony of the rumen, intense depression, sometimes tenderness of the feet, and death in 5 out of 6 animals. The rumen liquor and the plasma of peripheral and portal blood of such sheep was toxic to normal sheep and dogs, causing a fall of blood pressure and leucopenia. Dogs lost their sensitivity after repeated injections. Antihistamines provided some degree of protection, but the material was not destroyed by a histamine preparation known to destroy histamine. Attempts to identify the toxic material were not successful.—A. T. Phillipson.

1529

PENNY, R. H. C. Suspected poisoning by fodder-beet in the bovine. *Vet. Rec.*, 1954, 66, 134. [Leighton Buzzard.]

A young Guernsey cow gained access to a fodder beet clamp and consumed an unknown amount of this material. She was found unable to rise, with evidence of digestive disturbance, but no tympany. Faeces were passed in only small amounts. Next day the animal was on her feet, but very dull. Her temperature was 103°F ., she refused all food, and ground her teeth; ruminal movements were in abeyance. Her condition worsened progressively, and her temperature rose to 104.6°F ., with pulse rate 90 per min. Rumenotomy was performed and quantities of ruminal contents were removed. Despite this she died on the fourth day. Post-mortem examination revealed diffuse patchy inflammation of the lining of the rumen, reticulum, abomasum and intestines. Liver and kidneys were pale and blotchy, and the heart showed haemorrhages along the course of the coronary vessels. Blood samples taken during the illness revealed that serum Ca and inorganic P both were slightly low.

It is concluded that death resulted from toxæmia following the absorption of some irritant principle. It is suggested that the absence of fibre in the rumen when the roots were consumed contributed to the ruminal atony.—W. A. Greig.

1530

ROBINS, J. H. and SHAFPOOTT, R. Acorn poisoning in sheep. *N.Z. Vet. J.*, 1954, 2, 55. [Temuka, S. Canterbury.]

1531

TRETHEWIE, E. R., GAFFNEY, F. M. and GLADWELL, P. J. Pharmacological studies of grasses

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obtained from a property where "tall fescue lameness" in cattle occurs. *Austral. J. Exp. Biol. Med. Sci.*, 1954, **32**, 207-211. [Dept. Physiol., Univ. Melbourne.]

Cattle grazing on tall fescue (*Festuca arundinacea*) developed characteristic vasoconstriction and dry gangrene. Extracts of this grass and of the harmless ryegrass (*Lolium perenne*) were made in 0.6 per cent. acid saline. The neutralised extracts were injected into the femoral vein of cats whose vagi had been cut and the carotid blood pressure was recorded.

Both extracts acted as vasopressors, the fescue extract after a delay; the ryegrass extract, which was more powerful, produced an immediate increase smaller than the later main rise in blood pressure. The response to adrenaline after injections of the extracts was slightly greater. The pressor effects were evidently mediated through the adrenals, as was shown by the negative response after adrenalectomy.

The isolated cat uterus was stimulated and the isolated rat uterus inhibited by both extracts. The response of the rat uterus diminished with repeated doses of extract, but the inhibitory effect of ergometrine was unaltered. In the cat uterus grass extracts did not inhibit the response to adrenaline. It was concluded that the effect of the grass extracts was not caused by a substance of ergotamine type.—A. Hepburn.

1532

BETTY, R. W. and MARKSON, L. M. Liver biopsy in the diagnosis of ragwort (*Senecio jacobaea*) poisoning in a herd of cattle. *Vet. Rec.*, 1954, **66**, 398-400. [Crewkerne, Somerset.]

1533

BOBEK, K. and VANĚK, J. Otrava starčkem. [Poisoning with *Senecio*.] *Lékařské listy*, 1954, **9**, No. 15/16, 361-363. [Int. Clin. and Inst. Pathol., Med. Fac., Pilsen.] English, French and Russian summaries.

IMMUNITY

1534

RAMAKRISHNAN, S. P., BHATNAGAR, V. N., PRAKASH, S. and MISRA, B. G. Effect of milk diet on *Plasmodium gallinaceum* infection in its vertebrate and invertebrate hosts. *Indian J. Malariol.*, 1953, **7**, 261-265. [Malaria Inst. India, Delhi.]

With fowls, milk diet provided no protection, but rather the reverse, against multiplication in the blood of *P. gallinaceum*.—E. M. Hume.

1535

RICHARD, R. M., SHUMARD, R. F., POPE, A. L., PHILLIPS, P. H., HERRICK, C. A. and BOHSTEDT, G. The effect of certain mineral supplements on lambs infected with the stomach worm (*Haemonchus contortus*). *J. Animal Sci.*, 1954, **13**, 694-705. [Dept. Animal Husb., Univ. Wisconsin, Madison.]

In the first experiment additional cobalt in the diet of lambs infested with *Haemonchus contortus* appeared to benefit the parasite and not the host. There was a great increase in worm egg production in the cobalt-fed lambs, although there was no difference in the number of adult worms between the dietary groups at autopsy. Anaemia was present in the heavily infested lambs and most severe in the Co group.

A second experiment was set up to find out if Ca and P affected the results. Additional Ca and P were given in the form of steamed bonemeal. Apart from a more rapid initial increase in egg count, the lambs given Co or Co plus steamed bonemeal did better, in all measurements taken, than the lambs getting the basal diet or basal diet plus steamed bonemeal alone. Observations were made on weight gains, egg counts, Hb, vitamin B₁₂ and nicotinic acid content of the blood and rumen ingesta, plasma Ca and the market price and quality of the animals.—G. C. Hunter.

1536

HIRCH, A. and LAWRENCE, W. E. Experimental infection with *Mycobacterium johnei*. 1. The effect of a low calcium diet on the disease in goats. *J. Comp. Pathol.*, 1954, **64**, 102-115. [Dept. Vet. Pathol., Univ. Liverpool.]

Eight 2-month-old kids were infected by drenching with gut scrapings from cattle with Johne's disease, or by a combination of drenching and an intravenous injection of a fluid culture of *Mycobacterium johnei*. The drenching and injection were repeated after 10 days. Four were given a normal diet, with cod liver oil supplements, and 4 were given a low-Ca but otherwise similar diet; one of these was also given KH₂PO₄ to limit its absorption of Ca.

Two of the control kids developed signs of Johne's disease, and were killed after 39 and 36½ weeks. The remaining 6 were killed from 28 to 41 weeks after the first infecting dose. At post-mortem examination, which included cultural examinations and counts of clumps and acid-fast organisms in intestinal smears, there was no obvious difference between the groups, except that the control animals had calcified lesions in the mesenteric lymph nodes but those on the low-Ca diet had not.—W. A. Greig.

7. BOOK REVIEWS

1537

HORDER (Lord), DODDS, C. and MORAN, T. **Bread. The chemistry and nutrition of flour and bread, with an introduction to their history and technology.** Constable and Company, Ltd., London, 1954, pp. vii + 186.

The authors of this book, representing as they did administrative, academic and commercial interests in bread, were well qualified to bring together, digest and summarise under one cover the vast information available on the subject. The book does not profess to be a complete review of literature for the specialist research worker, although every chapter has its bibliography. Nor is it for the general public. It is intended mainly for that section of the public which has a scientific background, doctor, science teacher, social worker, dietitian and the like.

The book begins with a short history of bread, which apparently was made in 2600 B.C. in much the same way as now. There follow an account of the types of wheat now used and their sources and a description of milling and baking techniques. The use of chemical improvers such as agene is discussed. The chapters devoted to the chemistry, digestion and assimilation of wheat, flour and bread summarise concisely the large modern literature. The contribution of flour and bread to the diet is assessed and the relative nutritive value of breads made from flours of different extraction rates and enriched flour are discussed. These chapters present a very clear picture of the importance of flour and bread in the U.K. diet. They supply about one-quarter of energy requirements and more protein than any single food, as well as being a rich source of B vitamins and minerals. But bread is not usually the sole food, and this should be borne in mind when such questions as the relative merits of high extraction and enrichment of flour are discussed.

The authors are nothing if not fair, and a final chapter on bread and health considers the evidence that high bread consumption may have harmful effects such as contributing to obesity, causing rickets, dental caries and digestive tract disorders. Little positive evidence against bread is found except for the relatively recent discovery that patients with coeliac disease require the exclusion of wheat gluten from the diet.

The usefulness of this little book is enhanced by the addition of a subject index.—F. C. Aitken.

1538

KALE, G. T., BHUTANI, R. C., IYENGAR, N. V. R., BALU, V. and SANKARAN, A. N. (Eds.).

Technical aid to food industries. Proceedings of the Symposium held at the C.F.T.R.I. Mysore on 5th and 6th February 1953. Central Food Technol. Res. Inst., Mysore, 1954, pp. xvi + 270.

The Third Symposium was held at the Central Food Technological Research Institute, Mysore in February 1953. Its subject was Technical Aid to Food Industries and it was attended by representatives of government departments, universities and research institutes, the food industries and their associations and of FAO; its president was the Deputy Minister of Natural Resources and Scientific Research, New Delhi. This small book is a report of the 44 technical papers presented.

Their subject matter ranges widely from the large-scale baking and cereal-processing industries to the small-scale manufacture of *pan supari*, the betel-nut product, provision of which, in the Hindu household, is at once a mark of hospitality and a source of nutrient calcium. The Director of the Institute at Mysore estimated the annual turnover of the food industry in India to be 1500 crores of rupees, about £1125 million, and these papers indicate how seriously and scientifically the Indian manufacturers are considering those problems of the feeding of the population of India which are their particular concern.—D. Harvey.

1539

SWEETMAN, M. D. and MACKELLAR, I. **Food selection and preparation.** J. Wiley and Sons, Inc., New York, 1954, 4th ed., pp. ix + 645.

This is the fourth edition of a textbook first published by the senior author in 1932 under the title *Food Preparation*. The subject-matter is planned to accompany laboratory work on food selection and preparation and meal planning by students of home economics in America. Five yardsticks of relative values of foods are analysed in the first 5 chapters: nutritive quality, digestibility, sanitary quality, palatability or appetite appeal, and economy. The next 3 chapters on processing, preparation and general structure of foods complete that part of the book which is in general terms. The remainder, approximately two-thirds of the book, deals with the application of these yardsticks to particular foods in their natural state and after processing or preparation. There follows an appendix of food values in common portions of foods and a subject index.

The book is written in such detail that it can scarcely fail to meet the needs of the teachers and

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students in the United States for whom it is intended. But since all the detail of necessity relates to American conditions the book can have but little appeal or usefulness elsewhere.

F. C. Aitken.

1540

COLONIAL OFFICE. **Malnutrition in African mothers, infants and young children. Report of Second Inter-African (C.C.T.A.) Conference on Nutrition, Gambia, 1952.** H.M.S.O., London, 1954, pp. 398. Price 25s. net.

This conference was held at the Medical Research Council's Field Research Station at Fajara, Gambia, under the auspices of the Commission for Technical Cooperation in Africa South of the Sahara (C.C.T.A.) and was attended by some 50 delegates and observers. Its report contains 36 communications and about as many summaries of demonstrations, discussions and other material.

Inevitably, perhaps, the conference was concerned chiefly with "kwashiorkor". The inverted commas are necessary, since it rapidly becomes clear that the delegates found it almost impossible to decide whether they were discussing one disease or several related diseases, or the manifestations of a single or multiple etiology. The chief value of the report may lie in the fact that it brings together many different sets of facts, opinions and approaches, which would otherwise have to be sought from a variety of sources. The fact that informal discussion is summarised brings the divergences most vividly to life.

In general, it seems that we must be satisfied for the time being with the knowledge that, in parts of Africa and elsewhere, where infants and toddlers are given highly unsuitable low-protein foods when the supply of breast milk fails, many of them become seriously ill. Their condition is characterised, more or less, by failure of growth, oedema, wasting of muscle (but not of subcutaneous fat), disturbances of food utilisation, liability to degenerative changes in the liver, moderate anaemia and various other signs possibly related to vitamin deficiencies, directly or indirectly produced. The common feature seems to be a low-protein diet. There is no sound evidence that infection with malaria or other communicable disease plays any essential part in the etiology. No one doubts that sound feeding practices would eliminate "kwashiorkor", but the puzzle is to get nourishing foods into the people and the children, even if the problem of supply were solved.

In the absence of any reasonably precise definition, there are few epidemiological facts about kwashiorkor, and the report has little to say about incidence. It apparently does not occur among Melanesians, "one of the few groups in the world still unaffected by what might be called 'western civilization'". While clinicians struggle with the

formidable problems of diagnosis and treatment, pathologists, biochemists and dietitians are concerned to narrow down the mechanisms and its etiology. Most of the contributions of the latter demonstrate that we have as yet no real integrating hypothesis which will weld together the scattered facts and speculations at our disposal and enable a specific programme of management to be devised. Dr. E. G. Holmes very properly underlined our lack of basic knowledge:

"It is necessary . . . to stress our lack of fundamental information about the nutrition, growth and general health of the African and to express the hope that a start will be made with the necessarily laborious and expensive process of obtaining information on these matters. Without such knowledge, progress will be hampered in many ways, not the least in that of devising effective preventative measures."

It is abundantly clear that kwashiorkor starts when the original symbiosis of the mother and her child breaks down and is not effectively replaced by the conditions necessary for wholesome independent life. Thus, kwashiorkor is rooted in the mother-child relationship. This aspect of the problem is dealt with so sketchily as to reinforce the impression of powerful ignorance of the fundamental facts. A paper with "mother-infant relationship" in its title is more speculative than factual, and another headed "Obstetrical data" is disposed of in 11 lines. The remaining papers under the general title "Maternal Malnutrition" deal with the behaviour of milk in the stomachs of rats; anaemia as an indicator of protein deficiency in pregnancy; anaemias of pregnancy in the Gold Coast; and serum calcium and magnesium levels in Dakar Africans.

In general, the report gives a good impression of the deliberations of a group of very puzzled experts, who without doubt must have gained individually from the interchange of ideas which the conference made possible. But, unless they lead to an acceleration of fundamental research, and of medical, economic and nutritional betterment, their formal conclusions will not help the malnourished African mother and her child very much.—A. M. Thomson.

1541

TURNER, D. **Handbook of diet therapy.** Univ. Chicago Press, Chicago, Ill., 1952, revised ed., pp. x + 138.

The second edition of this useful handbook, published in 1952, remains a practical manual to be used by qualified dietitians for the calculation and construction of "therapeutic" diets. Among useful new additions to this edition is a section on low-sodium diets and new tables dealing with the amino-acid content of foods.—S. J. Cowell.

1542

FISHER, R. B. **Protein metabolism.** Methuen and Co., Ltd., London, 1954, pp. ix + 198.

This book deals with the digestion and absorption of protein but with no mention of the peculiarities of ruminant digestion; the overall picture of protein metabolism; deamination, transamination and urea synthesis; general aspects of the metabolism of amino-acids; the use of isotopes in the study of protein metabolism; metabolic and endocrine interactions in protein metabolism, and the final chapter is on the nutritive value of proteins.

In the writing of this little book the author has attempted what he considers is more truly a "re-view" than a sequence of discoveries. He finds, for example, that "there is little evidence for the necessity for peptic digestion and little certainty of the occurrence of 'eruptic' digestion of proteins, but tryptic digestion seems essential to normal protein absorption". The evidence that the products of the digestion are amino-acids and that protein passes into the bloodstream in this form he considers is incomplete, and is at variance with the time taken for complete digestion of protein. Evidence for the chemical form of the products of protein absorption is believed to be unreliable.

The problem of the form of the normal products of absorption is held to be important, because it determines the course of investigation into the details of protein metabolism. It is suggested that there is enough evidence to consider seriously the possibility that peptides and not amino-acids are the normal currency of protein metabolism. The general interpretation adopted is that implicit in the notion of "continuing metabolism" known by early workers but first enunciated by Borsook and Keighley in 1935, namely, that synthetic processes, mainly those leading to cytoplasmic protein synthesis, are the immediate fate of the products of absorption of protein in the body. The author's special contribution is the emphasis on the incompatibility of this interpretation with the notion that the major processes of protein metabolism can be profitably studied by investigating the fate in the organism of individual amino-acids. The metabolism of protein is the metabolism of the amino-acids in concert. He holds that there must be a series of intermediate molecules of great importance, which must fall into the category of neglected peptides.

This is a provocative book.—D. P. Cuthbertson.

1543

Colloque sur les acides aminés, tenu à la Clinique Médicale Universitaire (Hôpital Nestlé) de Lausanne du 16 au 17 Avril 1953. [Colloquium on amino-acids, held at the Clinique Médicale

Universitaire (Hôpital Nestlé) in Lausanne, April 16-19, 1953.] *Exp. Med. Surg.*, 1954 12, 1-333.

The colloquium lasted 4 days, and there were 48 participants. The papers are in English, German and French, chiefly the last. Groups of papers were given on methods, chiefly chromatography and microbiological estimation; absorption and intermediary metabolism; amino-acids in the structure and synthesis of proteins, particularly in regard to haemopoiesis and plasma proteins; amino-acids in the blood and urine; and clinical problems and their treatment. The last section includes papers on the use of amino-acids in the treatment of hepatitis, tuberculosis, duodenal ulcer, anaemias, and kwashiorkor, and in the rearing of infants, particularly the premature. None of the papers is long. Many of them are followed by a discussion. Most of them have little or no bibliography, but a small number have quite a considerable one.—E. M. Hume.

1544

Colloque sur les acides aminés. [Colloquium on amino-acids.] S. Karger, Basle, 1954, pp. 333.

1545

DYKE, S. C., CRUICKSHANK, R., ALLOTT, E. N., MACFARLANE, R. G. and ROBB-SMITH, A. H. T. (Eds.) **Recent advances in clinical pathology.** J. and A. Churchill, Ltd., London, W. 1, 1951, 2nd ed., pp. xii + 575. Price 40s.

The second edition of this wellknown book is almost completely new. The General Editor states in the preface that only one-quarter of the subjects dealt with in the first edition have found a place in the second and that chapters dealing with these have been very largely rewritten. The 4 section editors covering bacteriology, biochemistry, haematology and histology have enlisted the support of 27 other contributors. No attempt can be made here to survey the material contained in the 31 separate chapters of the book. The volume represents a competent survey of the recent advances and will be invaluable to all clinical pathologists. Full working details are given of laboratory methods, with ample references to the literature.—H. A. Krebs.

1546

GREENBERG, D. M. (Ed.) **Chemical pathways of metabolism.** Volume 1. Academic Press, Inc., New York, 1954, pp. x + 460. Price 88s.

This is the first of 2 volumes. There are extensive well-connected accounts of glycolysis (Stumpf), the tricarboxylic acid cycle (Krebs), other pathways of carbohydrate metabolism (S. S. Cohen) and fat metabolism (Chaikoff and G. W. Brown), 2 chapters on more general topics, on free energy (Pardee) and on metabolic sequences

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(D. E. Green) which overlap in some measure on the more specific chapters, and finally chapters on polysaccharide synthesis (Hassid) and on the metabolism of sterols and steroids (Fukushima and Rosenfeld).

Each chapter, of average length 50 pages, refers to from 150 to 300 original papers. Despite this dense bibliography, the general impression is much more one of successful synthesis than of compilation. This series of careful coherent accounts of major metabolic topics should make the book worth its high price to biochemists engaged in advanced teaching or in research into the topics treated.—R. B. Fisher.

1547

HAMMOND, J. (Ed.) **Progress in the physiology of farm animals. Volume 1.** Butterworths Scientific Publications, London, 1954, pp. vii + 392.

Dr. Hammond is the father of agricultural physiology in this country and the late F. H. A. Marshall the grandfather. Their squirearchy in the School of Agriculture, Cambridge has produced many pupils and their influence is seen throughout the whole Commonwealth. This series, of which only volume I has so far appeared, is edited by Dr. Hammond and is intended to supplement, not to replace, other books dealing with the physiology of farm animals. Animal production is the science of making use of the normal trends of animal life and leading them in a way which is more economical for the farmer. To do this it is essential to understand the basic biological processes of life; in other words, to study their physiology, using that word in its broadest sense. The agriculturist is therefore most interested in long-term effects on the animal and so departs from the usual concept of physiology, which is concerned more and more with the intimate detail of cellular reactions.

Volume 1 deals with nutrition and environment. Nutrition is a tedious subject if it amounts to nothing more than determining how many pounds of this or that or how many milligrams of the several vitamins are needed to make an animal increase weight at such and such a rate. The chapter on poultry can be criticised in that too much attention is given to such information, while the really interesting peculiarities of the digestion and metabolism of the bird are but cursorily treated. A more complete bibliography to this chapter would have been welcome.

Nutrition, however, is not necessarily a tedious subject and the chapters on ruminant nutrition and trace elements show what can be done when they are treated against a biological background. It is true that in the chapter dealing with ruminants some assumptions are made from the available evidence that are scarcely warranted, such as that

60 per cent. of the protein of the ration is converted to bacterial protein. These will be put right in the course of time; otherwise the chapter makes interesting reading. The chapter on pigs gives a stimulating account of the growth and nutrition of piglets and shows that the pig is worth studying as a mammalian type quite apart from its final destiny. On this account it is a pity that nothing is said of the alimentary physiology of the pig. Perhaps it is not necessary if one believes that the only interest to be found in pigs lies in the ultimate bacon. The whole section on nutrition is meant to include metabolism, but one cannot but be struck by how little is known (or is mentioned) of metabolism in farm animals.

The section dealing with environment starts with an interesting account of the ecology of farm animals. This is a sadly neglected subject and the chapter is a welcome addition to a book on physiology; it is also an indication of the breadth of perception of the editor. The environmental physiology of domestic animals and of poultry is treated with precision; work on this subject is mostly pre-occupied with measuring the overall reactions of animals and birds in terms of heat losses and the different indications of heat tolerance under different environmental conditions. Housing inevitably comes into consideration. It seems as though this period is now coming to an end and that more attention will in the future be given to the essential nervous and vascular reactions concerned with temperature control. A start on these lines has been made with cattle. The chapter dealing with poultry ends with a provocative discussion on the merits of poultry and reptiles as egg producers in tropical climates, a subject worth some thought. The section ends with a chapter on the effect of daylight changes on the breeding cycle, which is perhaps the nearest approach to classical physiology in the whole book; maybe this is because the stamp of F. H. A. Marshall, who pioneered this subject, is still upon it.

This is a stimulating and important book, for it will influence the thinking of future generations. Of course criticism can and should be made: the most obvious is that the section on nutrition contains little physiology. Perhaps the most worrying feature of the book is that it reveals the conflict between those who think solely in terms of animal production and those who adhere to a physiological approach.

Marshall was a physiologist primarily; Hammond is a physiologist who has turned his knowledge to good account in terms of animal production. The question this book raises is whether the physiological tradition of the Cambridge School will be followed in the future or whether the next generation will concentrate like Shylock on its pound of flesh.—A. T. Phillipson.

1548
JANČÁŘEK, A. Úvod do fyziologie trávení hospodářských zvířat. [Introduction to the physiology of digestion in domestic animals.] Státní zemědělské Nakladatelství, Prague, 1954, pp. 116.

1549
STURKIE, P. D. *Avian physiology*. Comstock Publishing Associates (Cornell University Press), Ithaca, N.Y., 1954, pp. xx + 423. Price 48s. net.

This book is needed. The author in his preface says that it "should be of especial interest to teachers, students, and research workers in poultry science and husbandry and in veterinary medicine". As the first book devoted to the physiology of birds it will be welcomed by all these and also by zoologists. The author has managed to combine a direct enough approach for the student with the presentation of sufficient detail to supply the research worker with background information, a somewhat rare achievement, and there is an adequate bibliography after each chapter.

The bird has been neglected, and this is soon apparent, for every chapter reveals the width of our ignorance of successive aspects of its physiology. A certain lack of balance betrays the fact that some of these aspects have been more attractive to the research worker than others. The first 2 chapters deal with the physical, histological and chemical characteristics of the blood, the next 3 with circulation, the heart and the electrocardiogram, and in all of these Dr. Sturkie is on his own ground. Respiration and the regulation of body temperature follow, and a short chapter on energy metabolism. The digestive tract has been fairly well studied. There is a chapter on carbohydrate metabolism, but protein and mineral metabolism seem to have received scant notice. Apart from short sections on the special senses, too, the central nervous system is hardly mentioned, and behaviour not at all. Not unexpectedly, because of their practical importance, reproduction and egg formation are relatively well understood, especially in the domesticated species. The book ends with several short chapters on the endocrine organs.

With such a wealth of information, it is unfortunate that the presentation is marred for the British reader by the ugly and often ungrammatical phraseology and the constant use of jargon. The book is pleasant to handle and type and paper are good. The illustrations are not memorable. There are too many misprints. The spelling "granivorous" appears several times, and "graniferous" on p. 193 is almost inexcusable.

D. Duncan.

1550
SACKS, J. *Isotopic tracers in biochemistry and physiology*. McGraw-Hill Book Company, Inc., New York, 1953, 1st ed., pp. vii + 383. Price 68s.

The number of textbooks dealing with the applications of isotopes to biochemical and physiological problems is now reasonably large, but this monograph by Professor Sacks will be regarded as a worthy addition to the list.

The chapters in the book can be divided into two sections. The first deals with the general principles of the use of tracers as tools in biological experiments and discusses such matters as the limitations of the technique, methods of measurement, the general design of tracer experiments, and the precautions which are essential if the hazards to health are to be minimised. This section which comprises the first six chapters is followed by ten chapters describing some of the results which have been obtained when isotopic tracers have been used in the investigation of metabolic pathways and of such topics as ion transport and the physiology of the blood. These chapters may perhaps give the uninstructed reader a wrong impression of certain aspects of biochemistry and physiology. Naturally enough no mention is made of the not inconsiderable contributions made by non-isotopic experimental work, but this tends to give the impression that our knowledge of the metabolism of carbohydrate, fat, protein, and other nutrients, has been built up solely by the use of the tracer technique. Moreover, the work described and the references given are almost entirely American. If it is remembered that these chapters provide merely examples of the use of isotopes in biological research and are in no way an account of the development of present knowledge in particular fields, then they do serve a useful purpose. At the same time one cannot help wishing that Professor Sacks had expanded the chapters on general methods at the expense of those giving examples of applications.

The whole book is characterised by its great lucidity and the author, commendably, draws attention at all times to the necessity for careful design of experiment and, even more important, careful interpretation of the results. The publishers too are to be congratulated on the excellent standard of production. The book is printed in pleasant type on good quality paper, and is strongly bound.—W. C. Hutchison.

1551
LEDERER, E. and LEDERER, M. *Chromatography. A review of principles and applications*. Elsevier Publishing Co., Amsterdam, 1954, pp. xviii + 460. Price 60s.

The field of application of chromatography

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methods has so greatly expanded in the last 10 years that any review of the subject is of interest. Of the numerous books on chromatography which have been published recently this is by far the most comprehensive. It reviews all types of chromatography, dealing briefly with the general theoretical and practical aspects of the subject and exhaustively with applications of the methods. As such a wide field is covered there is insufficient space, in a book of reasonable dimensions, for much detail of all the individual applications, but a surprising amount of detailed information is presented on many of the topics and the literature has been exhaustively surveyed. The intention to keep abreast of the continuing expansion of the field is shown in an appendix containing a classified list of papers which have appeared too recently for review in the present edition.

The book is on the whole uncritical, and this is a pity as regards the theoretical treatment of chromatography. For the rest, the vast scope of the subject precludes any one author or pair of authors having sufficiently broad experience to attempt criticism except in a narrow sector.

The main value of the book will lie in its quality as a reference book. In this capacity it should prove of great value in any laboratory with biochemical or chemical interests.—G. Leaf.

1552

LUCK, J. M., LORING, H. S. and MACKINNEY, G. (Eds.) *Annual review of biochemistry. Volume 23. Annual Reviews, Inc., Stanford, Calif., 1954, pp. ix + 636. Price 56s.*

1553

SOCIETY OF PUBLIC ANALYSTS, ANALYTICAL METHODS COMMITTEE. *Bibliography of standard tentative and recommended or recognised methods of analysis. W. Heffer and Sons, Ltd., Cambridge, pp. vii + 225. Price 25s.*

1554

ECKEY, E. W. (with MILLER, L. P.) *Vegetable fats and oils. Reinhold Publishing Corporation, New York, 1954, Amer. Chem. Soc., Monograph Ser. No. 123, pp. ix + 836.*

This work carries the same title as its now out-of-print predecessor in the same series. The present author has rewritten the book, but it remains a descriptive catalogue of the chemical properties of vegetable fats and oils. The old "technological" order of classification into drying, semi-drying and non-drying oils has been replaced by re-grouping them on systematic botanical lines according to the plant of origin. In addition to many photographs, the text is liberally supplemented with tables showing the analytical characteristics of the lipids of related plants, thus facilitating ready comparison.

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By way of preface to the main part of the book are 7 chapters covering the chemical composition and physical properties of fats in general, their nutritional and biochemical significance, their biogenesis and methods of analysis.

References are indicated in the text and given in full at the end of each chapter; a comprehensive subject index (occupying no less than 46 pages) is provided.

This compendious volume, which is well produced and strongly bound, should prove a valuable work of reference.—G. A. Garton.

1555

CÉPÈDE, M. and LENGELLÉ, M. *Économie alimentaire du globe. [World food economy.] Librairie de Médecis, 3 Rue de Médecis, Paris, 1953, pp. 654. Price 47s. 6d. net.*

This large-scale work, in four parts, grew out of a study by Lengellé of the relation between fat consumption and energy consumption and one by Cépède on the relation between consumption of animal products and energy consumption, based on data from the F.A.O. World Food Survey, mainly for the years 1934-38. Mean consumptions of fat, sugar, meat, milk, pulses, cereals and roots and tubers, and the proportions of the total energy supplied by them, are tabulated for daily energy consumptions per head from 1800 to 3200 Cal. by 200 Cal. stages, and these are used as standards of reference for the discussion and graphical presentation of the food habits of different countries and regions of the world. Part 1 closes with a brief geographical survey indicating the countries with diets which are either inadequate or unbalanced, or both.

The evil results for health, physique and mortality are elaborated in part 2, with statistics for many countries, notably from France during the second world war. Two concluding chapters, more speculative but of gloomy interest, with quotations from classical and early Christian literature onwards, are devoted to the psychological effects of underfeeding and the part they may play, when conjoined with the contrast between "haves" and "have nots" among classes and nations, in bringing about revolution and war.

Part 3 is devoted to economic aspects of food. Among the topics considered are the relation between food expenditure and standard of living, the effect of nutrition on productivity in industrialised countries and colonial regions, the problem of animal versus crop production, seasonal variations in food supply, and the general world food situation.

The final part deals with world food policy. After an account of trends in world food trade and special consideration of the fat problem both of the world in general and France in particular, and of

the problems of animal production in France, food plans for underdeveloped countries, in particular those of the French overseas territories, are discussed. There is a chapter on the possibilities and limitations of international aid and finally, a chapter emphasising the precarious food position under present economic circumstances of Western Europe, and the necessity that she should develop a coherent food policy, both for her own survival and as a contribution to general human welfare.

To back up the wide range of topics covered there are numerous scientific and literary references, a great many tables and diagrams and 9 coloured maps of the world or parts of it. Other interesting

items are a list of great famines in world history and an appendix on films, commercial and other, dealing with hunger.

Enough has been said to indicate the wide range of subject matter. With such riches it is perhaps inevitable that the treatment should be somewhat uneven and here and there uncritical; for example, aspects of hygiene other than nutrition must have played a part in some of the mortality statistics quoted. One cannot help thinking also that a more compact, less ambitious volume would have been more likely to be read by and to influence those in authority in national and world affairs.

W. M. Deans.

8. FOOD AND AGRICULTURE ORGANIZATION (AND OTHER ORGANIZATIONS) OF THE UNITED NATIONS

Monthly Bulletin of Agricultural Economics and Statistics.
Vol. 3, No. 9, September 1954, pp. 40. Price \$0.50. No. 10, October 1954, pp. 52. Price \$0.50.
Recent developments in the world food and agricultural situation.

Grain exports, by source and destination, 1953-54. Rome, Italy, 1954. Mimeographed, pp. 22. Price \$0.25.

Nutritional Studies No. 1. Rice and rice diets. A nutritional survey. Revised edition. Rome, Italy, September 1954, pp. v. + 78. Price \$0.75.

In this revised edition of the review first published in 1948 (see p. 917, Vol. 18) much of the text remains as in the original. Its being brought up to date is based largely on the results of deliberations at the 2nd and 3rd meetings of the Nutrition Committee for South and East Asia held at Rangoon in 1950 (p. 516, Vol. 20) and at Bandung in 1953 (p. 484, Vol. 24). In the tables in this edition data on mortality rates and on rice consumption and amino-acid composition have been revised and more recent analyses for Indian and Malayan samples have been included. The bibliography with 100 entries is half as large again as that in the original edition.

Nutritional Studies No. 13. Syndrome policarencial infantil (kwashiorkor) and its prevention in Central America. Rome, Italy, October 1954, pp. v. + 81. Price \$1.00.

Following a recommendation in 1951 by the Joint FAO/WHO Expert Committee on Nutrition a study of the relevant South American literature was made and later brief visits were paid to Guatemala, Honduras, Nicaragua, Costa Rica and Panama. As a name for the disease, which is essentially the same as kwashiorkor in Africa,

the authors have chosen one which is coming into general use from among at least 15 which have been applied locally to the condition.

The medical aspects are considered in 6 categories of changes in general health, digestive system, metabolism, skin and mucous membranes, cardiovascular and haematopoietic systems and in bone and muscle. Complete data on its incidence are not available, but it appears most often at between 1 and 4 years of age. There was some evidence of its being more frequent at over 5 years of age than is kwashiorkor in Africa.

Weaning practices, often from breast milk to maize gruel, are described. From diet surveys which had been made in 3 of the territories, Guatemala, Honduras and Costa Rica, it was found that protein intake, while probably adequate in amount, was poor in quality with only between 7 and 17 g. per head daily from animal sources, and that intakes of calcium, vitamin A and riboflavin were below recommended amounts. Ignorance amongst mothers of the relative values of foods does much to prevent the best use being made of those that are available.

For the prevention of the disease a long-term measure is increasing the production of foods rich in protein. Of these milk is the most important and the area is fortunate in not being beset with problems of overstocking and erosion. Equally far-reaching are the educational and hygienic measures which must be pressed forward to take the place of the short-term programmes in supplementary feeding at present being financed by UNICEF.

Subjects mentioned as awaiting further investigation are, the effect of infections in precipitating the appearance of the syndrome, diet surveys for individual children, the incidence of the disease among negro children in the area and, in the technological field, the preparation of simple and cheap mixtures for the feeding of babies and young children.

9. DEPARTMENTAL AND OTHER REPORTS

INDIA.

Indian Council of Medical Research. Technical Report of the Scientific Advisory Board for the Year 1953. Pp. xiii + 449.

Malaria Institute of India, New Delhi.

Inquiry to study nutritional states and their effects on mammalian malaria: effect of different quantities of the same diet and different quality diets on course of infection in rats; pyridoxine deficiency and malaria.

Nutrition Research Laboratories, Coonoor.

Vitamin A deficiency in the monkey.

Dietary protein and utilisation of riboflavin.

Mode of action of vitamin D on rachitic cartilage: vitamin D in Indian butterfat.

Protein: trypsin inhibitor in duck egg white: protein metabolism in Indian adults on animal- and vegetable-protein diets: effect of age on nitrogen metabolism: essential amino-acids in Indian pulses: role of S-containing amino-acids in toxic injury to liver: plasma lipase and esterase in human malnutrition: effect of protein depletion on liver of rats.

Alleged toxicity of Indian pulses.

Basal metabolism and electrocardiogram in nutritional oedema: syndrome of nutritional oedema in children. Composition of breast milk of Indian women.

University College of Science and Technology, Calcutta.

Biosynthesis of ascorbic acid: pyruvic acid as precursor.

Bound nicotinic acid, concentration from rice bran.

Metabolism of iron during embryonic development of hen's egg.

Effect of canning and storage on nutritive value of some Indian vegetables.

Vitamin B₁ in purebred strains of cereals and pulses.

Seth G. S. Medical College, Bombay.

Amino-acids, vitamin B₁, riboflavin and nicotinic acid in purebred strains of cereals and pulses.

Biosynthesis of nicotinic acid in germinating cereals and pulses.

Physiological availability of folic acid from cereals and pulses.

Effect of protein on urea clearance in human subjects.

National Chemical Laboratory of India, Poona.

Effect of dietary protein on serum protein components.

All-India Institute of Hygiene and Public Health, Calcutta.

Vitamin A in metabolism of the cell.

Estimation of sodium and potassium in common Indian foodstuffs.

Presidency College, Calcutta.

Biosynthesis and site of synthesis of nicotinic acid and its derivatives from tryptophan in rats on a nicotinic acid-deficient diet.

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Generalised mechanism of the action of vitamin A in the body.

Studies on energy metabolism.

University Biochemical Laboratory, University of Madras.

Enzymic role of inositol in the activity of α -amylase.

M.G.M. Medical College, Indore.

Human requirements for riboflavin and vitamin B₁.

Department of Biochemistry, Institute of Science, Bombay.

Quality of proteins, non-proteins and fats in edible varieties of fish.

Indian Dairy Research Institute, Bangalore.

Optimum level of fat in the diet (rat).

Health Services, West Bengal, Calcutta.

Effect of dietary habits on incidence of goitre and tuberculosis in Darjeeling.

Ramkrishna Mission Sishumangal Prathisthan, Calcutta.

Physiological study of human breast milk and its correlation with sub-nutritional status of the newborn.

Haffkine Institute, Bombay.

Role of nutritional factors in hepatic cirrhosis.

School of Tropical Medicine, Calcutta.

Cause of relapse in nutritional macrocytic anaemia.

Antibiotics in nutritional macrocytic anaemia with reference to excretion of vitamin B₁₂.

Leucovorin in nutritional macrocytic anaemia.

In vitro culture of bone marrow in nutritional macrocytic anaemia.

NORTHERN IRELAND.

Twenty-seventh Annual Report of the Agricultural Research Institute of Northern Ireland, Hillsborough, Co. Down. 1953-54. Pp. 38.

Comparison of grass silage and hay for winter fattening of cattle. Animals tied up as compared with loose-box.

Goitrogenic substances in pig nutrition: methyl-thiourea and rape cake meal.

Riboflavin supplement for weanling pigs on a diet containing only 5 per cent. fishmeal.

Antibiotic supplements to rations of pigs, all-vegetable or with different amounts of fishmeal.

Feeding copper salts to pigs.

Fodder beet, with and without antibiotics, for pigs.

Effect of vitamin B₁₂ deficiency on nitrogen retention in chickens.

Effect of live yeast on chick growth.

Sunflower cake meal for laying hens.

NEW ZEALAND.

Department of Agriculture. Annual Report of the Director-General of Agriculture for the Year ended 31 March 1954. Pp. 167.

Rickets-producing factor for sheep in green feed (vitamin A).
Rate of stocking in relation to fat lamb production.
Effect of two types of pasture nutrition on lifetime performance of cows.
Growth and production of heifers subjected to L-thyroxine treatment before calving.
Effect of growth hormone and thyrotropic hormone on growth and production of cows.
Grazing behaviour of calves.
Critical examination of chromogen method for estimating digestibility.
Antibiotics in pig feeding: effect when used with a bulky diet of separated milk.
Effect of level of feeding on growth rate and feed efficiency in pork production.
Trace elements: *cobalt*: deficiency in lambs in Southland; effect of vitamin B₁₂ therapy as compared with cobalt therapy; *iodine*: goitrogenic effect in lambs of feeding kale to ewes; *copper* and *molybdenum*: survey of pastures from main soil types.

UGANDA PROTECTORATE.

Annual Report of the Department of Veterinary Services and Animal Industry for the Year ended 31st December 1953. Pp. 47.

Factors influencing the inorganic phosphorus level and serum calcium level in the blood of Zebu cattle.
Silage making and use as supplement in the feeding of cows.
Preservation of fish offal and preparation of fishmeal.
Water intake of cattle under local conditions.

THE NETHERLANDS.

The Central Institute for Nutrition Research T.N.O.
A brief explanation of its activities. August 1954. Pp. 16.

Coeliac disease and fat absorption.
Nutritional status of the Netherlands population.
Spectrophotometric, fluorometric and microbiological estimation of vitamins and enzymes in raw materials, foods and feedingstuffs.
Deterioration of fats and fat-containing foods.
Non-enzymic browning of foods.

THE COMMONWEALTH BUREAU OF ANIMAL NUTRITION

NUTRITION ABSTRACTS AND REVIEWS

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THE PHYSIOLOGICAL EFFECTS OF LACTOSE

BY

DOROTHY L. DUNCAN

COMMONWEALTH BUREAU OF ANIMAL NUTRITION, ABERDEEN

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Introduction

THE only known source of lactose in nature is the milk of mammals; it is found in the milk of every species which has been studied, in amounts usually ranging from 2.0 to 8.5 per cent. As the natural carbohydrate food of every infant mammal it might be expected to hold a special place in paediatric practice, yet only a few writers on the subject have given it much attention, and opinions about its value differ greatly. Examination of the literature reveals that lactose has physiological effects not characteristic of other sugars or even of other disaccharides; some of them are due to galactose liberated when lactose is hydrolysed, others are specific to the lactose molecule itself. Certain of these effects appear to merit more attention than they have hitherto received, and the intention here is to collate the information available and to give expression to some of the questions it evokes.

The ordinary lactose of commerce is α -lactose hydrate, a galactosyl glucose, 4-O- β -D-galactosyl- α -D-glucose monohydrate, $C_{12}H_{22}O_{11} \cdot H_2O$. From lactose solutions crystallised at a temperature above 93.5° C. is obtained β -lactose, 4- β -D-galactosyl- β -D-glucose anhydride. In milk and after being kept in solutions α - and β -lactose form equilibrium mixtures. The physical and chemical properties and industrial uses of lactose have been reviewed by Whittier (1944) and its early chemical history by Funck (1948).

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Lactose in the digestive tract

IN the presence of lactases, in dilute solutions of strong acids or emulsin obtained from almonds, lactose is hydrolysed, each molecule giving one molecule of glucose and one of galactose. It can be fermented by yeasts and bacteria with production of lactic acid. There are thus three possible fates in the digestive tract: direct absorption, hydrolysis by alimentary lactase and absorption as glucose and galactose, or fermentation by bacteria.

Plimmer (1907) reviewed some early studies of the occurrence of lactase in the intestine, and concluded that "Of the mammals, the carnivora and omnivora have lactase present during the whole of their lives, but the herbivora only when they are young . . . the ferment . . . is localised in the cells of the mucous membrane of the intestine . . .". Cajori (1935) confirmed in dogs that almost all the lactase activity of the intestine is intracellular. Hydrolysis of lactose therefore occurs during transit from the intestine.

The evidence in regard to the changes with age in lactase activity has not been entirely conclusive. Koehler and Allen (1934) said "Textbooks frequently state that lactase is present during infancy, but disappears, particularly in man, during later life. Evidence on this latter point, however, to our knowledge is very meager." To go further, there is considerable evidence that lactase activity persists in adult man. Folin and Berglund (1922) recovered considerably more galactose than lactose

in the urine of adult subjects who had taken lactose. Watkins (1928) found that women, especially during menstruation and in pregnancy, could take quite large doses of lactose without excreting any sugar, the implication being that it was hydrolysed and utilised and not excreted. In men, and in women during the intermenstrual phase, ingestion of 10 g. lactose usually resulted in the appearance of some reducing sugar, either lactose or galactose, in the urine. The sugar excreted by Winter's (1931) female subjects was galactose only. During menstruation tolerance often rose to 20 g. and in pregnancy it was as high as 30 g., but immediately after delivery it fell again to 10 g. There is no evidence that ingested lactose or galactose is used as a source of lactose during milk secretion.

While hydrolysis of lactose by intestinal lactase undoubtedly occurs, transfer of lactose from intestine to blood can occur without hydrolysis. As mentioned above, Folin and Berglund (1922) showed that when adult men took 30 g. or more lactose by mouth, lactose appeared in the urine, thus giving evidence that the rate of absorption of lactose easily exceeded the capacity of the intracellular enzyme to hydrolyse it, so that some lactose entered the circulation unchanged. Bray *et al.* (1952), too, found lactose in the urine of a child given lactose by mouth. Verzár and MacDougall (1936), who imply by the term "absorption" passage from the intestinal lumen into the blood, state baldly that "Lactose is especially slowly absorbed . . . *since* [reviewer's italics] it is very slowly broken down"; yet they admit that lactose appears in both blood and urine after consumption of large doses. As lactose can be absorbed without hydrolysis it is difficult to see how the rate of hydrolysis can affect absorption, though the products of phosphorylation are probably absorbed more quickly than lactose itself. The transfer of lactose across the wall of loops of small intestine *in vitro* does not seem to have been studied.

Whatever the reason, lactose does seem to be absorbed slowly, since a proportion of the lactose ingested usually escapes absorption in the small intestine and reaches the colon. Although an excess of lactose causes diarrhoea in all species of animal, absorption is not limited solely as a result of increased intestinal motility. Feldberg and Solandt (1942) found that lactose had no stimulating effect on the motility of the isolated small intestine *in vitro*, but Fischer and Sutton (1948) demonstrated that diets containing 20, 30 or 40 per cent. lactose on dry basis passed through the digestive tract of rats more rapidly than similar diets with the lactose replaced by maize starch. The diet with 30 per cent. lactose had most effect on motility and that with 40 per cent. the least effect, but the latter caused the most severe diarrhoea.

The fairly extensive literature relating to lactose diarrhoea was reviewed by Fischer and Sutton (1949). When only moderate amounts of lactose are given the diarrhoea is transient and adaptation occurs in a few weeks, but with excessive amounts adaptation does not occur. Fischer *et al.* (1949) were unable to correlate adaptation in rats with any increase in intestinal lactase activity, but there is a relation between adaptation and the rate of absorption when the latter is expressed as the rate of disappearance of lactose from the gastro-intestinal tract. When rats were given lactose solution and killed an hour later, more lactose had been absorbed by adapted than by unadapted animals (Fischer and Sutton, 1953). Thus the rate of absorption depends on some factor other than lactase activity or intestinal motility.

Since most of the information available about the effect of lactose on the intestinal flora is closely related to work on infant feeding it will be considered in that context.

Lactose in the body

The effects of sugars given parenterally were quite widely studied at the end of the nineteenth century. Pavy (1899) injected sugars intravenously and subcutaneously into rabbits at rates of from 1 to 4 g. per kg. bodyweight. He reported that both sucrose and lactose "seem to comport themselves within the general system as unserviceable foreign matter and become speedily cast out in the urine". No physiological effect was observed. Folin and Berglund (1922) found no evidence of a renal threshold for lactose or galactose. Winter (1931), too, found that lactose given by vein to rabbits, even when they were lactating, was "largely" excreted unchanged in the urine. In rabbits with nephritis induced by tartrate, removal of injected lactose from the blood was slow, again suggesting that it is metabolised with difficulty and mostly excreted (Corley, 1929). Yet Hogan (1914) observed that "the recovery of sucrose or lactose in the urine after parenteral introduction of these sugars has frequently not been quantitatively complete". In experiments with dogs recoveries from 1 g. lactose given subcutaneously were usually from 60 to 90 per cent., though "on half a dozen occasions little or none was recovered". Hogan also quotes Leopold and von Reuss (1909), who gave repeated subcutaneous injections of lactose to dogs and children and estimated recoveries of "sugar" in the urine. Many results showed that 1 g. lactose might be completely retained by dogs weighing 4 kg., and one dog of 20 kg. retained 6 g. Similar results were obtained with children. Normal and diabetic adults retained from 2 to 10 per cent. of lactose given intravenously (Koehler *et al.*, 1935).

The explanation of this retention may lie in the report of Cajori (1935) that liver tissue and water extracts of live tissue from adult dogs showed some lactase activity, which "may be of significance in revealing a further mechanism for lactose hydrolysis in the body". There is no such information about the human liver, but the results described above suggest that it also may have some lactase.

Although the amount of lactose hydrolysed in the liver is probably insignificant, it may be true that the amount of lactose excreted in the urine after ingestion of lactose is not a guide to the amount absorbed intact. There is no biochemical evidence that lactose can be metabolised in the body without hydrolysis. What, then, is the nature of the effects attributed to it?

Blanco (1928) gave lactose intravenously and subcutaneously to rabbits anaesthetised with amylal and obtained increases, not only of total blood sugar, but also of blood glucose. In one rabbit the increase in total sugar 30 minutes after the injection was more than the amount of lactose injected. These results suggested that lactose might have caused mobilisation of glucose. Galactose and xylose also increased blood glucose, so the effect was not specific. On the other hand, lactose given by mouth to children depressed the blood glucose level, although an increase in blood galactose accounted for a small increase in total sugar, which was considered to follow from an improvement of glucose utilisation in the presence of galactose (Orsini and Pandolfelli, 1950). Normal adults showed no increase of blood sugar after ingestion of 80 to 120 g. lactose, though lactose or possibly galactose often appeared in the urine, incidentally supporting the observation of Folin and Berglund (1922) that there is no renal threshold for these sugars (Koehler *et al.*, 1935). In diabetics the blood fermentable sugar rose after lactose ingestion, and the urine contained fermentable sugar but no lactose. Since the diabetics dealt normally with injected lactose, it is postulated that no lactose was absorbed by them without hydrolysis, although in normal subjects some may have been absorbed unchanged. In experiments of Winter (1931) women given lactose by mouth excreted galactose but no lactose. As indicated by its effect on total blood sugar and its excretion in the urine, lactose was better utilised by subjects aged from 10 to 89 years than was dextrose, though less well than invert sugar or fructose (Albanese *et al.*, 1954).

Since most of the lactose absorbed by normal adults appears to be hydrolysed, many of the effects of dietary lactose may be ascribed to glucose or to galactose or to the specific value of these two sugars when utilised together. Lactose appears to give rise to a quite characteristic type

of body composition. One of the important effects of lactose feeding seems to lie in the amount of fat deposited. Jarvis (1930) records that fat babies were rare among those receiving diluted cow's milk with lactose; he remarked on the firmness of their tissues, as did Gerstley *et al.* (1945). Whittier *et al.* (1935) noted that young rats receiving 30 per cent. of the dry matter of the diet as lactose grew better than those receiving sucrose, and when they were adult they ate less, contained less fat and tended to live longer. Similarly, rats receiving 27 or 37 per cent. lactose had small livers containing less fat, and especially less non-phospholipin fatty acids, than those given other sugars, even when the diet contained 25 per cent. fat (Artom and Fishman, 1947). The similarity between these effects and those of a choline supplement is obvious and suggests that lactose led to extra production of choline, either by the tissues or by the intestinal flora. Such an effect was obtained also in pigeons after 4 weeks on a wheat diet with 1 g. lactose daily (Sadhu, 1953). Besides the low fat and phospholipin in the liver, the birds had high cerebroside and phospholipin and low sphingomyelin contents in the brain tissue. Sadhu speaks of a "choline-sparing" effect of galactose, suggesting that in the brain sphingosine can take up galactose or glucose to form cerebroside or else choline phosphoric acid to form sphingomyelin. He reported a positive correlation between the cerebroside and sphingomyelin contents of the brain and the lactose content of the milk of several mammalian species (Sadhu, 1948; 1952).

The alternative fates of galactose in the body are not well understood. Besides its role in the formation of cerebroside and mucopolysaccharides it appears to be oxidised in the liver. But Wick and Drury (1954) report that although galactose can enter the extrahepatic cells of the body slowly, and its entry can be accelerated by insulin, yet "the intracellular enzyme system has little if any capacity to oxidise galactose" as it oxidises glucose or mannose. Some support is thus given to Fournier's distinction (see p. 313) between "structural" and "energetic" sugars.

The interaction between lactose and dietary fat will be dealt with in the section on lactose tolerance. In rats galactose or lactose produced more liver and muscle glycogen than did glucose alone (Deuel *et al.*, 1933; Coryell and Christman, 1943).

Calves reared on synthetic milk diets containing lactose gained in 31 days twice as much weight as when glucose or maize syrup was the carbohydrate source. Ten per cent. of lactose in the dry matter of the rations containing other carbohydrates improved their utilisation (Flipse *et al.*, 1950a, b). Lactose tended to maintain normal faeces when the other sugars caused diarrhoea.

The relation of lactose to calcium metabolism

The relation to calcium metabolism may well be one of the most important aspects of lactose metabolism, but it has been the object of sporadic observations only and merits closer attention.

The first reference to a relation between lactose and calcium metabolism appears to be that of Bonnamour *et al.* (1913). A single adult rabbit was subjected to intravenous injection of 10 g. lactose every second day until 378 g. had been given. The animal at first appeared little affected, and maintained its weight without significant loss. After 2 months its bones began to soften, and when it was killed the skeleton was found to be soft, with slender, translucent ribs showing recent fractures, and the femurs curved in an arc. Analysis of the femurs revealed loss of calcium, with magnesium, phosphorus and total ash all above normal, on a dry matter basis. We have no information about what this rabbit ate or whether it was exposed to sunshine.

Yamane (1932) gave cane sugar to rabbits by mouth or intravenously and obtained softening of the bones; the calcium and phosphorus content of the bones decreased, but the calcium : phosphorus ratio was unchanged. Handler (1947), finding that rats given high lactose diets excreted much calcium in the urine, sought to check Bonnamour's results. His rats had a mineral mixture, vitamin mixture and cod liver oil adequate for their usual needs. He injected 0.5 g. daily of several sugars intraperitoneally; after 2 months the femurs of rats which received lactose or galactose weighed slightly less than those of rats having other sugars, but the concentrations of calcium and phosphorus and the ratio between them were not significantly different. The interpretation to be placed on these conflicting reports remains in doubt.

Equally dramatic was the work of Dragstedt and Peacock (1923). Believing parathyroid tetany to be due to a toxin, probably absorbed from the gut, they studied the effects of diet on the survival of dogs after removal of the parathyroids. Dogs on ordinary diets survived 3 to 5 days, but when they were given lactose puppies survived up to 10 days and adult dogs sometimes more than a year, and the incidence and severity of tetany were much reduced. Inouye (1924) repeated these experiments with purified diets. With a diet containing 5.5 per cent. casein, 5 per cent. lactose on dry matter basis, given at the expense of sucrose, was insufficient, but 15 per cent. lactose prevented tetany; with 37.6 per cent. casein, 35 per cent. lactose was necessary, or 20 per cent. galactose. Dextrin was not effective. In attacks of tetany lactose alone had some beneficial effect, but not as much as injected calcium. When calcium lactate given by mouth failed to raise the serum calcium

level, calcium lactate with lactose succeeded. When dogs received a diet containing 5.5 per cent. casein and 68 per cent. sucrose, with butterfat and a mineral mixture, 6 g. lactose (2 dogs) or 4 g. galactose (2 dogs) per kg. bodyweight, injected subcutaneously, failed to prevent tetany. The mineral mixture provided 0.25 g. calcium lactate and 2.3 g. bone ash per 100 g. of food, but ample calcium must be present for lactose to exert its effect. The importance of calcium was stressed by Salvesen (1923). After parathyroid removal dogs could be maintained alive by repeated injections of calcium, but nearly always tetany occurred within 24 hours after the last injection. With a milk diet the calcium injections could be reduced and omitted after a few weeks and the dogs lived indefinitely, although their serum calcium often remained at levels of about 5 or 6 mg. per 100 ml. When calcium was removed from the milk by adding oxalate and centrifuging, the milk diet was useless.

McCullagh and McCullagh (1932) used lactose diets to treat parathyroid tetany in human patients and obtained good results. In one patient neither parathyroid extract nor calcium lactate would relieve tetany, but both together, or calcium lactate and lactose, were successful. In three others calcium lactate and lactose together gave prolonged freedom from tetany after calcium alone had failed. Galactose did not relieve tetany.

In weaned calves, lactose given with an ordinary diet sometimes caused an unexpected fall of serum calcium, with a rise of phosphorus, but lactose given with calcium lactate produced a sharp rise of serum calcium and fall of phosphorus (Robinson *et al.*, 1929). Twice as much calcium was retained with lactose as when bonemeal or calcium lactate was given alone.

What is the mechanism of this effect of lactose? Bergeim (1926) found that in rats the addition of 25 per cent. lactose to the diet on a dry matter basis increased retention of calcium and sometimes of phosphorus, whether or not cod liver oil was given; "There does not appear to be any other reasonable explanation . . . than that of the increased acidity of the intestinal contents". Outhouse *et al.* (1935) also gave 25 per cent. lactose, which induced in their rats about the same phosphorus retention as did cod liver oil, a somewhat smaller calcium retention and "startlingly more" of magnesium. The effect was not due, as Bergeim suggested, to a more acid intestinal medium; lactose reduced intestinal pH in rats on a vegetable diet, but not in those receiving meat, and yet calcium retention was improved (Robinson and Duncan, 1931). Lactose *in vitro* combines with either Ca^{++} or Mg^{++} ions to form soluble, non-ionised compounds (Nordbø, 1939), and forms also salt complexes such as

lactose. $\text{CaCl}_2 \cdot 7\text{H}_2\text{O}$, which are more soluble than lactose itself (Jensen *et al.*, 1940). It might be thought that formation of such complexes would assist calcium absorption, but when rats were given calcium lactate in water or in sugar solutions, neither 5 nor 20 per cent. of lactose increased the rate of calcium absorption, and the higher concentration may even have been inhibitory (Roberts and Christman, 1942).

In children liberally supplied with vitamin D, 36 g. lactose given daily increased calcium retentions by from 7 to 89 per cent. above those found before lactose was given, and an effect persisted for some time after the lactose was withdrawn (Mills *et al.*, 1940). These children excreted significantly less calcium in the urine while taking lactose, on the average 12.0 instead of 16.9 per cent. of the intake, which is taken by the authors as evidence against increase of absorption. With the work of Roberts and Christman (1942) also in mind it seems reasonable to accept the suggestion of Mills *et al.*, that "lactose exerts its effect, not by rendering the dietary calcium more absorbable in the intestinal tract, but by making more utilizable that calcium which had found its way into the blood stream". Such an explanation would account also for the value of lactose feeding combined with injected calcium in tetany (McCullagh and McCullagh, 1932). Simultaneous injection of lactose and calcium does not seem to have been tried.

Its high lactose content may partly explain the value of human milk in the prevention of rickets: "The incidence of rickets among infants fed on human milk is everywhere decidedly less than that of those brought up on cow's milk" (Hess and Weinstock, 1927; see also Kline *et al.*, 1932; Gerstley *et al.*, 1945). In chicks lactose gave higher bone ash than ultraviolet irradiation with otherwise rickets-producing diets, though irradiation sufficed to prevent rickets (Kline *et al.*, 1932). Lactose protected young rats against rickets only less effectively than did cod liver oil, but failed to heal existing rickets (Sunderlin, 1933). The bones of rats on lactose had more ash than those on starch and sucrose, but galactose did not increase bone ash (Outhouse *et al.*, 1937). In later experiments cod liver oil increased retention of both calcium and phosphorus, lactose affected only calcium (Outhouse *et al.*, 1938). However, H. H. Mitchell *et al.* (1937) found higher percentages of ash, calcium and phosphorus in lactose-fed rats than in those fed on other sugars. More calcium was retained by the former in spite of diarrhoea and the lower digestibility of the diet. Increased utilisation of calcium occurred in growing rats and dogs, but not in mature animals (French and Cowgill, 1937).

A diet of whole milk (but not one of skimmed milk), when supplemented with the necessary trace

elements copper, iron and manganese, had effects similar to those of synthetic diets containing lactose. Rats given supplemented milk alone grew to a good size, but never became fat. They had denser bones and more calcium per unit body volume at the age of natural death, although their calcium intake had been only about half that of rats on stock diets (McCay *et al.*, 1952).

On the relationship of lactose to calcium metabolism important work has been done recently in France. Fournier (1954b) found with rats that diets containing not only lactose, but also D- and L-xylose and D- and L-arabinose each doubled the coefficient of utilisation of dietary calcium when compared with a diet in which starch was the only carbohydrate. Sucrose, glucose and maltose gave no better results than starch. Fournier considered lactose, galactose, xylose and arabinose as "structural" carbohydrates, the others as "energetic", by which he suggests a concept new in carbohydrate physiology. Diets composed mainly of milk (Fournier *et al.*, 1953) or containing 12 per cent. lactose on dry basis (Fournier, 1954a) partly or completely prevented loss of skeletal weight in lactating female rats. A group of rats on a stock diet lost on the average 250 mg. calcium from their bodies in the course of a lactation; those receiving the same diet with 12 per cent. lactose replacing starch gained on the average 18 mg. calcium during the same time. The suggestion is made that there may be some participation of lactose in the function of the bone cell. At all events, the evidence is that its relation to calcium metabolism is specific to the lactose molecule. If so, the relatively small amounts which are absorbed unchanged must be responsible. If the effects of lactose on the serum calcium in tetany as well as those on bone composition be taken into account, a wider concept of its role than that suggested by Fournier emerges, namely, the possibility that lactose can take part in the biochemical processes fundamentally concerned in calcium metabolism. There is, indeed, some resemblance between the effects of lactose and those of the parathyroid hormone (Campbell and Turner, 1942).

Another possible effect of lactose is submitted tentatively for consideration; the part it plays in the treatment of milk fever in cattle. The resemblance of certain elements of the milk fever syndrome to parathyroid tetany has led to the concept that milk fever is due at least in part to parathyroid hypofunction (Green, 1939), and parathyroid extract has, in fact, been used in its treatment. The old and usually effective treatment was by inflation of the udder. Inflation has now been to a great extent superseded by injection of a calcium salt, usually calcium borogluconate, but Robertson *et al.* (1948) found that "... in some cases of milk fever and particularly on certain

farms, inflation is a more reliable and more successful form of therapy." Cows which failed to respond to calcium injections responded to subsequent udder inflation. In a later discussion of this work (Robertson, 1949), Dryerre remarked that lactose, a product of mammary gland activity, appeared in the blood after inflation, and that consequently it might be argued that inflation put something else from the udder into the blood which might affect recovery. Lactose was here mentioned only to illustrate the occurrence of reabsorption, but it may now be considered whether lactose itself is not involved in such recoveries.

In his reply to Dryerre in the discussion mentioned above, Robertson stated that the cows were always milked out before udder inflation, and he did not support the theory that it was simply a case of putting constituents back into the blood or of stopping secretion. However, since milk secretion is normally a continuous process, milking out does not remove milk constituents entirely. Colostrum at parturition contains about 2.5 per cent. lactose and one-tenth of this amount of calcium and phosphorus, but 24 hours later the composition is almost that of normal milk, lactose having risen to a mean value (obtained from the results of 25 authors) of 4.23 per cent. and calcium and phosphorus having fallen to 0.15 per cent. or less (Garrett and Overman, 1940); about two-thirds of the calcium is in colloidal form (Ling, 1937). There does not appear to be information on the composition of milk obtained after the udder has been inflated with air, but when milk is returned to the udder after milking its lactose is rapidly re-absorbed (Jackson and Rothera, 1914). Petersen and Rigor (1932) delayed milking and found that "The most striking effect of retention of milk in the udder is upon the lactose content. Lactose rapidly diminished from nearly a normal of 5% to less than 1% for milk retained 120 hours. . . . Total ash increased, reaching the maximum in 36 hours. Calcium and phosphorus, however, decreased, reaching the minimum after 120 hours, which was slightly more than one-half of the normal." The amount of lactose likely to be absorbed, then, is considerably greater than the amounts of calcium or phosphorus; the amount of calcium available is unlikely to be of significance to a cow which has already failed to respond to injected calcium. Owing to the lack of a renal threshold the blood lactose level is not a guide to the quantity absorbed; lactose solutions injected even into the mammary ducts failed to raise significantly the blood sugar, although large quantities of lactose appeared in the urine (Brown *et al.*, 1936). Nevertheless, a mechanism such as that postulated above (p. 313), whereby lactose improves the metabolic use of calcium, may well

be brought into play as a result of udder inflation. Kirillov and Tsarenko (1953) treated cows with milk fever by infusing milk into the udder, though they give no clear explanation of why they did so. The results were excellent; seven cows which received from 450 to 2100 ml. milk by infusion into the teat ducts recovered in from 40 to 180 minutes. Two cows treated by inflation of the udder with air and subcutaneous injection of caffeine took 12 and 18 hours to recover.

The possibility that lactose affects magnesium utilisation has not been investigated, but it may be recalled that rats given lactose retained "startlingly more" magnesium than those given cod liver oil or sucrose (Outhouse *et al.*, 1935).

Lactose in infant feeding and its effects on the intestinal flora

As recently as 1932, Sauer wrote in a discussion about the ideal standard diet for the bottle-fed baby that "It seems paradoxical that no one has tried to enrich evaporated milk dilutions with lactose, the natural sugar occurring in breast milk." In fact, it was only two years earlier that the value of lactose had begun to be recognised. For forty years it had been regarded as a dangerous substance, to be avoided as far as possible. The reason for this attitude lay in the teaching of Finkelstein (1906) and his school, reviews of whose work were made by Schlutz (1912) and Porter and Dunn (1915). Briefly, Finkelstein and several earlier writers believed that lactose or acids caused by its fermentation produced inflammation of the alimentary tract and that the inflamed mucosa allowed undigested food components, including lactose itself, to be absorbed. The damage so caused, instead of infection, was blamed for the fever accompanying gastro-intestinal disturbances. "Lactose especially was the sugar [Finkelstein] feared, so much so that he stated that even minute doses of milk containing its natural carbohydrate were damaging. Babies were injured with lactose, dextrose, lactose salt mixtures, and dextrose alkali or lactose alkali mixtures, given in isotonic, hypertonic, or hypotonic proportions. The injury was considered always to express itself in mellituria and fever, and F. M. Schapps, Leopold and Von Reuss were one in thinking with Finkelstein that lactose was 'exquisitely pyrogenic'." (Porter and Dunn, 1915).

Schapps (1908) and others injected glucose or lactose into infants and reported a subsequent rise of temperature, which led to acceptance of the view that sugars are pyrogenic agents in themselves; the effects could be obtained also with salt solutions, and when Schlutz (1912) and others tried to repeat the lactose experiments no significant rise of temperature was found. Finkelstein

abandoned his theory of the directly pyrogenic effect of lactose, but maintained that it and its fermentation products were responsible for intestinal inflammation and that the fever was caused by disturbed osmotic balance.

Talbot and Hill (1914) and Porter and Dunn (1915) were bold enough to give lactose to babies. Talbot and Hill made metabolism trials with one baby. We are not told the exact form of the diet, except that it contained from 1.5 to 3.0 per cent. milk fat and from 1.6 to 1.8 per cent. protein. With proportions of lactose up to 9.93 g. per 100 ml. the baby thrived. With 14 g. lactose per 100 ml. it had diarrhoea and indigestion and the amount had to be reduced, but still no sugar ever appeared in the stools. Porter and Dunn gave as much as 18½ per cent. lactose to initially malnourished infants, and in quantity up to 225 g. or 54 g. per kg. daily with no ill effect; the theory of lactose toxicity was thus quite disproved, two of the sixteen babies each gaining 1 kg. in 20 days. In both these experiments excess of lactose (14 g. per 100 ml. in Talbot and Hill's infant, 9 to 17 g. in individual infants of Porter and Dunn's series) produced green, watery, acid stools containing lactic, acetic, succinic and butyric acids and causing sore buttocks. Despite the excellent results obtained with moderate amounts of lactose the idea was not dispelled that digestive disturbances arose from fermentation of unabsorbed lactose; this was taught in medical schools and as a result no further attempt was made to use added lactose in artificial feeds for infants during the next 15 years.

Two paradoxes appear not to have been fully appreciated. The first was that breast-fed babies were less susceptible to diarrhoea than those on cow's milk, although human milk contains more lactose. The second was the difference between the acid diarrhoea of lactose excess and the nearly neutral stools of the bottle-fed infant. Both points were dealt with in a series of experiments by Gerstley and his collaborators (1928a, b; 1930a, b). Starting with a comparison of the stools of breast-fed and bottle-fed infants, they found that the latter contained more total volatile acids and less lactic acid and were always more alkaline, the higher total acid being related to greater volume. The total acidity was not related to the lactose intake, since the breast-fed and bottle-fed infants received 7 and 4 g. lactose per 100 ml., respectively. Still bearing in mind the earlier theories, Gerstley was led to think that lactose given in cow's milk might somehow be more readily fermented than that in breast milk. What he found was that when as much as 12 g. of lactose per 100 ml. was added to cow's milk, not only was there no diarrhoea, but the infants did extremely well and their stools had a weight, acidity, and content of lactic

and volatile acids similar to those of breast-fed babies. After its long eclipse, lactose emerged unscathed. By the time Gerstley's first series of papers was completed several more had appeared, equally favourable in their conclusions. Barenberg and Abramson (1930) concluded that up to 12 to 15 per cent. of the diet could safely consist of lactose without causing laxation, and that it was well utilised, no sugar appearing in either urine or faeces. Kopeloff and Cohen (1930) connected the beneficial effect of lactose with maintenance of the natural intestinal flora as seen in the breast-fed infant. Jarvis (1930), reporting on over 1000 infants fed on mixtures of cow's milk, water and lactose, saw no evidence of intolerance. "The tissues of these children seemed more firm than that [*sic*] of the average infant receiving vegetable sugar and resembled that of the breast-fed infant. Fat babies were rarely observed. . . . Weight for weight, infants fed on milk sugar possess correspondingly more living tissue than when an excess of storage of glycogen exists as in the case of infants fed on vegetable sugar. Lactose, therefore, should be the sugar of choice for normal infants."

Sauer (1932) used lactose to enrich diluted evaporated milk, and claimed after using it for 150 infants, some of them premature, that it gave results closely comparable with those given by human milk. Skole (1934) reported that on milk mixtures containing lactose infants showed a freedom from constipation, scurvy and rickets unusual in those on cow's milk alone, less frequent gastro-intestinal disturbances, less diarrhoea and a general improvement in well-being. Moreover, lactose gave excellent results even in babies which had diarrhoea and vomited while breast-fed (Skole, 1933). Litchfield (1944) recorded that during the first 10 days of life infants on Biolac, a proprietary preparation with lactose and added vitamins A, B₁, D and iron, gained weight as rapidly as those on evaporated milk with added dextrin-maltose, although the former provided only 10 or 14 Cal. per fluid ounce and the latter 18.5 to 21 Cal. It is not known whether the lactose was responsible or the vitamins. A satisfactory standard mixture used in a hospital contained per 100 ml. 7.4 g. lactose and 2.8 g. each of fat and protein. When the lactose was increased to 8.2 g. there was greater frequency of stools, which was prevented by reducing the vitamin B₁ content. The infants continued to thrive despite these modifications (Wolman and Borowsky, 1943). When infants fed on a dried milk preparation had 3 per cent. lactose added abruptly to it some of them had diarrhoea and vomiting, but when the supplement was introduced gradually there was no ill effect from 3 or 5 per cent. (Ross and Dawes, 1954).

Gerstley *et al.* (1935) found α - and β -lactose equally effective in reducing intestinal pH and

establishing a Gram-positive flora in human infants, but Robinson and Gilliland (1937) found α -lactose ineffective in rabbits, and Maloyth and Kirmilidis (1939) and Priming and Turkus (1943) reported that it failed to encourage *Lactobacillus bifidus* in infants. Human and cow's milk both have equilibrium mixtures of the two forms (Habild, 1949). Schimansky (1943) pointed out the importance which would attach to the proof that substitution of one isomer of lactose for the other would greatly affect the intestinal flora of the bottle-fed baby, but so far this proof does not seem to have been produced.

Müller (1947) reviewed the history of the use of lactose in infant feeding. He considered that fats which encourage putrefactive bacteria are an important source of gastro-intestinal disturbances in babies given artificial foods. Lactose forms a suitable medium for the "bifidus" flora, and is an "Antibiosstoff" for the putrefactive bacteria. Müller also discussed possible differences in the effects of α - and β -lactose, but Frisell (1951) found that both forms produced moderate increases in the "bifidus" counts of healthy babies, while other bacteria were not affected. Ross and Dawes (1954) added 3 or 5 per cent. lactose to the dried milk food of 18 infants and found that while there was an initial fall in pH of the faeces from an average of 7.7 to one of 5.7, this lowest level was maintained for only two or three days. The lactobacillus counts then fell off and the pH rose again while the extra lactose was still being given. Ross and Dawes suggested that not only lactose, but probably also the "bifidus factor", is necessary for the maintenance of a lactobacillus flora and the resulting low pH. Of course, the "bifidus factor" itself probably contains galactose (Gauhe *et al.*, 1954; Tomarelli *et al.*, 1954).

Platt (1955) speculates about the possible importance of lactose, or more specifically galactose, for the nutrition of infants. He suggests that if, as seems probable, there is no formation of galactose in the human body except in the lactating mammary gland, this sugar may be regarded as a dietary essential because of its role in cerebroside and mucopolysaccharides. If when the supply of galactose is insufficient, it is replaced in such compounds by glucose, he asks whether the differences might not lead in later life to diseases involving these structural substances, such as disseminated sclerosis and collagen diseases. The infant fed on diluted cow's milk with a vegetable sugar certainly receives little galactose. The rare infant without ability to metabolise galactose normally, who develops "idiopathic galactosaemia", can sometimes be brought up on a diet free of this sugar. Townsend *et al.* (1951) discussed the small number of such infants reported in the literature; one of the persistent accompani-

ments of the disorder is mental retardation, but there are as yet no long follow-up studies from which the incidence of later nervous or connective-tissue sequelae might be discovered. Another result is the development of cataract.

The published work discussed above gives an impression that lactose may be distinctly preferable to other sugars for feeding infants. Diarrhoea seems to occur only when the lactose content of the diet is increased too suddenly or when excessive quantities are given. A careful search of the literature has failed to reveal any other basis for its unpopularity with paediatricians. Yet Gunther (1952) has written: "Lactose is not better than sucrose or glucose in the artificial feeding of infants, and we are still without an explanation of why this particular sugar is present in milk. One can only speculate that the formation of lactose is in some way involved in the process of secretion of the fat and protein."

Effects of an excess of lactose

An excess of lactose may be defined according to two different criteria: that of tolerance in its more usual sense, expressing the amount of lactose which can be taken before sugar appears in the urine; and that of the appearance of ill effects such as diarrhoea and retarded growth.

The relation of lactose intake to diarrhoea was discussed in a searching review by Fischer and Sutton (1949), and it is unnecessary to review the same subject again at length. They concluded that young animals are more susceptible to diarrhoea than older ones. In babies, diarrhoea is commonly produced by diets containing from 12 to 19 "per cent." lactose, depending on individual differences, in puppies by 10 to 15 "per cent." and in weanling rats by 20 "per cent." [It is not clear whether all these percentages are on the same basis.] Lactose is of course not pushed beyond this amount in infants, so for normal babies it may be said to be free from ill effect; any diarrhoea is readily overcome by reducing the lactose intake. Fischer and Sutton considered the lactose itself to be responsible for the diarrhoea and they refer to the possibility that it exerts a "hydragogue" effect, though the diarrhoea is not associated with dehydration. Interference with absorption of water may account for it; solutions of lactose given by mouth, whether hypertonic, isotonic or hypotonic, always led to excretion of less urine than did an equal volume of water (Roccuzzo, 1945).

In animal experiments high proportions of lactose have been given. With calves the utilisation of lactose in whole or skimmed milk was highly efficient, only 1.1 to 3.4 per cent. being excreted. When the lactose content of the milk

was doubled, galactose excreted in the urine represented 8 per cent. of the lactose intake. Calves thus utilise effectively a relatively small concentration of lactose, probably less than 10 per cent. on a wet weight basis (Rojas *et al.*, 1948). Growing rats given 37 per cent. of lactose in the dry matter of their diet had only mild diarrhoea and grew almost as well as those on other sugars (Artom and Fishman, 1947). With 45 or 60 per cent. growth was poor (Mitchell, 1927). Utilisation became less efficient when the diet contained 50 per cent. (Riggs and Beaty, 1947). Weanling rats given 73 per cent. lactose as their only source of carbohydrate developed alopecia and survived for only from 5 to 26 days, according to the strain. Older rats survived with the same proportion of lactose somewhat longer (Ershoff and Deuel, 1944). A mixture of galactose and glucose was as quickly fatal to young rats as lactose; the critical proportion of lactose for survival was 60 to 70 per cent. of the dry matter of the diet, that of galactose 30 or 40 per cent. (Handler, 1947). The failure of skeletal calcification, high serum alkaline phosphatase and low phosphorus levels in these rats might all result from simple inanition (Handler *et al.*, 1947). It is doubtful whether these large proportions of sugar should not be considered as pharmacological instead of physiological.

In all the experiments discussed above moderate quantities of components of the vitamin B complex were supplied, but there is evidence that requirements for them may be high when excessively high carbohydrate diets are used (Byerrum and Flokstra, 1951; Yuckin, 1951), which may account, as will be seen, for the close relation between lactose utilisation and the amount and kind of fat in the diet. Schantz *et al.* (1938) record that rats fed on whole milk supplemented with iron, copper and manganese utilised the lactose of the milk completely; with skimmed milk about 9 to 18 per cent. of the lactose was lost in the urine as galactose. Addition of butterfat, lard, vegetable oils, oleic acid, triolein or tripalmitin prevented the loss of galactose, and complete utilisation persisted for a few days after the fat was withdrawn. Butterfat gave somewhat better growth than the other fats, which was later confirmed and the saturated fraction of the fatty acids was found to be responsible (Schantz *et al.*, 1940a, b). In calves, too, butterfat, closely followed by lard and tallow, gave better weight gains and general condition than did vegetable oils; with maize, cottonseed or soya bean oils the calves were unthrifty, listless and emaciated, some had dermatitis and several died (Gullickson *et al.*, 1942). Deuel *et al.* (1944), using a diet containing 70.6 per cent. mineralised skimmed milk powder, saw no difference in growth of rats given butterfat, margarine or vegetable oils, but in later experiments with lactose, survival

was better with butter or margarine than with maize or cottonseed oil (Ershoff and Deuel, 1947). This difference in the value of fats is specifically related to lactose; with other sugars there was no difference in value between maize oil and butterfat. Lactose gave poor growth with maize oil, but with butterfat growth approached that obtained with other sugars (Boutwell *et al.*, 1943a). The difference in value between butterfat and maize oil became greater as the lactose content of the diet increased. As with calves, so with rats, lard and margarines containing mixtures of animal fats were only slightly inferior to butterfat (Boutwell *et al.*, 1943b). When large amounts of vitamin B₁, riboflavin, nicotinic acid, pyridoxine, pantothenic acid, *p*-aminobenzoic acid, inositol, choline and 1 per cent. liver powder were given, maize oil gave nearly as good results as butterfat (Boutwell *et al.*, 1945). It was considered that the butterfat enabled the intestinal flora to synthesise more B vitamins than did maize oil. Supplements of beef liver alone gave better utilisation of lactose diets (Ershoff, 1949), and liver but none of the known vitamins cured dermatitis produced in rats by lactose diets with vegetable oil (Collins *et al.*, 1951).

Gruber (1950) related the value of fat in high-carbohydrate diets to a diminished destruction of vitamin B₁ in the tissues. This vitamin may, on the other hand, be less directly concerned. The growth of lactic acid bacteria is stimulated by certain unsaturated fatty acids such as oleic and linoleic acids, though high levels of these acids are toxic (Williams *et al.*, 1947; Tomarelli *et al.*, 1949). Balakrishnan and Rajagopalan (1952; 1953) found the highest vitamin B₁ contents in the urine, faeces and liver of rats in association with high counts of total and coliform bacteria, but not of lactobacilli, and in rats on lactose diets such conditions were obtained with butterfat and not with coconut or groundnut oils. The details of the relation between carbohydrates, fat and vitamin synthesis cannot be clearly seen at present.

Mitchell and Dodge (1935) first reported the occurrence of cataract in rats on lactose diets. Early lens changes occurred after 3.6, 2.4 and 1.3 weeks in rats on diets containing 30, 50 and 70 per cent. lactose on a dry matter basis, respectively. With 70 per cent. of lactose every rat showed lens changes and from 50 to 68 per cent. developed mature cataracts; the severity was less the later in life the rats were first given the lactose diet. The young rats showed only transient diarrhoea, though their faeces often continued to be soft. All appeared sleek and well nourished, but they were blind. Serum calcium was not high on these diets but the calcium content of the whole eye in rats with mature cataract was double the normal amount. Day (1936) incriminated galactose as

the cause of cataract. The high blood sugar associated with high lactose or galactose intakes was due mainly to galactose (H. S. Mitchell *et al.*, 1937), but there was no specific relation between the blood sugar level and the rate of cataract development. The addition of calcium lactate to a diet with 62 per cent. lactose did not affect the incidence of cataract. Calcium gluconate, and to a greater extent sodium gluconate, added to a diet with 60 per cent. lactose produced more severe diarrhoea and lower blood sugar than lactose alone, and did not produce cataract (Mitchell *et al.*, 1939). It is suggested that the gluconate radical interfered with lactose absorption or hydrolysis. Not only lactose or galactose alone, but skimmed milk diets produced cataract in rats (Cashell and Kon, 1939), though whole milk did not (Daniels and Everson, 1935). Here again the relation with fats and vitamins may be involved. Krewson *et al.* (1939) were unable to produce cataract in rats on skimmed milk, even when it contained 20 per cent. free galactose or 70 per cent. lactose, but with 30 per cent. of the dry matter as galactose every rat developed bilateral cataract. Day (1936) claimed that cataract due to galactose was easily distinguished with the ophthalmoscope from that produced by riboflavin deficiency.

Hörmann (1954) has discussed theories about the pathogenesis of galactose cataract, giving about 70 references to literature on the subject. He was able to prevent cataract in rats consuming 70 per cent. α -lactose or 30 per cent. galactose by repeated injection of cocarboxylase. Without cocarboxylase the rats receiving 70 per cent. α -lactose lived only 12 or 14 days, but cocarboxylase extended their survival to the full experimental period of 100 days. Hörmann concluded that lactose and galactose interfere with carbohydrate breakdown and that this is particularly serious in the lens because of its isolation from the blood stream. The young lens is more susceptible than the old (Mitchell and Cook, 1938). When inhibitors of carbohydrate metabolism were added to Tyrode glucose medium in which were lenses from calves' eyes, all the lenses developed cataracts (Nordmann *et al.*, 1954). The cataracts appeared more quickly with four inhibitors affecting different phases of the anaerobic cycle than with two acting on the citric acid cycle.

The effect of excess lactose in rats appears on the whole to be concerned with their inability to metabolise large amounts of galactose. Similar intolerance to lactose, with liver enlargement and cataract as consequences, occasionally occurs in infants with a congenital inability to metabolise galactose (Bray *et al.*, 1952; Johnson, 1953; Hudson *et al.*, 1954).

Lactose indigestion in chicks has another basis. Chicks receiving more than 10 per cent. lactose in

the dry matter of the diet showed progressively poorer growth and more severe diarrhoea, and the toes became curled outwards (Rutter *et al.*, 1953). Galactose produced a toxic syndrome with convulsions, but no galactose was found in the blood after lactose feeding. It is suggested that lactose was not metabolised; the retarded growth and weakness may represent simple undernutrition. Hamilton and Mitchell (1924) found little lactase in the crop and none in the intestines of chickens. Yet no severe toxic sign was reported by Kline *et al.* (1932) in chicks given diets containing initially 10 per cent. lactose, even though the amount was slowly increased to 40 per cent. by the fourth week, and there is no suggestion that the birds were greatly undernourished, as would be expected if such a high proportion of the diet was not metabolised. These results are not reconcilable, but then lactose is an unnatural sugar for birds.

Summary

Lactose has physiological effects not characteristic of other sugars; some are due to galactose liberated when lactose is hydrolysed, others are specific to the lactose molecule.

Hydrolysis of lactose by lactase occurs during its passage from the intestinal lumen to the blood, but absorption of unhydrolysed lactose occurs also. Part, but not necessarily all, of the lactose absorbed or injected is excreted in the urine.

Lactose in the diet, in the presence of ample calcium, maintains normal serum calcium and prevents tetany after parathyroid removal. It increases retention of dietary calcium, apparently by improving the utilisation of calcium already absorbed, and increases the mineral content of the bones. It prevents loss of minerals from the skeleton of lactating rats. A possible role in the treatment of milk fever is discussed.

As the natural sugar occurring in breast milk lactose appears to have special value in infant feeding, yet it has been unpopular with paediatricians. It helps to maintain the natural intestinal flora seen in the breast-fed infant, and produces healthy, firm-fleshed babies with few gastro-intestinal upsets. When it is hydrolysed it provides the energy-producing sugar glucose and the "structural" sugar galactose, which may be important in the formation of such compounds as cerebrosides and mucopolysaccharides.

Excess of lactose in animal experiments produces diarrhoea and undernutrition. Large amounts of galactose are poorly utilised by animals and lead to the formation of cataracts. There is some evidence that galactose may interfere with the mechanisms for carbohydrate breakdown. Fat and large amounts of B vitamins can counteract the effects of an excessive intake of lactose.

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1. TECHNIQUE

CHEMICAL

APPARATUS

1556

- DE VERDIER, C. H. and SjöBERG, C. I. An automatic conductivity bridge for chromatographic analyses. *Acta chem. scand.*, 1954, 8, 1161-1168. [Inst. Med. Chem., Univ. Upsala.]

A description of a modified form of the apparatus used by James *et al.* (*Biochem. J.*, 1951, 49, 293) for chromatographic estimations by the automatic recording of conductivity changes in the column. The apparatus has been successfully applied to the separation of amino-acids, and of peptides and amino-acids containing phosphorus.—A. Hepburn.

1557

- CARAVEL, C., DUCLOZ, J. and GROULADE, J. Dispositif d'alimentation à courant constant pour électrophorèse sur papier. [Apparatus for supplying a constant electric current for electrophoresis on paper.] *Ann. Inst. Pasteur*, 1954, 87, 227-229. *Proc.* [Fac. Sci., Centre Transfusion Sanguine, Grenoble.]

1558

- POTTERAT, M. and ESCHMANN, H. Un nouveau ballon-filtre. [A new filter flask.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 329-331. [Lab. Serv. Féd. Hyg. Pub., Berne.] German and English summaries.

A description, with diagram, is given of a flask with a side tube fused on at an angle of 120°, by means of which a transfer of precipitate, *e.g.*, in the authors' method of estimating sugars (Abst. 1568, Vol. 25) can be avoided.—W. M. Deans.

1559

- ANTONINI, F. M. Spettrofotometro a fiamma: costruzione di uno strumento a standard interno. [Flame spectrophotometry: construction of an instrument with an internal standard.] *Sperimentale*, 1953, 103, 305-323. [Clin. Med. Gen., Univ. Florence.]

The importance for clinical purposes of rapid estimation of Ca, Na and K in biological fluids is stressed, but flame spectrophotometers are expensive to buy. The theory of the apparatus is discussed and a full description of its construction, with drawings, is given. It was based on previous British and American research and had an internal standard.—E. M. Hume.

1560

- VALLEE, B. L. Simultaneous determination of sodium, potassium, calcium, magnesium and

strontium by a new multichannel flame-spectrometer. *Nature*, 1954, 174, 1050-1051. [Biophys. Res. Lab., Dept. Med., Peter Bent Brigham Hosp., Boston, Mass.]

ANALYTICAL METHODS

General

1561

- DIECKERT, J. W. and REISER, R. Glass fiber paper impregnated with silicic acid as a new chromatographic tool. *Science*, 1954, 120, 678. [Dept. Biochem. Nutrit., Texas Agric. and Mech. Coll., College Station.]

This material is used when the tests needed for detecting compounds involve the use of drastic conditions. Triglycerides, fatty acids and cholesterol and its esters can be separated by using glass paper, impregnated with silicic acid, with 2 per cent. diethyl ether in *iso*-octane as developing solvent. Sterols are located by spraying one side of the developed chromatogram with Liebermann Burchard reagent and then heating on an electric hotplate with exposed elements; they give pink-red spots on a white background. Carbon compounds can be detected on the same chromatogram by spraying the other side with a mixture of H₂SO₄ and dichromate mixture and heating as before to give grey-black spots on a yellow background.—H. G. Bray.

1562

- HAGDAHL, L. and DANIELSON, C. E. A new paper column for preparative chromatography. *Nature*, 1954, 174, 1062-1063. [Inst. Biochem., Upsala.]

The column consists of a roll of filter paper contained in a polythene tube.—H. G. Bray.

1563

- STÖCKLI, A. Mehrdimensionale Papierchromatographie. [Multi-dimensional paper chromatography.] *Helv. chim. Acta*, 1954, 37, 1581-1585. [Versuchstat. Schweiz. Brauereien, Zürich.]

The partly separated constituents are transferred to a fresh paper for each subsequent development.—H. G. Bray.

1564

- EHRLMANTRAUT, H. C. and WEINSTOCK, A. A simple method of applying the Beckman spectrophotometer to the measurement of paper chromatograms. *Biochim. biophys. Acta*,

1954, **15**, 589-590. [Armour Res. Found., Chicago, Ill.]

Excised stained areas of paper chromatograms are attached to the faces of the cuvettes and readings are taken in the normal way. The optical density of the spots is proportional to the logarithm of the concentration.—H. G. Bray.

1565

WALDMANN-MEYER, H. and LOBO-ONELL, C. Separation and concentration of biologic colloids by cryodialysis. *J. Lab. Clin. Med.*, 1954, **44**, 314-319. [Dept. Urol., Univ. Chile, Santiago.]

Biological fluids are placed in cellophane tubes and suspended in cold air. A solution of crystalloids diffuses out and freezes, and so can be removed.—H. G. Bray.

1566

SULSER, H. Die Mikrobestimmung der Phosphatidbestandteile Inosit, Äthanolamin, Serin und Cholin. 5. Mitteilung über Anwendung der Papierchromatographie auf lebensmittelchemische Probleme. [Micro-estimation of the phosphatide components inositol, ethanolamine, serine and choline. 5th Paper on the use of paper chromatography in problems of food chemistry.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, **45**, 251-294. [Lab. Eidg. Gesundheitsamt., Berne.] French and English summaries.

For other parts see Title 4538, Vol. 21; *Mitt. Geb. Lebensmittel. Hyg.*, 1953, **44**, 79; Abst. 1610, Vol. 25.

Inositol is estimated with ethylacetate:acetic acid: water (3:1:3) as solvent mixture and 2.5 per cent. methanolic AgNO₃ as detecting agent. The solvent mixture for ethanolamine and serine is *n*-butanol: ethanol: water (80:25.5:60) with ninhydrin as detecting agent. Choline is estimated with *tert*-butanol: methanol: water (4:5:1) as solvent and phosphomolybdate and stannous chloride for detection. Other methods of estimating these compounds are reviewed.—H. G. Bray.

Carbohydrate Constituents

1567

JONES, J. K. N. and PRIDHAM, J. B. A colorimetric estimation of sugars using benzidine. *Biochem. J.*, 1954, **58**, 288-290. [Dept. Chem., Univ. Bristol.]

The method depends on the formation by sugars of an orange-yellow colour with benzidine. The reaction is suitable for the estimation of concentrations of from 20 to 600 µg. per ml. of aldopentoses, methylaldopentoses, aldohexoses, hexuronic acids, methylated sugars and disaccharides; ketoses and amino-sugars cannot be estimated.

H. G. Bray.

1568

POTTERAT, M. and ESCHMANN, H. Application des complexones au dosage des sucres. [Use of complexones in the estimation of sugars.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, **45**, 312-329. [Lab. Serv. Féd. Hyg. Pub., Berne.] German and English summaries.

A reagent superior to that of Löffl and Schoorl (*Ztschr. Untersuch. Lebensmittel*, 1929, **57**, 566) was devised, incorporating complexone III (ethylenediamine tetra-acetate), which forms a complex with cuprous oxide.—H. G. Bray.

1569

WHISTLER, R. L. On column chromatography of sugars. *Science*, 1954, **120**, 899-900. [Dept. Biochem., Purdue Univ., Lafayette, Ind.]

The following preliminary preparation of chromatographic columns for the separation of carbohydrates of low molecular weight is advised.

Carbon columns are best washed with 1 per cent. HCl to remove basic ash, and then with distilled water. Celite, usually mixed with the charcoal, sometimes dissolves in the developing solution and can be removed from the concentrated effluent by filtration or by evaporating to dryness and redissolving the carbohydrate in water. Columns entirely of charcoal are advantageous. Cellulose columns should be washed with water to reduce the elution of extraneous carbohydrates. It is better to apply pressure at the top of the column than suction at the bottom, which often withdraws part of the solvent, with consequent poor separations. Columns are best packed dry or with a thick slurry.—A. Hepburn.

1570

SOUTAR, T. H. and HAMPTON, E. Structural changes in boiling solutions of sugar with reference to chromatography of carbohydrates. *Nature*, 1954, **174**, 801-802. [Brit. Jute Trade Res. Assoc., Kinnoull Rd., Kingsway West, Dundee.]

It was shown that a structural change in rhamnose and xylose occurs when they are boiled in water for 12 hr.—H. G. Bray.

1571

McCREADY, R. M. and McCOMB, E. A. Quantitative determination of sugars on paper chromatograms by a reflectance method. *Anal. Chem.*, 1954, **26**, 1645-1647. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 6, Calif.]

1572

POGELL, B. M. The quantitative determination of fructose with skatole and hydrochloric acid. *J. Biol. Chem.*, 1954, **211**, 143-147. [Chem.

N.A. and R., April 1955

Sect., Fourth Army Area Med. Lab., Brooke Army Med. Centre, Fort Sam Houston, Tex.]

Fructose was estimated spectrophotometrically from the purple colour produced on reaction with skatole in concentrated HCl. Sugars other than ketoses did not react significantly at the experimental temperature of 37° C. Glucose in molar amounts 5 times that of fructose did not appreciably interfere but with 10 times there was an error of 9 per cent. The recovery of fructose from mouse liver homogenates, oxalated human blood, human sera and urine ranged from 93 to 102 per cent.—A. Hepburn.

1573

BONTING, S. L. **Differential determination of glucose and fructose in microgram quantities.** *Arch. Biochem. Biophys.*, 1954, **52**, 272-279. [Dept. Physiol., Coll. Med., State Univ. Iowa, Iowa City.]

An adaptation of the anthrone method of Morris (Abst. 14, Vol. 18). Fructose is estimated in reaction mixtures which are not heated, and both fructose and glucose in mixtures heated for 10 min. in a boiling-water bath. The procedure is applicable to quantities of 0.2 to 2 μ g. in 25 ml.

H. G. Bray.

1574

STITT, F., FRIEDLANDER, S., LEWIS, H. J. and YOUNG, F. E. **Photometric determination of glucose in presence of fructose.** *Anal. Chem.*, 1954, **26**, 1478-1484. [W. Utilisation Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany, Calif.]

The method depends on the fact that sodium chlorate oxidises fructose much more rapidly than glucose at pH 4. Chlorine dioxide, a reaction product, is estimated spectrophotometrically or colorimetrically. The difference between ClO_2 production by the solution under investigation and a standard fructose sample is ascertained. The method is applicable to fructose with from 0.05 to 0.5 per cent. of glucose.—H. G. Bray.

1575

RELAJZE, C. B. **Determinación cuantitativa de glucosa por micrométodo colorimétrico. [Quantitative estimation of glucose by a colorimetric micro-method.]** *Crón. Méd.*, Lima, 1951, **68**, 101-112. [Cát. Farm., Fac. Farm., Lima.]

A photocolorimetric method is described for the estimation of glucose in 0.05 ml. blood, which follows the technique of Haslewood and Strookman (Abst. 1252, Vol. 9) in the use of Na tungstate and CuSO_4 . CuSO_4 was contained in physiological saline and glucose standards were made up in isotonic CuSO_4 . Pollis and Sortwell (Abst. 3792, Vol. 16) used perchloric acid as precipitating agent,

but this is not favoured, nor is the use of BaSO_4 (Absts. 849, Vol. 14; 2897, Vol. 15).

The alkaline CuSO_4 reagent of Somogyi (Abst. 2896, Vol. 15) was used with the deproteinised blood filtrate and the best development of colour was effected by the addition of a simple sulphuric acid solution of any phosphomolybdic acid.

A. Hepburn.

1576

LEE, J. **A quick and simple method for blood-sugar estimation.** *Brit. Med. J.*, 1954, **ii**, 1087-1088. [Dept. Physiol., Med. Sch., Charing Cross Hosp., London.]

A method with dinitrosalicylic acid.

H. G. Bray.

1577

WOOD, E. C. **The determination of sucrose in sweetened condensed milk: a simplification.** *Analyst*, 1954, **79**, 780-781. [Clarence House, Clarence Rd., Norwich.]

Details of the calculation of sucrose content from polarimetric measurements are given.

H. G. Bray.

1578

HARWOOD, V. D. **Analytical studies on the carbohydrates of grasses and clovers. 7. The isolation of D-mannitol from perennial rye-grass (*Lolium perenne*).** *J. Sci. Food Agric.*, 1954, **5**, 453-455. [Dept. Chem., Univ. Edinburgh.]

For previous parts see Absts. 39, 240, Vol. 25. Hot-water extraction of perennial ryegrass removes D-mannitol along with contaminating carbohydrate material. The D-mannitol may be isolated by chromatographic separation on a charcoal column.—D. M. Walker.

1579

NORTHCOTE, D. H. **Electrophoresis of some neutral polysaccharides.** *Biochem. J.*, 1954, **58**, 353-358. [Dept. Biochem., Univ. Cambridge.]

The process takes place in borate buffer, pH 9.2, polysaccharides migrating to the anode. The use of the buffer is necessary even with polysaccharides containing *trans*-vicinal hydroxyl groups.

H. G. Bray.

1580

CARTER, G. H. and NEUBERT, A. M. **Rapid determination of starch in apples.** *J. Agric. Food Chem.*, 1954, **2**, 1070-1072. [U.S. Fruit and Veg. Prod. Lab., Prosser, Wash.]

1581

MOULD, D. L. and SYNGE, R. L. M. **Separations of polysaccharides related to starch by electrokinetic ultrafiltration in collodion membranes.** *Biochem. J.*, 1954, **58**, 571-585. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The chromatographic separation of polysaccharides related to starch and materials derived from them by chemical or enzymic treatment was achieved by electroendosmosis with strips of collodion membrane. Separation was by adsorption on the inner membrane surfaces. The collodion strips were stained with iodine and KI, and R_F values were measured. Comparison with reference dextrans of known average degree of polymerisation (DP) enabled the range of DP in different preparations to be estimated.—A. Hepburn.

1582

MOULD, D. L. and SYNGE, R. L. M. The electrophoretic mobility and fractionation of complexes of hydrolysis products of amylose with iodine and potassium iodide. *Biochem. J.*, 1954, **58**, 585-593. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The electrophoresis in agar jelly of partial hydrolysates of amylose in the presence of iodine and iodide permitted separation into different coloured zones. By a continuous fractionation process 4 dextrin fractions stained blue, red, orange and scarcely at all were isolated and purified. The degrees of polymerisation in the respective fractions, calculated as in the preceding Abst., were 40 to 130, 25 to 40, 19 to 25 and < 10.

A. Hepburn.

1583

HOLT, R. Volumetric determination of pectin as calcium pectate. *Analyst*, 1954, **79**, 623-627. [Fruit and Veg. Canning and Quick Freezing Res. Assoc., Chipping Campden, Glos.]

1584

GAILLARD, B. D. E. Chromatografisch onderzoek naar de samenstelling van de polysacchariden uit de celwand in verband met de analyse van ruwvoeders. [Chromatographic study of the composition of the polysaccharides of the cell wall, with reference to the analysis of coarse fodders.] *Thesis, Utrecht*, 1954, pp. 65. English summary.

Crude fibre, as 70 per cent. of the dry matter of pasture and straw, with pasture covering more than half of the agricultural surface of Holland, and fodder crops on much of the arable surface, is a most important product and economically demands closer investigation. There are no satisfactory methods for the separation and estimation of the several components of crude fibre. These are: pectins, i.e., polygalacturonic acids, soluble in 0.5 per cent. ammonium oxalate, with araban and galactan, polymers of arabinose and galactose. There may also be xylan and low-molecular polymers of glucose. The hemicelluloses are a complex mixture of which xylan is the main component

either in pure form or with glucuronic acid or arabinose and glucuronic acid. Araban and galactan occur regularly, and low-molecular forms of cellulose, β - and γ -cellulose, are also present in solution in the alkali used to extract the hemicelluloses. They are sometimes grouped as soluble in 5 or in 24 per cent. KOH. Nomenclatures differ. Cross Bevan cellulose is a mixture of cellulose and hemicellulose; what remains when pectins and lignin have been removed is "holocellulose".

The cell-wall components to be estimated are polysaccharides, and mono- and oligosaccharides not of that complex are removed by extraction with alcohol and benzene, which remove also pigments and fat. Pectins are removed with 0.5 per cent. ammonium oxalate. Not all the hemicelluloses can be extracted until lignin has been removed, but some lignin is soluble, with hemicellulose, in alkali and some hemicellulose in the reagents used to remove lignin. Attempts to estimate the loss of hemicellulose in removing lignin by estimation of loss of furfural-producing components err in principle because hexoses are present as well as pentoses and uronic acids yield furfural.

After a review of methods of estimating hemicellulose, 4 are discussed in detail, those of Weihe and Phillips (Abst. 987, Vol. 12) and of Wise, Murphy and d'Addico (*Paper Trade J.*, 1946, **122**, 11) and 2 now proposed. And finally the procedure for use with plant materials is set out in detail, a complete and a shortened method.

The complete procedure is as follows. Two samples of the ground hay or straw are extracted, one with 90 per cent. alcohol, the other with alcohol and benzene. In the first extract glucose, fructose and sucrose are estimated by chromatography; the residue is extracted with boiling water and fructosan is estimated. From the second sample the residue is extracted with 0.5 per cent. ammonium sulphate to remove pectins and the residue is treated with chloramine and ethanolamine to remove lignin. The holocellulose is extracted with 5 per cent. KOH, the soluble hemicellulose is hydrolysed with $N H_2SO_4$ and xylose, arabinose, glucose and galactose are estimated, again by chromatography. The residue is extracted with 24 per cent. KOH, and both soluble hemicellulose and the residue are hydrolysed with $N H_2SO_4$. The resulting sugars are estimated. The insoluble residue is pure cellulose.

In the shortened method the holocellulose is hydrolysed partly with $N H_2SO_4$ to give sugars and a complex residue and partly with 0.1 $N H_2SO_4$ to give sugars and Cross Bevan cellulose.—I. Leitch.

1585

ELY, R. E., WISEMAN, H. G., IRVIN, H. M. and MOORE, L. A. Yields of holocellulose prepared

N.A. and R., April 1955

from feces by acid chlorite treatment. *J. Animal Sci.*, 1954, 13, 1008. [*Proc. [U.S. Dept. Agric.]*]

See also Abst. 2208.

Nitrogenous Constituents

1586

POLLEY, J. R. Colorimetric determination of nitrogen in biological materials. *Anal. Chem.*, 1954, 26, 1523-1524. [Virus Sect., Lab. Hyg., Dept. Nat. Health Welfare, Ottawa.]

The material is digested as in the Kjeldahl procedure, with a mercuric sulphate catalyst. Free mercury is removed from the digest by means of zinc and ammonia is estimated by a Nessler method.—H. G. Bray.

1587

BRAGANCA, B. M., QUASTEL, J. H. and SCHUCHER, R. Note on microestimation of ammonia using the Warburg manometric apparatus. *Arch. Biochem. Biophys.*, 1954, 52, 18-21. [Res. Inst., Montreal Gen. Hosp.]

1588

AMIRKHAANOVA, S. N. and AMIRKHAANOV, A. Kh. Frakzionirovanie belkov posledovatel'nyh osazhdeniem. [Fractionation of proteins by successive precipitation.] *Biokhimiya*, 1954, 19, 19-23. [Biol. Inst., Ufa.]

A method of fractionation of proteins is described, involving successive precipitation by repeated addition of small amounts of precipitant and rapid separation of the precipitate by centrifuging. The results for human serum, using 0.5 per cent. uranyl nitrate, are tabulated. The method is stated to be as accurate as, and simpler, more rapid and cheaper than, the Tiselius electrophoretic method.—D. W. Taylor.

1589

ASTRUP, T., BIRCH-ANDERSEN, A. and SCHILLING, K. Fractional precipitation of serum proteins by means of specific anions. *Acta chem. scand.*, 1954, 8, 901-908. [Biol. Inst., Carlsberg Found., Copenhagen.]

The anions studied were sulphosalicylate, tungstate, molybdate, phosphomolybdate, ferrocyanide, silicofluoride and metaphosphate. The course of the fractionation was followed electrophoretically and varied with the anion used. It is suggested that precipitation by a specific anion may be a useful technique to supplement conventional methods.—H. G. Bray.

1590

FEIGEN, G. A., CAMPBELL, J. M., SUTHERLAND, G. B. and MARKUS, G. Simultaneous estimation of serum proteins and oxypolygelatin by

phenol:nitrogen ratio. *J. Appl. Physiol.*, 1954, 7, 154-160. [Dept. Physiol., Stanford Univ., Calif.]

A differential procedure based on the colour reaction of proteins with the Folin Ciocalteu reagent.—H. G. Bray.

1591

REES, V. H., FIELDS, J. E. and LAURENCE, D. J. R. The dye-binding capacity of human plasma determined fluorimetrically and its relation to the determination of plasma albumin. *J. Clin. Pathol.*, 1954, 7, 336-340. [Dept. Chem. Pathol., Postgrad. Med. Sch., London.]

The dye used is 1-anilinonaphthalene-8-sulphonic acid, which fluoresces when adsorbed by plasma albumin. The relation between plasma albumin concentration and dye-binding capacity was found to be almost linear.—H. G. Bray.

1592

LARSON, D. L. and FEINBERG, R. Fractionation of human serum albumin using continuous filter-paper electrophoresis. *Science*, 1954, 120, 426-427. [Dept. Exp. Immunol., Army Med. Serv. Grad. Sch., Washington, D.C.]

A procedure is described, based on that of Durrum (*J. Amer. Chem. Soc.*, 1951, 73, 4875). A gel diffusion technique (Oudin, *Ann. Inst. Pasteur*, 1948, 75, 109; Munoz and Becker, *J. Immunol.*, 1950, 65, 47) is used to test for homogeneity of material separated by electrophoresis.

H. G. Bray.

1593

SCHIED, H. Zur Dichte- und Eiweissbestimmung des menschlichen Serums. [Estimation of the density and protein content of human serum.] *Ztschr. ges. exp. Med.*, 1954, 124, 201-208. [I. Med. Klin., Univ. Vienna.]

1594

OOSTERHUIS, H. K. Studies on paper electrophoresis: a comparison with the chemical method as an aid in clinical diagnosis. *J. Lab. Clin. Med.*, 1954, 44, 280-291. [Lab. Chem. Physiol., Free Univ., Amsterdam.]

Paper electrophoresis was found to be more suitable than chemical methods for the study of serum proteins.—H. G. Bray.

1595

VERSCHURE, J. C. M. and HOEFSMIT, I. Een snelle klinische methode voor papier-electrophoresis. [Rapid clinical method for electrophoresis on paper.] *Nederland. Tijdschr. Geneesk.*, 1954, 98, 3410-3411. [Geneesk. Clin., Rijksuniv., Utrecht.] English summary.

The chromatographic separation of polysaccharides related to starch and materials derived from them by chemical or enzymic treatment was achieved by electroendosmosis with strips of collodion membrane. Separation was by adsorption on the inner membrane surfaces. The collodion strips were stained with iodine and KI, and R_F values were measured. Comparison with reference dextrans of known average degree of polymerisation (DP) enabled the range of DP in different preparations to be estimated.—A. Hepburn.

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MOULD, D. L. and SYNGE, R. L. M. The electrophoretic mobility and fractionation of complexes of hydrolysis products of amylose with iodine and potassium iodide. *Biochem. J.*, 1954, 58, 585-593. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

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1584

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Crude fibre, as 70 per cent. of the dry matter of pasture and straw, with pasture covering more than half of the agricultural surface of Holland, and fodder crops on much of the arable surface, is a most important product and economically demands closer investigation. There are no satisfactory methods for the separation and estimation of the several components of crude fibre. These are: pectins, i.e., polygalacturonic acids, soluble in 0.5 per cent. ammonium oxalate, with araban and galactan, polymers of arabinose and galactose. There may also be xylan and low-molecular polymers of glucose. The hemicelluloses are a complex mixture of which xylan is the main component

either in pure form or with glucuronic acid or arabinose and glucuronic acid. Araban and galactan occur regularly, and low-molecular forms of cellulose, β - and γ -cellulose, are also present in solution in the alkali used to extract the hemicelluloses. They are sometimes grouped as soluble in 5 or in 24 per cent. KOH. Nomenclatures differ. Cross Bevan cellulose is a mixture of cellulose and hemicellulose; what remains when pectins and lignin have been removed is "holocellulose".

The cell-wall components to be estimated are polysaccharides, and mono- and oligosaccharides not of that complex are removed by extraction with alcohol and benzene, which remove also pigments and fat. Pectins are removed with 0.5 per cent. ammonium oxalate. Not all the hemicelluloses can be extracted until lignin has been removed, but some lignin is soluble, with hemicellulose, in alkali and some hemicellulose in the reagents used to remove lignin. Attempts to estimate the loss of hemicellulose in removing lignin by estimation of loss of furfural-producing components err in principle because hexoses are present as well as pentoses and uronic acids yield furfural.

After a review of methods of estimating hemicellulose, 4 are discussed in detail, those of Weihe and Phillips (Abst. 987, Vol. 12) and of Wise, Murphy and d'Addieco (*Paper Trade J.*, 1946, 122, 11) and 2 now proposed. And finally the procedure for use with plant materials is set out in detail, a complete and a shortened method.

The complete procedure is as follows. Two samples of the ground hay or straw are extracted, one with 90 per cent. alcohol, the other with alcohol and benzene. In the first extract glucose, fructose and sucrose are estimated by chromatography; the residue is extracted with boiling water and fructosan is estimated. From the second sample the residue is extracted with 0.5 per cent. ammonium sulphate to remove pectins and the residue is treated with chloramine and ethanolamine to remove lignin. The holocellulose is extracted with 5 per cent. KOH, the soluble hemicellulose is hydrolysed with $N H_2SO_4$ and xylose, arabinose, glucose and galactose are estimated, again by chromatography. The residue is extracted with 24 per cent. KOH, and both soluble hemicellulose and the residue are hydrolysed with $N H_2SO_4$. The resulting sugars are estimated. The insoluble residue is pure cellulose.

In the shortened method the holocellulose is hydrolysed partly with $N H_2SO_4$ to give sugars and a complex residue and partly with 0.1 $N H_2SO_4$ to give sugars and Cross Bevan cellulose.—I. Leitch.

1585

ELY, R. E., WISEMAN, H. G., IRVIN, H. M. and MOORE, L. A. Yields of holocellulose prepared

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from feces by acid chlorite treatment. *J. Animal Sci.*, 1954, **13**, 1008. [*Proc. [U.S. Dept. Agric.]*]
See also Abst. 2208.

Nitrogenous Constituents

1586

POLLEY, J. R. Colorimetric determination of nitrogen in biological materials. *Anal. Chem.*, 1954, **26**, 1523-1524. [Virus Sect., Lab. Hyg., Dept. Nat. Health Welfare, Ottawa.]

The material is digested as in the Kjeldahl procedure, with a mercuric sulphate catalyst. Free mercury is removed from the digest by means of zinc and ammonia is estimated by a Nessler method.—H. G. Bray.

1587

BRAGANCA, B. M., QUASTEL, J. H. and SCHUCHER, R. Note on microestimation of ammonia using the Warburg manometric apparatus. *Arch. Biochem. Biophys.*, 1954, **52**, 18-21. [Res. Inst., Montreal Gen. Hosp.]

1588

AMIRKHAANOVA, S. N. and AMIRKHAANOV, A. KH. Fraktsionirovanie belkov posledovatel'nyim osazhdeniem. [Fractionation of proteins by successive precipitation.] *Biokhimiya*, 1954, **19**, 19-23. [Biol. Inst., Ufa.]

A method of fractionation of proteins is described, involving successive precipitation by repeated addition of small amounts of precipitant and rapid separation of the precipitate by centrifuging. The results for human serum, using 0.5 per cent. uranyl nitrate, are tabulated. The method is stated to be as accurate as, and simpler, more rapid and cheaper than, the Tiselius electrophoretic method.—D. W. Taylor.

1589

ASTRUP, T., BIRCH-ANDERSEN, A. and SCHILLING, K. Fractional precipitation of serum proteins by means of specific anions. *Acta chem. scand.*, 1954, **8**, 901-908. [Biol. Inst., Carlsberg Found., Copenhagen.]

The anions studied were sulphosalicylate, tungstate, molybdate, phosphomolybdate, ferrocyanide, silicofluoride and metaphosphate. The course of the fractionation was followed electrophoretically and varied with the anion used. It is suggested that precipitation by a specific anion may be a useful technique to supplement conventional methods.—H. G. Bray.

1590

FEIGEN, G. A., CAMPBELL, J. M., SUTHERLAND, G. B. and MARKUS, G. Simultaneous estimation of serum proteins and oxypolygelatin by

phenol:nitrogen ratio. *J. Appl. Physiol.*, 1954, **7**, 154-160. [Dept. Physiol., Stanford Univ., Calif.]

A differential procedure based on the colour reaction of proteins with the Folin Ciocalteu reagent.—H. G. Bray.

1591

REES, V. H., FILDES, J. E. and LAURENCE, D. J. R. The dye-binding capacity of human plasma determined fluorimetrically and its relation to the determination of plasma albumin. *J. Clin. Pathol.*, 1954, **7**, 336-340. [Dept. Chem. Pathol., Postgrad. Med. Sch., London.]

The dye used is 1-anilimonaphthalene-8-sulphonic acid, which fluoresces when adsorbed by plasma albumin. The relation between plasma albumin concentration and dye-binding capacity was found to be almost linear.—H. G. Bray.

1592

LARSON, D. L. and FEINBERG, R. Fractionation of human serum albumin using continuous filter-paper electrophoresis. *Science*, 1954, **120**, 426-427. [Dept. Exp. Immunol., Army Med. Serv. Grad. Sch., Washington, D.C.]

A procedure is described, based on that of Durrum (*J. Amer. Chem. Soc.*, 1951, **73**, 4875). A gel diffusion technique (Oudin, *Ann. Inst. Pasteur*, 1948, **75**, 109; Munoz and Becker, *J. Immunol.*, 1950, **65**, 47) is used to test for homogeneity of material separated by electrophoresis.

H. G. Bray.

1593

SCHIED, H. Zur Dichte- und Eiweissbestimmung des menschlichen Serums. [Estimation of the density and protein content of human serum.] *Ztschr. ges. exp. Med.*, 1954, **124**, 201-208. [I. Med. Klin., Univ. Vienna.]

1594

OOSTERHUIS, H. K. Studies on paper electrophoresis: a comparison with the chemical method as an aid in clinical diagnosis. *J. Lab. Clin. Med.*, 1954, **44**, 280-291. [Lab. Chem. Physiol., Free Univ., Amsterdam.]

Paper electrophoresis was found to be more suitable than chemical methods for the study of serum proteins.—H. G. Bray.

1595

VERSCHURE, J. C. M. and HOEFSMIT, I. Een snelle klinische methode voor papier-electrophorese. [Rapid clinical method for electrophoresis on paper.] *Nederl. Tijdschr. Geneesk.*, 1954, **98**, 3410-3411. [Geneesk. Clin., Rijksuniv., Utrecht.] English summary.

1596

- KAWERAU, E. Electrophoresis of serum and urine proteins on filter-paper strips and agar jelly with the bridge unit. *Analyst*, 1954, **79**, 681-688. [Dept. Chem. Pathol., St. Mary's Hosp., London, W.2.]

1597

- ROMANI, J. D. La recherche et l'évaluation des glyco-protéines du sérum à l'aide de l'électrophorèse sur papier. [Study and evaluation of the glycoproteins of serum by means of electrophoresis on paper.] *Presse méd.*, 1954, **62**, 1578-1579. [Serv. Endocrinol., Hôp. Laennec, Paris.]

1598

- TRACTMAN, R. Clinical moving-boundary electrophoresis: nonplanar difficulties due to the presence of lipoproteins in normal and pathological serum. *Arch. Biochem. Biophys.*, 1954, **53**, 85-93. [Radiation Lab., Donner Lab., Univ. California, Berkeley.]

The electrophoresis of whole serum has several defects: in particular, the abnormality in the β -region which averages out the distribution in a horizontal plane, and the non-planarity of boundaries. These can be abolished if the low-density group of lipoproteins (β) is removed by ultracentrifuging in NaCl solution. The removal of all the lipoproteins by centrifuging with NaNO_3 plus added D_2O prevents non-planarity in the α -region. A. Hepburn.

1599

- HALASZ, N. A. and KREHL, W. A. An application of the paper electrophoresis technique to serum changes in arteriosclerosis. *Yale J. Biol. Med.*, 1954, **27**, 119-134. [Dept. Biochem., Nutrit. Lab., Sch. Med., Yale Univ., New Haven, Conn.]

Paper electrophoresis was used to separate serum protein, lipid and cholesterol; the staining agents used were amido schwarz, oil red O and antimony pentachloride.—H. G. Bray.

1600

- BOYD, G. S. The estimation of serum lipoproteins. A micromethod based on zone electrophoresis and cholesterol estimations. *Biochem. J.*, 1954, **58**, 680-685. [Dept. Biochem., Univ. Edinburgh.]

After electrophoresis the paper is cut up, the sections are eluted and cholesterol is estimated in the eluates. The concentrations of the α - and β -lipoproteins are assessed in terms of the cholesterol associated with them.—H. G. Bray.

1601

- McKINLEY, W. P., OLIVER, W. F., MAW, W. A. and COMMON, R. H. Studies on the serum proteins of the fowl by filter paper electrophoresis. *10th World's Poultry Congr. Sect. Papers*, Edinburgh, 1954, 139-142. [Macdonald Coll., McGill Univ., Que.]

1602

- ADJUTANTIS, G. An improved resolution of cytoplasmic proteins of rat liver after *n*-butanol treatment. *Nature*, 1954, **174**, 1054. [Dept. Chem. Pathol., Postgrad. Med. Sch., Ducane Rd., London, W. 12.]

See Abst. 4059, Vol. 24.

1603

- SCHÖBER, R., CHRIST, W. and NICLAUS, W. Über die refraktometrische Bestimmung von Casein in Milch. [Refractometric estimation of casein in milk.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, **99**, 299-302. [Staat. Milchwirtsch. Lehraust., Wangen i. Allgäu.]

A modification of the procedure of Brereton and Sharp (Abst. 2965, Vol. 12). A procedure is described for defatting milk by means of "Trilon F" ("Titriplex III") and amyl alcohol.

H. G. Bray.

1604

- JOHANSSON, B. An attempt to crystallise β -lactoglobulin from human milk whey. *Acta chem. scand.*, 1954, **8**, 1108. *Proc.* [Dept. Med. Chem., Univ. Gothenburg.]

1605

- KONSTANTINOVA, M. M. O metode polucheniya preparatov ferritina, svobodnykh ot kadmiya. [Method of obtaining preparations of ferritin free from cadmium.] *Biokhimiya*, 1954, **19**, 174-176. [Inst. Morfol., Akad. Nauk SSSR, Moscow.]

1606

- CARTER, J. R. Amperometric determination of disulphides in intact proteins. *Science*, 1954, **120**, 895-896. [Dept. Pathol., State Univ. Iowa, Iowa City.]

The reaction of sulphite with a disulphide bond to produce a sulphydryl group is used in this method.

One ml. of an aqueous protein solution plus a minute quantity of anti-foam emulsion is added to 28 ml. of 90 per cent. ethanol containing sufficient NH_4OH , or NH_4NO_3 and ethylenediamine tetraacetate to make concentrations of 0.25, 0.05 and 3×10^{-5} molar in 31 ml.; 2 ml. (excess) of freshly prepared cold saturated Na_2SO_3 is stirred

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into the mixture and sulphhydryl groups are estimated amperometrically by titration with $10^{-3} M$ $AgNO_3$. Higher protein concentrations were possible when anti-foam emulsion was employed.

Estimations were made on oxidised glutathione, insulin, prothrombin, thrombin, fibrinogen and thromboplastin. Results agreed well with literature on hydrolysates of insulin and of prothrombin.

A. Hepburn.

1607

PEDERSEN, J. W. and BAKER, B. E. **Studies on protein hydrolysis. 2. The use of sulphurous acid for the control of humin formation and loss of tryptophan during acid hydrolysis.** *J. Sci. Food Agric.*, 1954, 5, 549-556. [Dept. Chem., Fac. Agric., McGill Univ., Macdonald Coll., Que.]

For part I see Abst. 1376, Vol. 23.

Several proteins when treated with H_2SO_4 for 36 hr. at $100^\circ C$. were hydrolysed, releasing from 34 to 37 per cent. of the amino-N produced by 5 N HCl under reflux, but without loss of tryptophan. In the presence of $N H_2SO_4$ or HCl, hydrolysis by H_2SO_4 was more complete, from 60 to 70 per cent., and loss of tryptophan was still very slight. The effects of different concentrations, temperatures and times were studied.

Preliminary rat feeding tests showed that an H_2SO_4 - H_2SO_4 hydrolysate of casein, after removal of the acids, would support growth, though not as well as either the original casein or a commercial enzymic casein digest.—C. Warner.

1608

DREZE, A., MOORE, S. and BIGWOOD, E. J. **On the desalting of solutions of amino acids by ion exchange.** *Anal. chim. Acta*, 1954, 11, 554-558. [Lab. Biochem., Fac. Med., Univ. Brussels.] French and German summaries.

Neutral and acidic amino-acids are adsorbed on a basic resin, Dowex 2, and eluted with acetic acid, and basic amino-acids on an acidic resin, Dowex 50, and eluted with HCl. At salt:amino-acid ratios of 1000:1 the recovery of amino-acids is quantitative.—H. G. Bray.

1609

BHATTACHARYA, S. N. **Spectrophotometric method for the estimation of amino acids with sensitized Schiff's reagent.** *Anal. chim. Acta*, 1954, 11, 559-562. [Univ. Coll. Sci. Technol., Calcutta.] French and German summaries.

The method depends on the removal of SO_2 from reduced Schiff's reagent by basic groups of amino-acids. The colour due to free fuchsin liberated is measured spectrophotometrically at $535 m\mu$.—H. G. Bray.

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1610

SULSER, H. and KESKIN, H. **Identifizierung von Aminosäuren und Prüfung auf Reinheit. 6. Mitteilung über Anwendung der Papierchromatographie auf lebensmittelchemische Probleme. [Identification of amino-acids and testing for purity. 6th Paper on the use of paper chromatography in problems of food chemistry.]** *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 295-304. [Lab. Eidg. Gesundheitsamt., Berne.] French and English summaries.

For other parts see Abst. 1566, Vol. 25.

The solvent mixture used is *n*-butanol: water (80:25.5:60) and the detecting reagent ethanolic ninhydrin (0.2 per cent.).—H. G. Bray.

1611

UNDERWOOD, J. C. and ROCKLAND, L. B. **Small-scale filter paper chromatography. Factors affecting the separation and sequence of amino acids.**

ROCKLAND, L. B. and UNDERWOOD, J. C. **A rapid two-dimensional procedure.** *Anal. Chem.*, 1954, 26, 1553-1557; 1557-1563. [Fruit and Veg. Chem. Lab., Agric. Res. Serv., U.S. Dept. Agric., Pasadena 5, Calif.]

The solvent systems used are *tert*-butanol: formic acid: water, followed by phenol: ammonia: water.—H. G. Bray.

1612

BECK, M. T. and ÉBREY, P. **Some remarks on the paper chromatography of amino acids. (Preliminary communication.)** *Acta chim. hung.*, 1954, 4, 231-233. [Inst. Inorg. Anal. Chem., Univ. Szeged.]

Interaction of amino-acids during chromatography is discussed. A suggested solution is to block or eliminate amino or carboxyl groups which are responsible for the interaction.—H. G. Bray.

1613

MÜTJING, D. **Über den Aminosäureaufbau der Eiweisskörper Gesunder und Kranker. Vergleichende chemische und buntchromatische Untersuchungen. [Amino-acid make-up of the proteins of healthy and sick individuals. Comparative chemical and multi-coloured chromatographic studies.]** *Ztschr. ges. inn. Med.*, 1954, 9, 638-641. [Med. Klin. Poliklin., Univ. Greifswald.]

A method is described in detail which involves a combination of chemical and chromatographic analysis, in which Na-1:2-napthoquinone-4-sulphonate is used in place of the usual ninhydrin. With this new reagent different bright colours were developed on the paper chromatogram, corresponding to the amino-acids contained in the

hydrolysates of the different proteins. Isopropyl alcohol and glacial acetic acid in water was used as solvent.—H. Chick.

1614

SISAKYAN, N. M., BEZINGER, E. N., GARKAVI, P. G. and KIVMAN, G. YA. [A simple method for separating amino-acids by partition chromatography on paper.] *Dokl. Akad. Nauk S.S.S.R.*, 1954, 96, 343.

1615

KISFALUDY, S. and BRAUN, P. Quantitative Bestimmung der Aminosäuren durch Papierchromatographie. [Quantitative estimation of amino-acids by paper chromatography.] *Ztschr. ges. inn. Med.*, 1954, 9, 699-704. [I. Med. Klin., Univ. Budapest.]

1616

SHOCKMAN, G. D., KOLB, J. J. and TOENNIES, G. Improved bacterimetric method for cystine. *Anal. Chem.*, 1954, 26, 1657. [Lankenau Hosp. Res. Inst., Philadelphia 11, Pa.]

A modification of the procedure of Riesen *et al.* (Abst. 3408, Vol. 18).—H. G. Bray.

1617

BRODSKIĬ, V. YA. and LIMARENKO, I. M. Oprede-
lenie tirozina i triptofana v rastvorakh belkov
i na srezakh tkani po izmenennym spektram
progloshcheniya v ultravioletovyykh luchakh.
[Estimation of tyrosine and tryptophan in
protein solutions and in tissue sections from
changes in the ultraviolet absorption spectra.]
Dokl. Akad. Nauk S.S.S.R., 1954, 95, 313-
314. [Mosk. Gosud. Univ.]

The ultraviolet absorption of a series of pure amino-acids was studied spectrophotometrically, first in alkaline solution and after reaction with 0.2 per cent. HNO_3 . Absorption curves are shown. Effects of reaction time, temperature and HNO_3 concentration were studied for tyrosine, tryptophan and phenylalanine, and similar studies were made on gelatine, histone and casein. The results are applied to the analysis of photomicrographs with light of different wavelengths of rabbit nerve cells.

D. W. Taylor.

1618

FERGUSON, W. S. and TERRY, R. A. The fractiona-
tion of the non-protein nitrogen of grassland
herbage. *J. Sci. Food Agric.*, 1954, 5, 515-
524. [Imperial Chemical Industries, Ltd.,
Jealott's Hill Res. Stat., Bracknell, Berks.]

The N.P.N. of samples of spring and autumn grass, white clover and alfalfa was analysed for amino-N after hydrolysis, ammonia N, amide N, nitrate N, choline N, betaine N and purine N,

amounting in all to from 77 to 88 per cent. of the N.P.N. The samples of herbage were extracted with boiling water and peptides and polysaccharides were precipitated with 75 per cent. alcohol. The filtrate was passed on to an ion exchange column after the removal of purines as their silver salts. After treatment with H_2S the purines were separated chromatographically, eluted from the paper and measured by ultraviolet absorption. Peptides were the main constituent of the N.P.N., which represented 23 to 30 per cent. of the total N in the sample.—D. M. Walker.

1619

OWEN, J. A., IGGO, B., SCANDRETT, F. J. and STEWART, C. P. The determination of creatinine in plasma or serum, and in urine; a critical examination. *Biochem. J.*, 1954, 58, 58, 426-437. [Dept. Clin. Chem., Univ. Edinburgh.]

The effect of different conditions on the estimation of creatinine by the Jaffé reaction was studied, including the effect of pH and the use of Lloyd's reagent and NC bacteria (*Corynebacterium urea-faciens*). The use of Lloyd's reagent with dilute urine or in conjunction with procedures which yield serum or plasma filtrates of pH less than 2.5 was found to be most satisfactory.—H. G. Bray.

1620

ŠEPAČEK, M. Simultaneous determination of kynu-
renine and p-phenetidine in human urine.
Canad. J. Biochem. Physiol., 1954, 32, 604-
609. [Dept. Health and Welfare, Charlotte-
town, Prince Edward Island.]

The urine is hydrolysed with NaOH, which converts kynurenine to o-aminoacetophenone and p-phenetidine conjugates into the free base. These are distilled off, extracted from the distillate by ether and estimated spectrophotometrically. It is stated that p-phenetidine is not infrequently found in human urine.—H. G. Bray.

1621

ELŐDI, P. Methode zur gleichzeitigen Bestim-
mung von Harnstoff und Zitruillin. [Method
for the simultaneous estimation of urea and
citrulline.] *Acta physiol. hung.*, 1954, 6, 225-
233. [Biochem. Inst., Ungarisch. Akad. Wiss-
ensch., Budapest.] Russian summary.

1622

BERGMANN, F. and DIKSTEIN, S. Studies on uric
acid and related compounds. 1. Quantitative
determination of uric acid in biological fluids.
J. Biol. Chem., 1954, 211, 149-153. [Dept.
Pharmacol., Hadassah Med. Sch., Hebrew
Univ., Jerusalem.]

See also Absts. 1556, 1766, 1900.

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Lipoid Constituents

- 1623
HARTMAN, L. Determination of fat peroxides in the presence of phospholipids. *J. Sci. Food Agric.*, 1954, **5**, 476-481. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]
- Peroxides are reduced with FeCl_2 in benzene-methanol solution and the ferric iron is estimated by the addition of pyrophosphoric acid and 2:6-dichlorophenolindophenol. A comparison of results obtained by this method and the ferric thiocyanate method of Hills and Thiel (Abst. 1363, Vol. 16) was made with ox and mutton fats, dried buttermilk and several meat and fish tissues. The interference of phospholipins was considerable in the thiocyanate method; the present method was found to be free from such interference.
G. A. Garton.
- 1624
HADORN, H. and JUNGKUNZ, R. Beitrag zum Nachweis von pflanzlichen Fetten und Ölen mittelst der Phytosterinacetatprobe. [Identification of plant fats and oils by the phytosterol acetate test.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, **45**, 389-396. [Lab. VSK, Basle.] French and English summaries.
- A procedure is described for detection of phytosterols; sterols in unsaponifiable material are precipitated with digitonin and converted to acetates, which are recrystallised from acetic anhydride. It is concluded that if the melting-point of the product is 117°C . or higher the original fat or oil was of plant origin.—H. G. Bray.
- 1625
CASSELMAN, W. G. B. Acetylated Sudan black B as a more specific histochemical reagent for lipides. *Quart. J. Microscop. Sci.*, 1954, **95**, 321-322. [Cytol. Lab., Dept. Zool., Univ. Museum, Oxford.]
- 1626
STEWART, R. D. A method for the estimation of glycerides in blood. *Canad. J. Biochem. Physiol.*, 1954, **32**, 679-683. [Dept. Biochem., Dalhousie Univ., Halifax, N.S.]
- The lipids are extracted from 0.1 ml. whole blood with ethanol-ether. The solution is filtered, the solvents are removed and the lipids are saponified with KOH. The liberated glycerol is then oxidised with periodic acid to yield formaldehyde, which is distilled into Na sulphite solution. Addition of a solution of chromotropic acid in dilute H_2SO_4 produces a violet colour, the density of which is measured in a spectrophotometer. A standard curve is prepared from tripalmitin; allowance is made for glycerol derived from phospholipins by a separate estimation of lipoid P on the assumption that it is derived from lecithin.
G. A. Garton.
- 1627
KRUTY, M., SEGUR, J. B. and MINER, C. S. (Jr.) The determination of monoglycerides and glycerin in mixtures. *J. Amer. Oil Chem. Soc.*, 1954, **31**, 466-469. [Miner Labs., Chicago, Ill.]
- 1628
BARNETT, A. J. G. and SMITH, D. K. Electrophoretic movement of higher fatty acids on filter paper. *Nature*, 1954, **174**, 659-660. [Div. Agric. Biochem., Dept. Biol. Chem., Univ. Aberdeen.]
- The electrophoretic movement of straight-chain fatty acids, C_{10} - C_{18} , on paper in a closed vessel was studied. The observed rates of movement, under 6 volts per cm., were 4.5, 1.5, 0.33, 0.07 and 0.0017 cm. per hr. for the acids C_{10} , C_{12} , C_{14} , C_{16} and C_{18} , respectively. Oleic, elaidic and stearic acids moved at similar rates and no separation was possible.
G. A. Garton.
- 1629
NARAYAN, K. A. and KULKARNI, B. S. Nomographs for calculating the fatty acid composition of oils and fats from iodine values and either extinction coefficients or thiocyanogen values. *J. Amer. Oil Chem. Soc.*, 1954, **31**, 137-142. [Dept. Chem. Technol., Osmania Univ., Hyderabad, India.]
- 1630
JONES, E. W. and MACLEAN, M. A. A method of calculating fatty acid composition from ester fractionation analysis. *J. Amer. Oil Chem. Soc.*, 1954, **31**, 473-475. [D.S.I.R., Wellington, N.Z.]
- 1631
KABARA, J. J. The light insensitivity of the Liebermann-Burchard reaction during spectrophotometric determination of cholesterol. *J. Lab. Clin. Med.*, 1954, **44**, 246-249. [Argonne Cancer Res. Hosp., Univ. Chicago, Ill.]
- No special precautions concerning exclusion of light are necessary unless measurements are made at wavelengths between 340 and 540 $\text{m}\mu$. The use of a spectrophotometer is therefore indicated.
H. G. Bray.
- 1632
KNOBIL, E., HAGNEY, M. G., WILDER, E. J. and BRIGGS, F. N. Simplified method for determination of total adrenal cholesterol. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 48-50. [Dept. Physiol., Harvard Med. Sch., Boston, Mass.] See also Abst. 1599.

Other Organic Constituents

- 1633
KEUP, W. Eine quantitative Mikromethode zur Bestimmung von Phenylbrenztraubensäure. [Quantitative micro-method for estimating phenylpyruvic acid.] *Biochem. Ztschr.*, 1954, 326, 14-17. [Med. Klin., Univ. Zürich.]
- Phenylpyruvic acid is separated chromatographically with a 1 : 1 mixture of acetic acid and water and after elution is estimated in terms of the green colour given with ferric chloride.
- H. G. Bray.
- 1634
LADD, J. N. and NOSSAL, P. M. The chromatographic separation and identification of organic acids and their application to yeast. *Austral. J. Exp. Biol. Med. Sci.*, 1954, 32, 523-531. [Dept. Biochem., Univ. Adelaide.]
- 1635
BONDY, P. K. and MARABEL, C. (JR.) The interfering effects of *p*-amino hippurate and similar compounds on the estimation of ketone bodies by the 2, 4-dinitrophenylhydrazon technique. *J. Lab. Clin. Med.*, 1954, 44, 312-313. [Dept. Int. Med., Sch. Med., Yale Univ., New Haven, Conn.]
- 1636
BRIL, C. Enzymic micro-determination of succinate and fumarate in tissue homogenates. *Biochem. biophys. Acta*, 1954, 15, 258-262. [Lab. Physiol. Chem., Univ. Utrecht.] French and German summaries.
- 1637
WIERZCHOWSKI, Z. O nowych metodach oznaczania alkaloidów w łubinach pastewnych. 2. Mikrometody kolorymetryczne i wagowe. [New methods for the estimation of alkaloid content in fodder lupins. 2. Gravimetric and colorimetric micromethods.] *Roczn. Nauk rol.* [B], 1954, 67, 389-409. [Inst. Zootech., Dział Zwywnia Zwierząt, Oddział Paszoznawstwa.] Russian and English summaries.
- For part 1 see Abst. 121, Vol. 25.
- Both methods are based on the precipitation of the alkaloids from aqueous solutions as reineckates. In the colorimetric method the purple colour of these salts in acetone solution is used; in the gravimetric method the reineckate is dried and weighed and a factor, appropriate to the colour of the lupin and to the amount of alkaloid being measured, is applied. (From English summary.)—D. Harvey.
- 1638
BIGGERS, J. D. and CURNOW, D. H. Oestrogenic activity of subterranean clover. 1. The oestrogenic activity of genistein. 2. The isolation of genistein from subterranean clover and methods of quantitative estimation. *Biochem. J.*, 1954, 58, 278-282; 283-287. [Dept. Vet. Physiol., Univ. Sydney.]
1. The oestrogenic activity of genistein (5 : 7 : 4'-trihydroxyisoflavone) prepared synthetically or from clover (see part 2) was estimated with ovariectomised mice by the Allen Doisy vaginal cornification test. Subcutaneous injection of solutions of genistein in propylene glycol and groundnut oil showed potencies relative to oestradiol-3 : 17 β of 1.25 \times 10⁻⁵ and 4.53 \times 10⁻⁵.
2. In a series of steps involving ethanol extraction, the removal of chlorophyll and fats by benzene, ether extraction and chromatography of the resulting phenols on silica gel, a crystalline sample of genistein with a melting-point similar to that of the synthetic substance was obtained from fresh subterranean clover. The yield was equivalent to 369 mg. genistein per 100 g. dry matter.
- A reasonably accurate macro-method for the estimation of genistein in clover was evolved by calculation from the absorption spectrum of the crude phenolic mixture. A rough micro-estimation of genistein by visual comparison of the spots after paper chromatography was possible.
- The 4 varieties of subterranean clover studied contained large amounts of genistein, but other clovers contained none. Genistein, though a relatively feeble oestrogen, is possibly responsible for infertility in sheep grazing on subterranean clover.
- A. Hepburn.
- 1639
CHENG, E., YODER, L., STORY, C. D. and BURROUGHS, W. Estrogenic activity of some isoflavone derivatives. *Science*, 1954, 120, 575-576. [Iowa Agric. Exp. Stat., Ames.]
- The oestrogenic activity of 4 synthetic isoflavone derivatives, genistein (5 : 7 : 4'-trihydroxy-), daidzein (5 : 4'-dihydroxy-), biochanin A (5 : 7-dihydroxy : 4'-methoxy-) and formononetin (5-hydroxy : 4'-methoxy-) was estimated by uterine response in mice. Daidzein appeared to be the most active, genistein and biochanin A of approximately equal activity next and formononetin with only one free hydroxyl group was the least active.
- Biochanin A has been isolated from red clover, genistein from subterranean clover and the glucoside of daidzein from soya bean oilmeal. Oestrogenic activity in livestock feeds is probably due to isoflavone compounds and may be beneficial by stimulating weight gain (Title 5434, Vol. 24) or adverse when present in excess as in subterranean clover.—A. Hepburn.
- 1640
REINEKE, E. P. The thyroxine content of thyroactive iodinated proteins as determined by a

radioactive isotope dilution technique. *J. Dairy Sci.*, 1954, **37**, 1227-1232. [Dept. Physiol., Michigan State Coll., East Lansing.]

Inorganic Constituents

1641

GEE, A., DOMINGUES, L. P. and DEITZ, V. R. Determination of inorganic constituents in sucrose solutions. *Anal. Chem.*, 1954, **26**, 1487-1491. [Nat. Bur. Standards, Washington 25, D.C.]

Flame photometry is used for K, Na, Ca and Mg, or ethylenediamine tetra-acetic acid for Ca and Mg. Chloride is estimated by conductometric titration, sulphate by a barium sulphate turbidimetric method, and silicate and phosphate by a molybdenum blue procedure.—H. G. Bray.

1642

BAUMANN, R. and HERRMANN, R. Erfahrungen mit der Mikromethode bei fortlaufenden Bestimmungen von Natrium, Kalium und Calcium im Serum der lebenden Ratte. [Experiments with the micromethod in continuous estimation of sodium, potassium and calcium in the serum of the live rat.] *Ztschr. ges. exp. Med.*, 1954, **124**, 404-406. [Hautklin., Akad. Med. Forsch., Justus-Liebig-Hochsch., Giessen.]

A flame photometer technique previously described by the authors (Abst. 1310, Vol. 23); Title 1543, Vol. 24) was used.—H. G. Bray.

1643

VAN ASPEREN, K. and VAN ESCH, I. A simple microtitration method for the determination of calcium and magnesium in the haemolymph of insects. *Nature*, 1954, **174**, 927. [Lab. Res. Biocides, Nat. Counc. Agric. Res. T.N.O., Vondellaan 6, Utrecht.]

1644

DENT, E. D. (Jr.), WASELL, A. R. and SYEC, F. J. Effect of dextran on the Volhard chloride determination. *J. Amer. Med. Assoc.*, 1954, **156**, 123-124. [Dept. Pathol., Clin. Chem. Sect., U.S. Pub. Health Serv. Hosp., Baltimore, Md.]

1645

COPPENET, M., DUCET, G., CALVEZ, J. and BATS, J. Microdosage colorimétrique du cuivre dans les végétaux par la 2-2' diquinoléine. [Colorimetric micro-estimation of copper in plants by 2:2'-diquinoline.] *Ann. agronom.*, 1954, **5**, 597-600.

The formation of a pink complex between Cu⁺ and 2:2'-diquinoline in organic solvents is the basis of this method. Hydroxylamine hydrochloride was used to reduce Cu²⁺ to Cu⁺.

A dried sample of plant material was treated with a mixture of perchloric and nitric acids and the resulting solution was neutralised with KOH. Sodium tartrate, hydroxylamine hydrochloride and isoamyl alcohol containing 2:2'-diquinoline were added, the mixture was thoroughly shaken, and after centrifuging the alcohol layer was removed and Cu was estimated colorimetrically. Fe, Mn and Zn in concentrations 10 to 20 times that of Cu did not interfere with the estimation.

A. Hepburn.

1646

GOMES, C. L., COUTINHO, A. R. and GOMES, M. L. L. Fluor em manteiga. Um problema sanitário. [Fluorine in butter: a health problem.] *Mem. Inst. Ezequiel Dias*, 1954, **5**, 41-54. [Belo Horizonte, Minas Gerais, Brazil.] English summary.

The possible dangers of NaF added as a preservative to butter are discussed. A qualitative test based on the method of Villavecchia ("Química Analítica Aplicada", 3. ed. castelhana, 1949) did not detect quantities lower than 10 mg. NaF per 100 g. butter. By a modification of the A.O.A.C. method of estimating fluoride estimation of 0.1 mg. was possible, and this method was found suitable for routine examination of butter samples.

A. M. Copping.

1647

GERRITSMA, K. W. and FREDERIKS, J. C. De bepaling van fluor in anorganische fosfaten. [The estimation of fluorine in inorganic phosphates.] *Chem. Weekblad*, 1954, **50**, 356-358. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.]

Phosphates are so much used in the food and feedingstuffs industry that it is important to be able to estimate F reliably. The F is distilled off as silicofluoric acid and estimated colorimetrically with a zirconium alizarin lake, the preparation of which is described. HCl interferes but is eliminated by careful neutralisation with NaOH, with phenolphthalein as indicator. The distillation flask must be cleaned regularly with strong warm alkali because a deposit of amorphous silica interferes with the distillation.—I. Leitch.

1648

ARMSTRONG, W. D. and SINGER, L. Determination of fluoride by diffusion of hydrogen fluoride. *J. Dent. Res.*, 1954, **33**, 646. *Proc.* [Dept. Physiol. Chem., Univ. Minnesota, Minneapolis.]

1649

KLEIN, E. Eine einfache Methode zur Bestimmung des anorganischen Blutjodes. [Simple

method of estimating inorganic iodine in blood.]

Biochem. Ztschr., 1954, **326**, 9-13. [Krankenhaus Stuttgart, Bad Cannstatt.]

The method depends on catalysis by iodide of the decolourisation of ceric sulphate by arsenious acid. After precipitation of proteins with trichloroacetic acid the serum is treated with an arsenious acid reagent at 37° C. and then with ceric sulphate, and the colour remaining is measured photometrically.

H. G. Bray.

1650

ZIEVE, L., DAHLE, M. and SCHULTZ, A. L. **Comparison of incineration and chloric acid methods for determination of chemical protein-bound iodine.** *J. Lab. Clin. Med.*, 1954, **44**, 374-377. [Dept. Med., Veterans Admin. Hosp., Minneapolis, Minn.]

A chloric acid method of digesting serum was compared with the incineration method of Barker *et al.* (Abst. 100, Vol. 21) in the estimation of protein-bound iodine. Serum samples were obtained from 14 myxoedematous, 22 hyperthyroid and 50 euthyroid patients and the protein-bound I of individual samples was estimated by both methods. Frequency distributions of the values obtained by each of the methods were compared. There was no significant difference between the methods in the hypo- or hyperthyroid group but the distribution in the euthyroid group was shifted upwards by from 1 to 1.5 µg. per cent. with the chloric acid method. Since the hyperthyroid values obtained by the chloric acid method were not shifted upward in a corresponding way, any advantage in time and simplification gained by the chloric acid method was offset by loss of discrimination between the higher euthyroid values and the lower hyperthyroid values. There was an overlap between the 8 and 11 µg. per cent. levels.

B. W. Simpson.

1651

SCOTT, K. G. and REILLY, W. A. **Use of anionic exchange resin for the determination of protein-bound ¹³¹I in human plasma.** *Metabolism*, 1954, **3**, 506-509. [Radioisotope Unit, Veterans Admin. Hosp., Fort Miley, Calif.]

Iodide is removed from plasma by means of the resin Dowex 2 × 10 and protein-bound ¹³¹I is estimated in the residue.—H. G. Bray.

1652

FERRITT, D. J., MILNER, G. W. C. and SMALES, A. A. **The determination of lead in cocoa with a square-wave polarograph.** *Analyst*, 1954, **79**, 731-734. [Anal. Chem. Group, Atomic Energy Res. Establishment, Harwell, Berks.]

1653

NYLANDER, A. L. and HOLMQUIST, C. E. **Polarographic determination of lead in blood.** *Arch. Indust. Hyg.*, 1954, **10**, 183-191. [Dept. Indust. Hyg., Nat. Inst. Pub. Health, Tomtebodan, Sweden.]

1654

KAILA, A. **Iron as a disturbing factor in the determination of phosphate by the molybdenum blue method.** *Maataloust. Aikakausk.*, 1954, **26**, 159-168. [Dept. Agric. Chem., Univ. Helsinki.] Finnish summary.

Interference by ferric iron can be minimised by the choice of acid and molybdate concentrations and the amount of stannous chloride. The "fading" effect of ferrous iron can be reduced by the use of HCl instead of H₂SO₄ or of a mixture of the 2 acids.—H. G. Bray.

1655

HARRIS, W. D. and POPAT, P. **Determination of the phosphorus content of lipids.** *J. Amer. Oil Chem. Soc.*, 1954, **31**, 124-127. [Texas Eng. Stat., Texas Agric. and Mech. Coll. System, College Station.]

Colorimetric methods for estimating organically bound P are reviewed and discussed. In an attempt to combine the advantages of perchloric acid for combustion of the sample with a suitable reducing agent for the phosphoric-molybdic acid complex several photographic developers were tested. The use of metol (*p*-methylanilinophenol sulphate) is recommended and a method employing it is described in detail.—G. A. Garton.

1656

GERRITSMA, K. W. and WILLEMS, J. **Snelle bepaling van natriumchloride i voedingsmiddelen die eiwit bevatten. 2. [Rapid estimation of the salt content of protein-containing foodstuffs. 2.]** *Chem. Weekblad*, 1954, **50**, 271-272. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.]

In the method previously described (Abst. 4664, Vol. 20) 200 ml. ethanol with amyl alcohol to prevent foaming is replaced by 3 ml. amyl alcohol.

I. Leitch.

1657

VANATTA, J. C. and COX, C. C. **Quantitative determination of serum sodium involving separation of cations on a resin column.** *J. Biol. Chem.*, 1954, **210**, 719-732. [Dept. Physiol., Southwestern Med. Sch. Univ. Texas, Dallas.]

One ml. of serum was applied to a cation exchange resin column in the Ba form and eluted with 0.05 M BaCl₂. The first 40 ml. containing the serum proteins was discarded. The next fraction

N.A. and R., April 1955

of 82.5 ml. was heated to 100° C., the Ba was precipitated as BaSO₄ over a 60 ± 1 sec. interval and removed by centrifuging, and an aliquot of the supernatant was run through an anion exchange resin column in the hydroxide form; the NaCl was converted to NaOH and estimated by titration. When corrections were made for the adsorption of Na on the BaSO₄ precipitate and a blank for the anion exchange column, good reproducible results were obtained, which differed within 1 per cent. when compared with the method of Butler and Tuthill (Title, p. 404, Vol. 1).—A. Hepburn.

Enzyme Activity

1658

FRIEDMAN, H. S. The use of glycogen as a substrate for the determination of serum amylase. *J. Lab. Clin. Med.*, 1954, 44, 308-311. [Municip. Hosp., Tampa, Fla.]

1659

MARSH, C. A. A glucuronide - decomposing enzyme from rumen micro-organisms. 2. Purification and kinetics. *Biochem. J.*, 1954, 58, 609-617. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The intracellular glucuronide-decomposing enzyme preparation isolated from a mixture of rumen organisms by Karunairatnam and Levvy (Abst. 3097, Vol. 21) was prepared on a larger scale and partly purified by repeated fractionation with (NH₄)₂SO₄ to give a colourless fluid with an activity 400 times that of strained rumen liquor.

A. Hepburn.

1660

GOLDMAN, M. L., BURTON, T. H. and RAYMAN, M. M. Use of finely emulsified fats for the determination of lipase activity. *Food Res.*, 1954, 19, 503-514. [Quartermaster Food and Container Inst. Armed Forces, Chicago 9, Ill.]

A titration procedure using emulsions of particle diameter less than 0.5 μ . is described and used to investigate the stability and optimum pH of lipase and some aspects of its kinetics. The degree of lipolysis was found to be about the same for all finely emulsified fats studied, irrespective of their chemical nature.—H. G. Bray.

1661

BOCK, J. Method for quantitative determination of pepsin in gastric juice. *Scand. J. Clin. Lab. Invest.*, 1954, 6, 237-244. [Dept. Pharmacol., Univ. Copenhagen.]

1662

BOROUGHES, H. Separation of phosphatase activity from the bulk protein of leaves. *Arch. Biochem. Biophys.*, 1954, 53, 94-98. [Kerckhoff Labs. Biol., California Inst. Technol., Pasadena.]

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1663

KIND, P. R. N. and KING, E. J. Estimation of plasma phosphatase by determination of hydrolysed phenol with amino-antipyrine. *J. Clin. Pathol.*, 1954, 7, 322-326. [Postgrad. Med. Sch., London.]

1664

VAN KOETSVELD, E. E. The determination of the alkaline serum phosphatase activity with barium-*p*-nitro-phenylphosphate as a substrate. *Acta physiol. pharmacol. neerl.*, 1951-1952, 2, 276-279. [Netherlands Inst. Nutrit., Amsterdam.] French and German summaries.

Miscellaneous

1665

ERÄNKÖ, O. A simple apparatus for freeze-drying of animal tissues. *Acta pathol. microbiol. scand.*, 1954, 35, 426-432. [Dept. Physiol., Inst. Occupat. Health, Työterveyslaitos, Helsinki.]

1666

WARREN, F. S. and DIMMOCK, F. A comparison of moisture determination methods for grain corn. *Canad. J. Agric. Sci.*, 1954, 34, 435-443. [Forage Crops Div., Central Exp. Farm, Ottawa.]

The moisture content of 122 samples of hybrid maize, ranging from 21.6 to 44.2 per cent., was estimated over a period of 4 years by the Brown Duvel oil distillation tester, electrical tester and ear shrinkage methods. The standard error for the electrical tester and ear shrinkage methods in comparison with the Brown Duvel method, an official and accurate method but unsuitable for large numbers of samples, ranged from 0.83 to 2.52 and from 1.67 to 3.17 percentage units of moisture. The electrical tester method was rapid and sufficiently accurate for general experimental work. The ear shrinkage method, although quite convenient, was less reliable.—A. Hepburn.

1667

LINCOLN, H. W., DIRKS, B. M. and HARREL, C. G. A method for the rapid determination of moisture in doughs and breads. *Cereal Chem.*, 1954, 31, 506-513. [Res. and Development Labs., Pillsbury Mills, Inc., Minneapolis, Minn.]

A sample of dough or bread is pressed between 2 tared filter papers, then rapidly dried between 2 infrared lamps while suspended from one arm of a projection reading balance. The procedure takes 10 min. or less. The data for moisture content agreed well with methods using a regular air oven or vacuum oven. The standard error of a single estimation was for doughs 0.45 and for bread 0.09 per cent. moisture.—A. Hepburn.

- 1668
KOTTÁSZ, J. Bestimmung des Trockengehaltes von Speiseeisorten durch Anwendung von infraroten Strahlen. [Estimation of the dry matter of ice-cream with infrared rays.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 331-333. [Städt. Anst. Chem., Budapest.] French and English summaries.
- 1669
MACKINNEY, G. and CHICHESTER, C. O. The color problem in foods. *Advances in Food Res.*, 1954, 5, 301-351. [Dept. Food Technol., Univ. California, Berkeley.]
- 1670
HADORN, H. Vergleichende Untersuchungen an Kindernährmitteln. [Comparative studies of infant foods.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 402-411. [Lab. VSK, Basle.] French and English summaries.
- Methods previously used (Abst. 1611, Vol. 24) were tested in 4 laboratories on 3 infant foods, of which one was dextrinised and contained no vegetables and another was not dextrinised but contained vegetables, and were found satisfactory except that milk solids-not-fat could not be obtained from the estimation of casein, since dextrinised starch interfered with the precipitation of casein by uranyl acetate or phosphotungstic acid.—W. M. Deans.
- 1671
KRAŠNOZHEN, E., GENGRINOVICH, A., MATERANSKYA, N., NECHAEV, M. and KULAGINA, N. [New and improved methods for the analysis of milk and dairy products.] *Mol. Prom.*, 1954, 15, No. 6, 28.
- 1672
IVÁDY, J. and KOLTAY, M. Two simple flocculation tests to demonstrate adulterations of mother-milk. *Gyermekgyógyászat*, 1953, 9. [Dept. Paediat., Univ. Szeged, Hungary.]
Tests for detecting addition of cow's milk to breast milk.
- 1673
HARNS, V. J., SAUTER, E. A., McLAREN, B. A. and STADELMAN, W. J. A comparison of several methods for evaluation of quality in eggs. *Poultry Sci.*, 1954, 33, 1022-1028. [Dept. Home Econ., Washington Agric. Exp. Stat., Pullman.]
- 1674
FRÖLICH, A. Reaction between phthalein dyes and heated foodstuffs. *Nature*, 1954, 174, 879. [Nat. Animal Exp. Stat., Upsala 7.]
- The tentative method for the estimation of the quality of soya bean meal (see Abst. 3961, Vol. 24) has been examined further. The disadvantage of the instability of phenolphthalein when made alkaline in the presence of soya bean oil can be avoided by using cresol red. Preliminary data show that the amount, in mg. per g. meal, of this dye which is absorbed ranges from 2.5 to 3.0 for much underheated and from 4.4 to 4.5 for over-heated samples.—D. Harvey.
- 1675
HÖGL, O. and WENGER, F. Antioxydantien in Fetten und Ölen. 1. [Anti-oxidants in fats and oils. 1.] WENGER, F. 2. Prüfung von Fetten und Ölen mit dem Swift-Stabilitätstest auf Antioxydantien. [2. Testing fats and oils for anti-oxidants by the Swift stability test.] 3. Einfache Nachweisemethoden für Antioxydantien. [3. Simple methods for detecting anti-oxidants.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 335-363; 364-383; 383-388. [Lab. Eidg. Gesundheitsamt., Berne.] French and English summaries.
1. The mechanism of auto-oxidation, methods for estimating the stability of fats and oils, the mode of action of anti-oxidants, anti-oxidants permitted in different countries, and their possible harmful effects are reviewed, with references.
2. A detailed description, with illustrations, is given of apparatus for the Swift stability test, and of the use of the test to detect addition of anti-oxidants to fats. This is possible for animal fats but not where anti-oxidants have been added to inferior or badly handled vegetable fats in the attempt to pass them off as first-class products. Modified working conditions, 115°C. in a current of oxygen of 2.33 ml. per sec., are recommended.
3. Three rapid colour reactions with alcoholic solutions of the fat or oil are claimed to be more sensitive and reliable than the silver nitrate test. Gallates, nordihydroguaiaric acid and guaiac resin, but not thiodipropionic acid or butylhydroxyanisole, are detected with Fe thiocyanate, butylhydroxyanisole by the indophenol reaction with 2 : 6-dichloroquinonechloroimide, and gallates with ammonia, in amounts of 0.05 per cent. or less.
W. M. Deans.
- 1676
AXELSSON, J. Die Modernisierung der Futtermittelbewertung. [Modern methods of evaluating feedingstuffs.] *Wiss. Abh. Deutsch. Akad. Landwirtschaftswiss. Berlin*, 1954, 5, 71-90. [Landwirtsch. Hochschule, Upsala.]
A review concluding with a resumé of the author's system based on metabolisable energy (Abst. 4014, Vol. 23).—W. M. Deans.

1677

- HOMB, T. En kritisk vurdering av förmiddelanalyser. [A critical survey of analysis of feeding-stuffs.] *Tidsskr. norske Landbruk*, 1954, 61, 259-274.

The review is partly historical, from the first beginnings of Henneberg and Stohmann at the Weende Experiment Station in 1860, and partly concerned with the choice of a method from the plethora of modern proposals. It deals with dry matter (or water), ash, crude protein (according to Kjeldahl), true protein, crude fat, crude fibre and N-free extract. The conclusions for conventional analyses are: until a standard method for water can be agreed, the method used should be stated; there is no reason at present to depart from the conventional "ether extract"; precautions to be taken in the estimation of total N and protein N are outlined; the Weende method for crude fibre is still of value though its original interpretation is not upheld, and recent progress extends the description of a feedingstuff without displacing "crude fibre".—I. Leitch.

1678

- BRATZLER, J. W., COWAN, R. L., KECK, E. and SWIFT, R. W. Measurement of nutrient losses from grass silage. *J. Animal Sci.*, 1954, 13, 1006. *Proc.* [Pennsylvania State Univ.]

1679

- NEVENS, W. B., HARSHBARGER, K. E., TOUCHBERRY, R. W. and DUNCAN, G. H. The ear and leaf-stalk contents of corn forage as factors in silage evaluation. *J. Dairy Sci.*, 1954, 37, 1088-1093. [Dept. Agronom., Illinois Agric. Exp. Stat., Urbana.]

Dry matter (D.M.) was estimated during 5 successive seasons in the ear and leaf stalk of maize at different stages all suitable for silage. Ear D.M. expressed as a percentage of total D.M. in the forage increased rapidly over short periods, e.g., from 11.4 to 48.4 in 25 days. A high positive correlation between ear D.M. and total D.M. enabled the ear content of maize forage, or of maize silage, in which there is little change in D.M., to be predicted. The remaining D.M., in the leaf stalk, remained almost constant. On the assumptions that a bushel of ear maize containing 15 per cent. moisture weighs 70 lb. and that stalks and leaves have 90 per cent. of the feeding value of non-legume hay, the marketable value of maize silage or forage was assessed from the D.M. content. A. Hepburn.

1680

- BICKOFF, E. M., LIVINGSTON, A. L., BAILEY, G. F. and THOMPSON, C. R. Xanthophyll determination in dehydrated alfalfa meal. *J. Assoc. Off. Agric. Chem.*, 1954, 37, 894-902. [Agric. Res. Serv., U.S. Dept. Agric., Albany 6, Calif.]

MICROBIOLOGICAL

See Absts. 2480, 2482.

CLINICAL AND EXPERIMENTAL

1681

- RÜMKE, C. L. De fouten bij de telling van bloedcellen in een telkamer. [Error in counting blood cells in a counting chamber.] *Nederland. Tijdschr. Geneesk.*, 1954, 98, 3480-3485. [Pharmacol. Lab., Rijks-Univ., Groningen.]

1682

- NOMOF, N., HOPPER, J. (JR.), BROWN, E., SCOTT, K. and WENNESLAND, R. Simultaneous determinations of the total volume of red blood cells by use of carbon monoxide and chromium⁵¹ in healthy and diseased human subjects. *J. Clin. Invest.*, 1954, 33, 1382-1387. [Dept. Med., Univ. California Sch. Med., San Francisco.]

1683

- HERRERA ORTECHO, E. A. Determinación del volumen sanguíneo en lactantes. 1. Metódica. [Estimation of blood volume in infants. 1.

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- Method.] *Rev. española Pediat.*, 1954, 10, 473-486. [Cat. Puericult. Pediat., Fac. Med., Lima.] French, English and German summaries.

A detailed description is given of the technique for estimating blood volume in infants with the dye Brilliant Vital Red. Some general observations on blood volume and its physiological variations are also made.—M. B. Richards.

1684

- FRIS-HANSEN, B. The extracellular fluid volume in infants and children. *Acta paediat.*, 1954, 43, 444-458. [Dept. Paediat., Rigshosp., Copenhagen.] French, German and Spanish summaries.

Extracellular fluid volume was estimated by the thiosulphate method of Cardozo and Edelman (*J. Clin. Invest.*, 1952, 31, 280) in 50 children from 1 day to 12 months old. A solution of sodium thiosulphate containing sodium phosphate was

infused intravenously and samples of capillary blood were taken at intervals. Thiosulphate disappears from the blood at a rate proportional to its blood concentration, and on a semi-logarithmic scale the disappearance curve formed a straight line after equilibration, usually in 15 to 20 min. As thiosulphate was excreted rapidly the theoretical concentration at zero time was obtained by extrapolation. From this, taking the plasma protein concentration into consideration, the concentration in plasma water, C_{pw} , was obtained. The extracellular water volume was calculated as $V \times C_s \times 200$, where V was the volume of thiosulphate infused and C_s the concentration of the thiosulphate standard.

Values expressed as a percentage of bodyweight diminished rapidly from 44.1 to 30.4 during the first 6 months of life and then more slowly to 19.6 up to 12 years old. When they were expressed as litres per sq. m. surface area of the body the fall was slight and was mostly during the first month. No difference was found between males and females. Duplicate estimations in 3 subjects differed by 0.4, 2.8 and 0.3 as a percentage of bodyweight.—A. Hepburn.

1685

MACAULAY, D. Dye space and thiocyanate space estimations in children. *Clin. Sci.*, 1954, **13**, 345-350. [Dept. Child. Health, Univ. Manchester.]

1686

NOEL, W. E., KING, E. R., BROWN, R. B. and BRADY, L. W. A comparison of the micro-technique and macrotechnique for blood volume determinations. *Surg. Gynecol. Obstet.*, 1954, **99**, 500-502. [Radioisotope Lab., U.S. Naval Hosp., Bethesda, Md.]

The techniques depend on the use of iodinated (^{131}I) human serum albumin and give comparable results.—H. G. Bray.

1687

KLEMENT, A. W. (Jr.), AYER, D. E. and MCINTYRE, D. R. Simultaneous use of I^{131} -albumin and Cr^{51} -labelled red cells in blood volume studies in the goat. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 81-85. [Army Chem. Centre, Md.]

1688

CURRY, W. A. The qualitative and quantitative analysis of bone "in vivo" by radiographic technique. *J. Dent. Res.*, 1954, **33**, 656. *Proc.* [Tufts Coll. Dent. Sch., Boston, Mass.]

1689

SILVERMAN, I. Improved Vim-Silverman biopsy needle. *J. Amer. Med. Assoc.*, 1954, **155**, 1060-1061. [2726 Bedford Ave., Brooklyn, N.Y.]

1690

GREER, M. A. and SMITH, G. E. Method for increasing the accuracy of the radio iodine uptake as a test for thyroid function by the use of desiccated thyroid. *J. Clin. Endocrinol.*, 1954, **14**, 1374-1384. [Nat. Cancer Inst., Bethesda, Md.]

In patients with an iodine uptake by the thyroid which was borderline between the high normal and the hyperthyroid, administration of 180 or 540 mg. dried thyroid daily for 1 or 2 weeks reduced the I uptake to 20 per cent. or less of its initial value in euthyroid, but not in thyrotoxic, patients.

D. Duncan.

1691

MARGARIA, R., MESCHIA, G. and MARRO, F. Determination of O_2 consumption with Pauling oxygen meter. *J. Appl. Physiol.*, 1954, **6**, 776-780. [Physiol. Lab., Univ. Milan.]

This is an open circuit method. Partial pressures of oxygen in carbon-dioxide-free inspired and expired air are measured and oxygen consumption is obtained from nomograms. The sensitivity of the method is similar to that of the Benedict closed circuit method, and it is more rapid than conventional gas analysis.—H. G. Bray.

1692

CHINSKY, M. Evaluation of methods for determining basal metabolic rate in office practice. *J. Amer. Med. Assoc.*, 1954, **155**, 1055-1057. [Div. Med., Jewish Hosp., St. Louis, Mo.]

1693

BLAXTER, K. L., GRAHAM, N. M. and ROOK, J. A. F. Apparatus for the determination of the energy exchange of calves and of sheep. *J. Agric. Sci.*, 1954, **45**, 10-18. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

The construction of respiration chambers with open and closed circuits is described. The closed circuit apparatus presented more technical difficulties, but with animals weighing up to 75 kg. gave more satisfactory results than the open system. The closed circuit chamber has been used for as long as 16 days at a time. Its accuracy was assessed by simultaneous estimations of R.Q. from C and N balances and of the energy value of feed and excreta. Agreement between the results of the 2 methods was good. The precision of the apparatus was such that in 40 pairs of duplicate

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experiments 21 pairs of results differed by less than 2 per cent. and only 2 pairs by more than 8 per cent.—D. Duncan.

1694

KEŠNER, B. Metodiky výzkumu vlivu základních činitelů vzdušného prostředí na výměnu plynů telat a skotu. [Experimental methods on the effect of atmospheric elements on the gaseous exchange in calves and cows.] *Sborn. čsl. Akad. Zeměd.*, 1954, 27, 473-484. [Kat. Půdoznalství, Agrochem. Agrometeorol., Vys. Škol. Zeměd., Prague.] Russian and German summaries.

A mask is described for collection of expired gases from cattle, and apparatus for respiration experiments.—D. Duncan.

1695

DÖBELN, W. v. A simple bicycle ergometer. *J. Appl. Physiol.*, 1954, 7, 222-224. [Dept. Physiol., Kgl. Gymnast. Centralinst., Stockholm.]

1696

UTEKHIN, B. P. and BAKEEVA, E. N. K metodike izučeniya kishechnogo pishchevareniya u svinet. [A method of studying intestinal digestion in the pig.] *Fiziol. Zh. S.S.S.R. Sechenova*, 1954, 40, 235-236. [Inst. Svinovodstva, Poltava.]

The details of construction of trocar and cannulae and their insertion at operation are given. The method is stated to be an improvement on the Thiry Vella fistula for the study of intestinal physiology.—D. W. Taylor.

1697

LOYD, L. E. and McCAY, C. M. The use of chromic oxide in digestibility and balance studies with dogs. *J. Nutrition*, 1954, 53, 613-622. [Animal Nutrit. Lab., Cornell Univ., Ithaca, N.Y.]

The chromic oxide method is suitable for digestibility and balance trials with dogs. The apparent digestibility of crude protein and ether extract was greater in 4 dogs aged 8 years or more than in 4 aged 7 months.—D. Duncan.

1698

DAY, K. M. Source of error in determination of chromic oxide using perchloric-sulfuric acid digestion method. *Science*, 1954, 120, 717-718. [Dept. Agric. Chem., Washington State Coll., Pullman.]

Time, temperature and acidity of the digestion mixture are all critical. An optimum digestion time of 10 to 12 min. gave results with a standard

deviation of ± 0.02 per cent. in the range from 0.3 to 0.5 per cent. Cr_2O_3 . Rapid chilling and dilution of the solution at the end of the digestion period is effective in arresting the reduction of hexavalent chromium due to the formation of a small amount of H_2O_2 during the oxidation.

D. M. Walker.

1699

ANTHONY, W. B., MARTIN, C. M., STARLING, J. G., BROWN, L. and MAYTON, E. L. The applicability of the fecal chromogen technique in digestion studies with some southern-grown forages. *J. Animal Sci.*, 1954, 13, 1004. *Proc. [Alabama Polytech. Inst.]*

1700

MARTIN, C. M., ANTHONY, W. B. and STARLING, J. G. Field use of the chromic oxide and fecal chromogen techniques in evaluating pasture herbage with grazing animals. *J. Animal Sci.*, 1954, 13, 1010. *Proc. [Alabama Polytech. Inst.]*

1701

BRISSON, G. J., ANGUS, W. J. and SYLVESTRE, P. E. Plant pigments as internal indicators of digestibility of dry matter of pasture herbage. *Canad. J. Agric. Sci.*, 1954, 34, 528-532. [Chem. Div., Sci. Serv., Canada Dept. Agric., Ottawa.]

A comparison was made with steers and wethers between the digestibility of the dry matter of pasture herbage estimated by (1) the conventional total collection method, and (2) the chromogen marker technique. The herbage was dried artificially and 4 trials were made with herbage differing in age and quality. There was good agreement between digestibility coefficients estimated by the 2 methods. Optical densities of the pigment extracts were estimated at 10 wavelengths between 395 and 445 $\text{m}\mu$, of which 404 $\text{m}\mu$ gave best agreement with the total collecting technique in steers. With wethers the results from 406 $\text{m}\mu$, which were nearly 4 per cent. above those from 404 $\text{m}\mu$, were almost identical with those of the total collection method. The difference may be due to the higher chromogen content of the younger grass given to the sheep; also, there was probably some destruction of pigment during drying. The chromogen formula developed with data for steers by Reid *et al.* (Abst. 1622, Vol. 22) was applicable also to sheep.—D. M. Walker.

1702

MÜLLER, W. Die Brauchbarkeit von Indikatormethoden bei Verdauungsversuchen mit Geflügel. [The suitability of indicator methods in digestibility experiments with poultry.] *Thesis, Univ. Zürich*, 1953, pp. 89.

Digestibility experiments on fowls are much simplified by the use of indicator methods. By adding to the feed a known amount of an indigestible indicator, and estimating the amount of nutrient per g. indicator in the excrement, the digestibility coefficient can be found without any quantitative estimation of feed intake and excretion as in the standard method. Of the indicators tested Ba sulphate and lignin were regarded as unsuitable because of analytical difficulties, but chromic oxide gave satisfactory results after a pre-period of 5 days. Since the night and day excrements show a difference in chromic oxide content, it is essential that an aliquot portion of the 24-hr. excretion be taken for analysis. As a rule the method gives results somewhat below those obtained by the standard method, but the differences are small, especially for feedingstuffs of good digestibility.—M. B. Richards.

1703

TREADWELL, C. R. and ROE, J. H. (Jr.) **Technic for complete pancreatectomy in the rat.** *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 878-881. [Dept. Biochem., Sch. Med., George Washington Univ., Washington, D.C.]

1704

TVERSKOI, G. B. **Primenenie kanyuli dlya izucheniya deyatel'nosti molochnoi zhelezy v khronicheskikh opytkakh.** [Use of a cannula for the study of the activity of the mammary glands in chronic experiments.] *Fiziol. Zh. S.S.S.R. Sechenova*, 1954, **40**, 233-235. [Inst. Physiol. I.P. Pavlova, Akad. Nauk SSSR.]

A description of the construction and details of insertion at operation of a cannula for study of mammary gland activity.—D. W. Taylor.

1705

DAMJANOVIĆ, Z. M. and WALÉN, R. J. **A simple method of calibration of Warburg respirometers.** *Biochim. biophys. Acta*, 1954, **15**, 586-587. [Inst. Nuclear Sci. "Boris Kidrich", Lab. Biol., Belgrade.]

1706

RANDLES, C. A. (Jr.) **On the use of isotopic tracers in biochemical embryology.** *Poultry Sci.*, 1954, **33**, 1078. *Proc.* [Oak Ridge Inst. Nuclear Studies, Ohio State Univ., Columbus.]

1707

ARMITAGE, P. **Sequential tests in prophylactic and therapeutic trials.** *Quart. J. Med.*, 1954, **23**, 255-274. [Statist. Res. Unit Med. Res. Council, London Sch. Hyg. Trop. Med.]

In this paper the methods and applications of the classical fixed-sample-size test and the sequential

test in assessing the efficiency of prophylactic or therapeutic substances are discussed. The comparisons are made in detail in 2 types of test, (1) where the proportions of successes and failure are compared and, (2) where quantitative comparisons are to be made. One example of the application of the sequential procedure to each case is worked out in detail.

The sequential test will usually, though not always, be more efficient than the equivalent classical test, provided certain conditions are met. Among these are that the test should be "open" and not "closed". An "open" test is allowed to run until a conclusion is reached. A "closed" test is one where some specified number of observations is not to be exceeded. In the latter the classical test is more suitable. Another condition essential for the success of the sequential test is that there should be one criterion only by which the test substances are to be judged.

There is also a discussion on some of the sampling problems encountered in the sequential test.

A. W. Boyne.

1708

HOMMEYER, P. G. and PAULS, J. F. **Statistical analysis and techniques in chick nutrition experiments.** *Poultry Sci.*, 1954, **33**, 1060. *Proc.* [Iowa State Coll., Ames.]

1709

OSTLE, B. and TISCHER, R. G. **Statistical methods in food research.** *Advances in Food Res.*, 1954, **5**, 161-259. [Montana State Coll., Bozeman, Mont.]

1710

FERRARI, T. J. **The accuracy of yields of grassland and oats evaluated by eye estimates.** *Netherlands J. Agric. Sci.*, 1953, **1**, 88-96. [Agric. Exp. Stat., Groningen.]

1711

PAGOT, J., DERBAL, Z. and LAHORE, J. **Méthode pratique d'analyse floristique des pâturages tropicaux (première note).** [Practical method for the botanical analysis of tropical pastures (preliminary note).] *Rev. Élevage Méd. vét. Pays trop.*, 1954, **7**, 173-175. [Fed. Centre Res. Zootec., Sotuba, Sudan, A.O.F.]

Certain methods of pasture sampling are unsuited to tropical pastures or bushland with a rich flora with species varying greatly in size, or where there are denuded areas. For cleared bush or fallow land the footprint method is recommended; for more general use the method of squares, supplemented by studies of pasture yield; and for more extended areas the method of Boitel [no reference given].—W. M. Deans.

See also Absts. 2122, 2145, 2165, 2564, 2722, 2725, 2741.

N.A. and R., April 1955

COOKING, STERILISATION AND PRESERVATION OF FOOD

1712

- JIMÉNEZ DÍAZ, C. Influencia sobre el valor nutritivo de los alimentos de los procesos industriales de conservación y transformación. [Influence on the nutritive value of foods of industrial processes of preservation and transformation.] *Rev. clín. española*, 1954, **54**, 319-322.

A review.

1713

- SCHWEIGERT, B. S. Radiation in food processing. *J. Amer. Dietetic Assoc.*, 1954, **30**, 973-975. [Div. Biochem. Nutr., Amer. Meat Inst. Found., Chicago, Ill.]

1714

- CHAPPELL, G. M. Food waste and loss of weight in cooking. *Brit. J. Nutrition*, 1954, **8**, 325-340. [Dept. Household Arts, Queen Elizabeth Coll., Univ. London.]

A table is given of changes in weight of some 70 foods during cooking, expressed as a percentage of raw edible weight. At least a dozen samples of each item were examined but methods were not precisely standardised, since "the work was undertaken to show changes occurring in normal careful domestic cookery". Many of the ranges are wide, but on the whole the mean values tend to agree with those in the literature.

Another table gives the waste during careful preparation of a number of fruits and vegetables, eggs, prawns, plaice and sole, as a percentage of weight as purchased, with values from the literature. Inevitable waste is so high for many foods that avoidance of unnecessary waste is urgent.

The work was done between 1949 and 1952.

W. M. Deans.

1715

- MAYERHOFER, E. Die konservierte Frauenmilch und ihre Sammelstellen von 1907 bis heute. [Preservation of human milk and the collecting centres from 1907 till to-day.] *Öst. Ztschr. Kinderheilk.*, 1954, **10**, 127-140. [Medveščak 73, Zagreb.]

A historical sketch is given of 50 years' experience in the preservation and storage of excess human milk for use with weak and dangerously sick infants. The project first took form in 1907 when the author was attached to the Prague Kinderklinik, and was further developed and organised in Vienna from 1909 to 1914, in cooperation between the author at the Franz-Joseph Hospital and Dr. Příbram at the Vienna Serum Institute. The method was a modification of that of Budde; the milk, up to 100 litres daily, was treated with H_2O_2

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at 50° to 55° C. The technique for handling and for bacteriological control was like that customary for preparing therapeutic sera. It is claimed that denaturation is avoided and the natural biological properties of the milk are retained by the Budde method. The milk could be preserved liquid or dried *in vacuo*.

Descriptions are given of the subsequent organisation of human milk banks in Germany, the United States and Belgium, and by the author in Yugoslavia. Of the methods employed, the author commends, in addition to his own, freezing and addition of antibiotics. Sterilisation by prolonged heating up to 100° C. is condemned as damaging the natural properties of the milk.

Protest is made against any commercialisation of preserved human milk. Preservation should be organised in connection with a hospital and a reasonable fee should be charged, as is usual with blood required for transfusion.—H. Chick.

1716

- MAXCY, R. B. and SOMMER, H. H. Fat separation in evaporated milk. 3. Gravity separation and heat stability. *J. Dairy Sci.*, 1954, **37**, 1061-1070. [Dept. Dairy Food Indust., Univ. Wisconsin, Madison.]

1717

- DE, S. and RAY, S. C. Studies on the indigenous method of *Chhana*-making. 1. The influence of the conditions of coagulation and the type of milk on the production of *Chhana*. *Indian J. Dairy Sci.*, 1954, **7**, 113-125. [Indian Dairy Res. Inst., Bangalore.]

1718

- WEISBERG, S. M. Recent progress in the manufacture and use of lactose: a review. *J. Dairy Sci.*, 1954, **37**, 1106-1115. [Nat. Dairy Res. Labs., Oakdale, Long Island, N.Y.]

1719

- WATTS, B. M. Oxidative rancidity and discoloration in meat. *Advances in Food Res.*, 1954, **5**, 1-52. [Dept. Food Nutr., Florida State Univ., Tallahassee.]

1720

- WANG, H., AUERBACH, E., BATES, V., DOTY, D. M. and KRAYBILL, H. R. A historical and histochemical study of beef dehydration. 4. Characteristics of muscle tissues dehydrated by freeze-drying techniques.

- AUERBACH, E., WANG, H., MAYNARD, N., DOTY, D. M. and KRAYBILL, H. R. 5. Some factors influencing the rehydration level of frozen-dried

muscle tissue. *Food Res.*, 1954, **19**, 543-556; 557-563. [Amer. Meat Inst. Found., Chicago, Ill.]

For part 2 see Abst. 2827, Vol. 24. [No reference to part 3.]

4. Slices of biceps femoris and semimembranosus muscles were frozen at -150° , -80° or -17° C. before being lyophilised at pressures between 0.001 and 0.3 mm. Hg. The rate of removal of water was uniform and faster than by warm air methods. On rehydration all samples took up moisture to between 85 and 90 per cent. of their original content and the diameters of muscle fibres returned to between 89 and 98 per cent. of their original size. Freeze-drying proceeded inward from the surface and partly lyophilised muscles contained an unaltered central core. Drying of such samples could be completed at temperatures of from 65° to 70° C. without much effect on the quality of the product when reconstituted. If such a two-stage method could be devised on a large scale there might be a considerable saving in cost compared with complete freeze-drying.

5. Conditions likely to affect the rehydration of frozen-dried muscle were investigated in samples of the same 2 muscles and in others of semitendinosus. Rehydration was faster and more complete in samples cut across the fibre than in those cut lengthwise. The temperature at which it took place, 22° or 55° C., affected neither the rate nor the extent of rehydration. With increasingly hypertonic solutions the extent of rehydration decreased; irrespective of its osmotic pressure a salt solution at pH about 7 gave the highest level. Samples rehydrated *in vacuo* took up moisture faster and to a greater extent than did those treated under ordinary pressure.—D. Harvey.

1721
LUTJEN, A. F. M. G. Changes in Dutch salted matjesherring during storage and spoilage. *Proc. Symposium on Cured and Frozen Fish Techn.* Swedish Inst. Food Preserv. Res., Gothenburg, November 1953, pp. 12.

Samples of matjesherring [immature herring] with salt content ranging from 4.8 to 13.5 per cent. were canned and stored at -5° , -2° , 0° and $+2^{\circ}$ C. and at intervals up to 600 days bacterial counts and organoleptic tests were made and pH, acidity and Lea peroxide number of fat, tyrosine by the Folin Ciocalteu reagent, ammonia and trimethylamine by micro-diffusion in Conway units, and volatile acids by the method of Friedemann and Brook (Title 37, Vol. 8; see also Abst. 4218, Vol. 17) were estimated.

Bacterial counts were not related to storage temperature, salt content or degree of spoilage. Formation of tyrosine, ammonia and trimethylamine was favoured by higher temperature and

lower salt content. Volatile acids were more sensitive to temperature than to salt content. Samples with 6.5 per cent. salt kept for 300 days at -5° or -2° C., those with 9.4 per cent. salt for 300 days at $+2^{\circ}$ C. and 600 days at 0° C. or below. The type of spoilage in lightly and heavily salted herring was different. It was concluded that neither tyrosine nor ammonia nor trimethylamine estimation is a satisfactory criterion of spoilage in matjesherring. Estimation of volatile acids was more promising, the limiting value being from 60 to 80 ml. 0.01 N NaOH per 100 g. fish, but is useless for herring delicacies prepared with acetic acid.—W. M. Deans.

1722
JONES, N. R. Factors affecting the free amino acid composition of fresh and iced skeletal muscle of North Sea codling (*Gadus callarias*). *Biochem. J.*, 1954, **58**, xlvii-xlviii. [D.S.I.R., Food Invest. Organiz., Torry Res. Stat., Aberdeen.]

1723
OLAFSSON, P. Chemical aspects of the brownish-yellow discoloration of salt cod. *J. Sci. Food Agric.*, 1954, **5**, 589-593. [Chem. Lab., Icelandic State Herringoil and Meal Factories, Siglufjörður.]

1724
SHAMMAS, E. and ADOLPH, W. H. Nutritive value of parboiled wheat used in the Near East. *J. Amer. Dietetic Assoc.*, 1954, **30**, 982-983. [Dept. Biochem., American Univ. Beirut, Lebanon.]

A description is given of the preparation of parboiled wheat in the Lebanon. The proximate composition and vitamin B₁, riboflavin and nicotinic acid contents of parboiled wheat and the wheat as harvested are tabulated. According to the text three-quarters of the riboflavin and one-quarter of the vitamin B₁ and nicotinic acid of wheat are lost in the process. [The tabulated values for nicotinic acid show no loss.] Tests with weanling rats showed that parboiled wheat as sole food for 30 days was equal in growth-promoting value and protein efficiency to the same quantity of whole wheat. Attention is drawn to the possibility of introducing parboiled wheat into the diet of rice-eating people in times of rice shortage and wheat surpluses.—F. C. Aitken.

1725
CUENDET, L. S., LARSON, E., NORRIS, C. G. and GEDDES, W. F. The influence of moisture content and other factors on the stability of wheat flours at 37.8° C. *Cereal Chem.*, 1954, **31**, 362-389. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

Different grades of white and whole wheat flour milled from a hard wheat mix, some of which had been treated with chlorine dioxide (ClO_2), were stored at 37-8°C. With whole wheat flour the effects on stability of treatment with anti-oxidants, of heat treatment and of storage at low oxygen tensions were investigated. After storage in sealed containers at moisture levels of 3, 6, 10 and 14 per cent, the flour samples were used for experimental baking, examination of the physical properties of the doughs and chemical investigation of hydrolytic and oxidative changes in the lipids.

The stability of the flour samples depended on their degree of refinement, treatment with ClO_2 and the moisture content of the stored product. The baking quality of unbleached short patent flour which had been stored for 38 weeks at 3 and 6 per cent. moisture content showed little change; at 10 and 14 per cent. moisture the loaf volume decreased greatly after storage of the flour for 38 and 10 weeks, respectively. Development of objectionable odours was promoted when the storage moisture was increased from 6 to 10 to 14 per cent.; bleaching shortened the storage time after which odour was noticeable. The development of free fatty acids increased with decreasing flour refinement; it was not affected by bleaching. Replacement of the bulk of the lipid material from whole wheat flour which had deteriorated by lipid from sound flour did not fully restore its baking quality. When treatment with ClO_2 was superimposed on natural ageing, "overtreatment" eventually resulted in a rapid falling off in baking quality; it is suggested that flours destined for prolonged periods of storage should not be treated with oxidising "improvers".—G. F. Garton.

1726

KENNEDY, B. M., FLETCHER, L. R. and SABISTON, A. R. Studies on the incorporation of nonfat milk solids in whole wheat bread. 1. Dough properties and baking tests. *Cereal Chem.*, 1954, **31**, 347-361. [Dept. Home Econ., Univ. California, Berkeley.]

Whole wheat bread containing up to 22 per cent. added non-fat milk solids was baked from 7 commercial flours and from 10 experimentally milled varieties of wheat. The commercial flours tolerated up to 22 per cent. of the milk solids without loss of volume; optimum volumes were obtained with from 6 to 22 per cent. milk solids, depending on the flour. Of the wheats studied, Baart and Turkey and Comanche gave increased volumes with all levels of milk solids up to 22 per cent. and Baart 38 and Wichita showed small increases with the 18 per cent. milk levels. Bunyip 41 and Pawnee showed volume increases with 6 and 12 per cent. milk. Mida and Thatcher tolerated 22 per cent.

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milk solids without loss of volume, but Ramona 44 gave decreased volumes with all levels of milk.

G. F. Garton.

1727

BOTHMA, F., WEIJERS, H. A. and VAN DE KAMER, J. H. Boekweitbrood ter vervanging van tarwebrood in het dieet van coeliakiepatiënten. [Buckwheat bread as a substitute for wheat bread in the diet of coeliac patients.] *Voeding*, 1954, **15**, 218-223. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.] English summary.

Three recipes and instructions are presented for the baking of buckwheat bread. Protein is supplied as dried whole milk with or without egg, and pH is adjusted with lactic or, in summer, acetic acid.—I. Leitch.

1728

KNYAGINICHEV, M. I., PLOTNIKOV, P. M., BOLKHOVITINA, Y. R., BAZOVSKAYA, K. G. and PROSKURINA, O. V. Soderzhanie kislot v rzhanom teste i khlebe, prigotovlennykh raznymi sposobami. [Acid content of rye bread prepared in different ways.] *Biokhimiya*, 1954, **19**, 96-99. [Leningrad Technol. Inst. Food Indust.]

The dough was fermented at 2 different temperatures, from 28° to 30° and from 34° to 36°C, the usual method being to ferment at the lower temperature. Fermentation at the higher temperature increased the amount of lactic acid in the dough and in the bread and diminished the amount of volatile acids. The amounts of the different acids in percentages of the total acidity of the bread were as follows: lactic acid about 60, volatile acids 32, succinic and malic acids together 4 and tartaric and citric acids together 4. The fermentation process took less time at the higher temperature and also there was less loss of dry matter.—H. Scherbatoff.

1729

PARIHAR, D. B. Free amino-acids in some Indian grown rice samples (*Oryza sativa* Linn.). *Naturwissenschaften*, 1954, **41**, 502. [Defense Sci. Lab., Hillside Rd., New Delhi.]

Water extracts of 8 varieties of rice, 4 raw and 4 parboiled, fresh or stored for 1, 2 or 3 years, were analysed by paper chromatography for amino-acids. The amino-acid pattern was similar in all samples. The proportions of alanine, threonine and glutamic acid and the amounts of lysine and histidine decreased with age. In parboiled rice, tryptophan, methionine, valine, alanine, threonine and glutamic acid were comparable with the amounts found in raw rice stored for the same period. Cystine was present in 3 samples of old rice, but not in fresh ones.—A. Hepburn.

1730

NARAYANA RAO, M., VISWANATHA, T., MATHUR, P. B., SWAMINATHAN, M. and SUBRAHMANYAN, V. **Effect of storage on the chemical composition of husked, undermilled and milled rice.** *J. Soc. Food Agric.*, 1954, **5**, 405-409. [Central Food Technol. Res. Inst., Mysore.]

Raw husked, raw undermilled, parboiled undermilled and raw milled rice were stored in gunny bags for 1 year.

The high amylase activity of freshly harvested rice decreased rapidly during storage; cooking quality, as measured by swelling capacity, also improved. Raw milled rice swelled more than raw undermilled or husked rice.

All the samples showed a loss of 20 to 30 per cent. of vitamin B₁ except parboiled undermilled rice, which had a considerably smaller loss. Total N and digestibility of the protein remained almost constant, but N soluble in 3 per cent. NaCl decreased, indicating denaturation.

At the end of storage a rancid odour was noticeable in the husked and parboiled undermilled samples, which were unacceptable to taste. Fat acidity and peroxide values were regularly estimated and were very low for the raw milled rice. On the assumption that rice samples with a peroxide value of 40 were likely to be unacceptable, the storage life in months was computed graphically to be as follows: raw husked rice 7, raw undermilled rice 12, parboiled undermilled rice 11, and raw milled rice 13.—A. Hepburn.

1731

JAGOE, R. B. **An experiment in the storage of under-milled rice.** *Malayan Agric. J.*, 1954, **37**, 154-168.

Sacks of undermilled rice were stored in 3 different rooms, one well ventilated, another not so well ventilated, with fine gauze on the windows and doors, and the third sealed as completely as possible.

Rice in the ventilated rooms kept well for 5 months and then gradually deteriorated in the best ventilated room but in the other room with a lower average relative humidity remained almost unchanged and was in good condition after 20 months. Rice in the sealed room with the highest average temperature and ultimately the highest relative humidity deteriorated most rapidly. Insect pests appeared in all rooms. The higher fat content of undermilled rice as compared with highly milled rice was largely offset by the decomposition of fat on storage, this being least in the rice that kept best. Experiments with rats showed that rice from the sealed room lost about half its vitamin B₁ but rice from the ventilated rooms suffered only slight loss.—A. Hepburn.

1732

HOUSTON, D. F., HUNTER, I. R., McCOMB, E. A. and KESTER, E. B. **Deteriorative changes in the oil fraction of stored parboiled rice.** *J. Agric. Food Chem.*, 1954, **2**, 1185-1190. [Agric. Res. Serv., U.S. Dept. Agric., Albany 6, Calif.]

Three samples of rice, 2 of short-grain Pearl and 1 of long-grain Century Patna, were kept under conditions of open or sealed storage in darkness or in light. Estimations were made of peroxides and of monocarbonyl compounds, mainly aldehydes, and of the free acidity.

In darkness with open storage at 77° F., after an induction period of nearly 200 days each value rose rapidly and rancid odours appeared. Aldehydes and peroxides later fell and the odours disappeared. At higher temperatures, 100° and 140° F., the changes were similar but they happened earlier, at about 100 and 20 days, respectively. With sealed storage induction periods were longer and the odour suggested fermentation, the free acidity curve being flatter than with open storage. Light reduced storage life especially of Pearl rice; this difference is being examined further.

D. Harvey.

1733

RAYMOND, W. D., SQUIRES, J. A. and WARD, J. B. **The milling of sorghum in Nigeria.** *Colonial Plant Animal Prod.*, 1954, **4**, 152-155.

Experiments were made in milling white and yellow sorghum on a laboratory scale and in a pilot plant which was a modification of the "Maxima" mill commonly used in Commonwealth territories. Analytical data for the two commercial flours, respectively, were vitamin B₁ 2.35 and 2.0, nicotinic acid 31.5 and 33, riboflavin 0.85 and 1.0 µg. per g., total P 218 and 189, phytin 34.6 and 27.7 mg. and crude protein 7.7 and 6.9 g. per 100 g. For the middlings from white sorghum, of which the yield was 12.2 per cent., the corresponding data were 5.4, 77.4 and 1.5 µg. per g., 350 and 30.4 mg. and 10.9 g. per 100 g.

Tests of acceptability to West Africans were made. Both the flours and especially the middlings were popular for cooking by native methods. When baked in a mixture with wheat flour, sorghum flour diminished loaf volume but did not adversely affect flavour.—D. Harvey.

1734

LEE, F. A. **Chemical changes taking place in the crude lipids during the storage of frozen raw vegetables.** *Food Res.*, 1954, **19**, 515-520. [New York State Agric. Exp. Stat., Cornell Univ., Geneva.]

Samples of unblanched or steam-blanching asparagus, maize, Lima beans, snap beans, spinach

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and several varieties of peas were frozen and stored at 0° F. for 2.5, 6 or 7.5 years. After lyophilisation the material was extracted with ether in a Soxhlet apparatus to yield crude lipids on which acid value, iodine value and peroxide value were estimated, the latter at intervals of up to 48 days after extraction.

Peroxides found in the lipids of the frozen vegetables tended to decrease when the crude extract was kept for several weeks in a vacuum desiccator over P_2O_5 . Unblanched maize, peas, snap beans and spinach all yielded crude lipids giving high peroxide and acid values. Unblanched asparagus lipids gave no peroxide value, except after the longest periods of storage (7.5 years), but showed high acid values. Maize was the only blanched vegetable of which the lipids were peroxidised to any extent; this suggested that some non-enzymic agent was involved. Iodine values showed considerable variation and it was concluded that they were of little use as an index of changes in crude lipids.—G. A. Garton.

1735

PARIAR, D. B. Changes in the saccharides of stored-pulses. A study by circular paper chromatography. *Naturwissenschaften*, 1954, **41**, 427-428. [Minist. Defence, New Delhi.]

Circular paper chromatography, with *n*-butanol : acetic acid : water (40 : 10 : 50) as solvent and aniline diphenylamine phosphate as detecting reagent, of purified and concentrated aqueous extracts of *Ocifer arietinum*, Linn., *Lens esculenta*, Moench, *Cajanus indicus*, Spreng, *Phaseolus mungo*, Linn., and *Phaseolus aureus*, Roxb., fresh or after storage in closed tins at about 30° C. for 2½ years, showed that fructose and glucose were always formed on storage, and galactose sometimes. Sucrose and raffinose were present in all samples, also unidentified substances travelling more slowly than raffinose.—W. M. Deans.

1736

CZHRNCIIV K., N. Calidad y estabilidad de algunos productos criollos enlatados. [Quality and stability of some indigenous foods canned.] *Arch. venezol. Nutricion*, 1954, **5**, 135-145. [Lab. Indust. Conserv., Ocumare del Tuy.] English and German summaries.

Observations made on tinned native products, kept for varying periods at from 85° to 90° F., demonstrate the stability of their nutritive properties, both analytical and organoleptic, if they have been well processed. The storage life in a tropical climate is given provisionally as 2 years for tomatoes, 1 year for tomato juice, 2 years for papaya juice and 1½ years for "cambures" in syrup. The "cambur", of which there are several varieties, is a fruit similar to the banana. The tinned

products are rich in vitamins A and C, especially papaya juice. This juice has also colloidal properties which would make it suitable for use as a natural emulsifier in the manufacture of sauces.

M. B. Richards.

1737

RAGHUNATHA RAO, Y. K. Some recent advances in production methods for vegetable oils and edible meals. *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, **3**, 249-252.

A review.

1738

EAGLE, E., BIALEK, H. F., DAVIES, D. L. and BREMER, J. W. Detoxification of cottonseed by salts and alkalis. *J. Amer. Oil Chem. Soc.*, 1954, **31**, 121-124. [Res. Labs., Swift and Co., Chicago, Ill.]

Samples of hexane-extracted cottonseed meal were treated with (1) dry heat, (2) moist heat, (3) moist heat in the presence of salts or alkalis. Treatment 1 was ineffective and meal 2 was only partly detoxified as tested by inclusion at a level of 67 per cent. in the diets of rats. Treatment 3 was more effective, alkalis being better than salts. The best results were obtained with NaOH, the order of decreasing effectiveness being NaOH, KOH, NH_4OH , $Ca(OH)_2$.

The residual toxicity for rats could not be related to the free gossypol content of the treated meal.—D. H. Shrimpton.

1739

THURBER, F. H., VIX, H. L. E., PONS, W. A. (Jr.), CROVETTO, A. J. and KNOEFFLER, N. B. The effect of processing conditions on the properties of screw-press cottonseed meal and oil. *J. Amer. Oil Chem. Soc.*, 1954, **31**, 384-388. [S. Reg. Res. Lab., New Orleans, La.]

Four series of experiments are reported, the seeds used being low in free fatty acids (0.6 to 1.9 per cent.) and with a moisture content from 7 to 12 per cent. In every case the seed was de-linted and hulled to yield final meals with crude protein content 41 per cent. In each series, 3 types of cooking conditions were used: (1) normal mill practice, moisture 6.6 to 11.4 per cent., temperature 239° to 250° F., duration 30 to 75 min.; (2) low-temperature dry cooking, moisture 7 per cent., temperature 160° to 200° F., duration 22 to 45 min.; (3) wet low-temperature cooking followed by evaporative cooling, moisture 12 to 18 per cent., temperature 216° to 228° F., duration 45 to 65 min.

Meals were analysed for moisture, oil, total N, free and total gossypol and N soluble in 0.5 *M* NaCl. Oils were analysed for free fatty acids, refining loss, refined colour, bleach colour, and total gossypol. All meals were low in free gossypol

(< 0.050 per cent.), but protein quality of meals prepared by methods 2 and 3 was superior. By method 2, little gossypol was bound, but by method 3, 90 per cent. of the gossypol was bound. Oils prepared by methods 2 and 3 were also superior, but there was no direct relation between processing variables and the amounts of gossypol in the oils.

D. H. Shrimpton.

1740

JACQUOT, R. Traitements thermiques et valeur alimentaire. [Heat treatments and nutritive value.] *Ann. Zootech.*, 1954, **3**, 189-214. [Lab. Biochem. Nutrit., C.N.R.S., Bellevue.]
A review dealing with feedingstuffs.

1741

CRASEMANN, E. Über Grünfüttererkonservierung mit besonderer Berücksichtigung der künstlichen Trocknung. [Conservation of green fodder with special reference to artificial drying.] *Landwirtsch. Jahrb.*, 1954, **31**, pp. 22.
A review.

1742

MEREGALLI, A. I vari tipi di foraggi e sottoprodotti essiccabili artificialmente. [Types of forage and by-products suitable for artificial drying.] *Riv. Zootec.*, 1954, **27**, 319-320.

1743

ARCHIBALD, J. G., BLAISDELL, M. L., GERSTEN, B. and KINSMAN, D. M. Grass silage: a reappraisal. *Massachusetts Agric. Exp. Stat. Bull.* No. 477, May 1954, pp. 22. [Amherst, Mass.]

The results of 18 years' experience with grass silage are reviewed.

Good silage is indicated by a pH of about 4.5 or less, a low volatile base content, 3 to 5 per cent. or less of lactic acid and 2 per cent. or less of butyric acid. The relations between these and other constituents show that the estimations of water, pH and protein are sufficient for the judging of silage quality. Good silage is usually greenish brown or yellowish brown. Odour and consistency (absence of sliminess) often indicate the quality. Water below 60 per cent. induces mould; above 70 per cent. there is a risk of poor silage and at 75 per cent. almost a certainty. As the most nutritious forage crops always contain over 70 per cent., wilting of the crop or the use of preservatives or conditioners is essential. Silage to which preservatives had been added were superior in chemical composition, dry matter, energy value, odour and palatability.

Preservatives are either fermentable carbohydrates which promote the production of lactic acid, e.g., molasses, ground cereal grain, or mild antiseptics which prevent the breakdown of

protein and formation of butyric acid or both, e.g., liquid SO_2 and sodium bisulphite. Conditioners are dry materials, e.g., citrus meal, beet pulp, chopped hay and ground grain, which absorb excess moisture. Ground grain is easily applied, 80 per cent. or more of the feeding value being retained, and makes excellent silage. Liquid SO_2 is a good preservative if uniformly applied, but the task is irksome and requires special equipment. Sodium bisulphite acts by slow evolution of SO_2 on contact with the moist green crop; it is cheap and easily applied and makes excellent silage surpassed only by that made with hominy meal or ground wheat. Citrus meal does not produce such high quality, nor does molasses, which is difficult to apply and is no longer recommended.

Structures recommended for storing silage in addition to the upright silo are the temporary one made from a ring of snow fence lined with strong building paper, with a similar section superimposed when filled, and the trench silo. In the trench adequate drainage from the base and the exclusion of surface water are necessary.—A. Hepburn.

1744

ARCHIBALD, J. G. and KUZMESKI, J. W. Further observations on the composition of grass silage. *J. Dairy Sci.*, 1954, **37**, 1283-1290. [Massachusetts Agric. Exp. Stat., Amherst.]

A summary of analyses of grass silage from 1937 to 1953 is presented. Quality in silage as judged by low pH, low content of volatile bases and butyric acid and high content of lactic acid was best attained by the addition of sodium metabisulphite, ground wheat or hominy meal. Preservatives in general gave good conditions. Liquid SO_2 or sodium metabisulphite gave the highest sugar content. High moisture content was associated with a high content of fibre and butyric acid and, except in silages preserved with SO_2 or sodium metabisulphite, indicated poor quality.

A. Hepburn.

1745

MARTIN, J. and BUYSSSE, F. Résultats de recherches en matière d'ensilage. [Research on silage material.] *Rev. Agric.*, 1953, **6**, No. 10, pp. 8.

Estimations were made of pH and of dry matter, butyric and acetic acids, ammonia N, protein and crude fibre in 165 samples of silage. Summary data are presented for some of them according to the nature of the material ensiled and of the substance admixed. On these bases general directions are given for improving the quality of silage.

D. Harvey.

1746

MARTIN, J. and BUYSSSE, F. Onderzoek naar de waarde als silcermiddel van enkele nieuwere producten. [Ensiling experiments with some

N.A. and R., April 1955

new products.] *Med. Landbouwhoges. Opzoekingsstat. Gent*, 1952, 17, no. 4, pp. 616-631.

French, English and German summaries.

The results of experiments on the ensiling under pressure, in silos of experimental or practical size, of chopped lucerne or barley with powdered sodium bisulphite, calcium chloride, calcium hypochloride, Formosil, Kofa, or the liquid G₂-30 Sopura (an ester of monobromoacetic acid) were inconclusive. As a guide to quality of silage made with dry powders, or from wilted crops, pH was found unsatisfactory; judged by butyric acid content all the silages were successful, but those made with sodium bisulphite or G₂-30 Sopura were not readily eaten by cattle. Further studies are planned. (From summaries.)

W. M. Deans.

1747

MARTIN, J., and BUYSSE, F. De bruikbaarheid van KOFA als sileermiddel. [The use of KOFA in silage.] *Med. Landbouwhoges. Opzoekingsstat. Gent*, 1953, 18, no. 3, 617-648. English, French, and German summaries.

The use of Kofa powder in silage making was investigated in 4 trials. The first trial compared silage made from unchopped clover with no addition or with Kofa added. Kofa did not affect the pH, but butyric acid decreased and lactic acid increased and the loss of dry matter (DM) and crude protein (CP) and carbohydrates was less.

In the second trial unchopped alfalfa was ensiled with Kofa, with mineral acid or without any addition. In the Kofa silage, compared with the mineral acid silage, pH was higher, butyric acid slightly lower, lactic acid slightly higher and breakdown of protein greater. Compared with silage made without addition, pH was higher, butyric acid much lower and lactic acid higher; protein breakdown was the same.

Chopped alfalfa was used in the third trial. It was ensiled in 4 layers in the same silo: the bottom layer had mineral acid added, the second Sovilon, the third Kofa and the top layer nothing. All 4 layers were comparable in having no butyric acid, sufficient lactic acid and very little protein breakdown.

Finally, unchopped clover without addition, with Kofa, with Formiasil (Amasil) [presumably same as Formosil in preceding Abst.] and with mineral acid, was ensiled. Kofa made the best silage. That made with no addition was poor. As an indication of palatability it was found that animals ate less of the mineral acid silage than of the others, but when digestibility was measured by the lignin method, it had the highest percentage digestibility (63.35), followed by Kofa (56.87), Formiasil (55.57) and untreated (52.07).

T. D. Bell.

1748

HALL, H. H., ETCHHELLS, J. L., JONES, I. D. and LEWIS, W. M. Microbiological and chemical studies of sweet potato vine silage. *J. Dairy Sci.*, 1954, 37, 1325-1336. [Agric. Res. Serv., U.S. Dept. Agric.]

Experimental silage was made in barrels and glass jars with sweet potato vine, including leaf, 100 per cent.; vine 85 and tubers 15 per cent.; and vine 83.5, tubers 13.5 and molasses 3 per cent. With all, fermentation was of acid type, giving silage of good odour, colour and texture. The population of acid-forming bacteria, mainly *Lactobacillus plantarum*, increased rapidly during the first 5 days, and was not greatly affected by the addition of tubers or molasses. During fermentation there was a fall in pH and sugar content, and lactic acid was formed. More lactic acid was formed when tubers or molasses were added.

T. D. Bell.

1749

DE MAN, J. C. The influence of temperature rise on silage. *Netherlands J. Agric. Sci.*, 1953, 1, 186-187. [Exp. Stat. Potato Processing, Groningen.]

Silage made in preserving jars from cut or crushed grass deteriorated after 6 months at 20°C. as shown by an increase in butyric acid and a decrease in lactic acid when the jars were kept for a week previously at 35°C. Even after 1 to 8 days at 35°C and storage for 3 months this effect was apparent, but only the acetic acid increased in silage from crushed grass.—A. Hepburn.

1750

WALKER, B. J., HILL, D. L. and LUNDQUIST, N. S. A modified cryovac process for making grass silage in the laboratory. *J. Animal Sci.*, 1954, 13, 1013. *Proc.* [Purdue Univ., Lafayette, Ind.]

1751

TANOVICANU, Y. Cercetări asupra tehnicii de iodare a sării și a factorilor care influențează remanenta titrului de iod. [The technique of iodising salt and factors influencing the stability of the iodine.] *Rev. Igien. Microbiol. Epidemiol.*, 1954, 2, 37-46. French and Russian summaries.

The amount of iodine in samples of iodised salt which was supposed to contain 30 mg. KI per 100 g. ranged from none to 40. The technical faults in the process of iodisation and the causes of later loss of iodine are discussed. It is suggested that 50 mg. thiosulphate per 100 g. should be added to increase the stability of the iodine.—D. Duncan.

See also Absta. 1646, 1675, 1819, 1865-67, 1883, 1884, 2031.

CULTURE OF MICRO-ORGANISMS FOR FOOD

- 1752
STEINBERG, M. P. and ORDAL, Z. J. Theoretical rate of fat formation by yeasts. *Science*, 1954,

120, 609-610. [Dept. Food Technol., Univ. Illinois, Urbana.]

2. CHEMICAL COMPOSITION OF FOODSTUFFS

(Except Vitamins, for which see Section 3)

ENERGY VALUE, PROXIMATE PRINCIPLES AND INORGANIC CONSTITUENTS

GENERAL

- 1753
FACHMANN, W., KRAUT, H. and SPERLING, H. Nährstoff- und Nährwertgehalt von Nahrungsmitteln. [Nutrient and energy value of foods.] *Die Ernährung*, 1953, No. 11, pp. vi + 58.

This second, revised, edition of food composition tables which first appeared in 1943, after an explanatory introduction gives for some hundreds of classified German foods and beverages the content, in g., of protein, fat and carbohydrate (directly estimated), and the energy value calculated with the factors 4.1, 9.3, 4.1, 3.4, 4.1 for protein, fat, carbohydrate, citric acid and other organic acids, respectively, (1) of the edible substance of 100 g. as retailed, (2) of the same at the producer's or wholesale stage, and (3) of 100 g. edible substance as consumed. Tables 1 and 2 also give percentages of waste. Waste of edible substance in the household is not allowed for; it is estimated to be between 5 and 10 per cent. in Germany at present.

W. M. Deans.

- 1754
DE IBARRA, C. Tabla de composición de alimentos para uso práctico. Revision 1954. [Tables of composition of foods for practical use. Revised 1954.] *Inst. Nac. Nutricion, Caracas, Venezuela*, 1954, Publ. No. 17, pp. 24.
An augmented table of composition of some 200 foods, including protein, fat and carbohydrate percentages, Cal. per 100 g., and some of the minerals and vitamins is presented and indexed by the common name of the food, followed by the scientific name where applicable.—T. D. Bell.

- 1755
ADRIAENS, E. L. Note sur la composition chimique de quelques aliments mineurs indigènes du Kwango. [Chemical composition of some less important native foods of the Kwango.] *Ann. Soc. belg. Méd. trop.*, 1953, 33, 531-543. Flemish summary.

Results are presented of analyses for total ash, protein, fat and carbohydrate of caterpillars, crickets, termites and other insects, a small snake,

molluscs, the fishes *Anabas* sp. and *Clarias* sp., many genera and species of fungi, and the flowers of *Eriodendron* sp.

These foods are eaten fresh or dried; they tend to have a high protein content and, though eaten in very small quantities, must provide useful supplements to the diet.—E. M. Hume.

- 1756
WILLARD, C., ENGLEBERT, R. D. and RICHARDS, L. M. Fatty acid contents of certain processed foods. Fatty acid contents of several food products. *J. Amer. Oil Chem. Soc.*, 1954, 31, 131-135; 135. [Stanford Res. Inst., Calif.]

A table is given of the fatty acid compositions of samples of bacon, American cheese, Swiss cheese, Frankfurters, ham, luncheon meat, "MFB" baker's shortening and oleomargarine as estimated by ester-fractionation and spectrophotometric analysis.

The fatty acid compositions, as estimated by ester-fractionation, of the fats of maize meal, peanut butter, raw and roasted peanuts, rolled oats, walnuts and Crisco are given in another table.—G. A. Garton.

- 1757
HADORN, H. and JUNGKUNZ, R. Über den Gehalt an Unverseifbarem und Gesamtsterinen in Speisefetten und Speiseölen. [Unsaponifiable matter and total sterols in edible fats and oils.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 397-401. [Lab. VSK, Basle.] French and English summaries.

Unsaponifiable matter was estimated after double saponification and ether extraction (Title 1723, Vol. 19) and sterols by the authors' gravimetric digitonin method (Abst. 4492, Vol. 21) in 13 vegetable oils, 3 vegetable fats and 4 animal fats. The results are tabulated along with values from the literature, with which they were in general agreement except that the maximum values for unsaponifiable matter in the literature were higher, possibly because they date from a time when edible fats and oils were less highly refined than now.—W. M. Deans.

- 1758
BLAIR, G. W. S. The rheology of fats: a review. *J. Sci. Food Agric.*, 1954, **5**, 401-405. [Nat. Inst. Res. Dairying, Shinfield, Reading.]

- 1759
HILDITCH, T. P. The fats: a story of nature's art. *J. Sci. Food Agric.*, 1954, **5**, 557-566.

- 1760
CAMARA-BESA, S. F. and BATACLAN, M. The sodium and potassium content of Philippine foods. 2. Sample daily diets. *Acta med. philipp.*, 1953, **9**, 270-273. [Dept. Biochem., Coll. Med., Univ. Philippines.]

Sodium and potassium were estimated in 9 daily diets at moderate cost prepared in the Institute of Nutrition and in 41 daily diets collected from 7 hospitals or other institutions. The mean values in g. daily were Na 3.43 ± 1.115 and K 2.23 ± 0.683 . Separate analyses of breakfast and of midday and evening meals showed the intake of both Na and K to be highest at midday and lowest at breakfast. Samples of the common sauces, *patis* and *toyo* or soya sauce, contained on the average 108 and 85 mg. Na per ml., and fairly large amounts of K as well. The use of the sauces could add considerable amounts of Na to the diet. A. M. Copping.

- 1761
BATE-SMITH, E. C. Flavonoid compounds in foods. *Advances in Food Res.*, 1954, **5**, 261-300. [Low Temp. Res. Stat., Univ. Cambridge.]

FOODSTUFFS OF ANIMAL ORIGIN

Milk and Milk Products

- 1762
SUNDAL, A. Kvinnemelk-morsmelkernaering-die-givningsevne. [Human milk. Breast feeding and suckling capacity.] *Nord. Med.*, 1954, **52**, 1577-1579. [Paediat. Klin., Univ. Bergen.] English summary.
A brief account of the supposed average composition of breast milk and a comparison of frequency of suckling at the Bergen welfare centre in 1940 and 1953.—I. Leitch.

- 1763
HYTTEN, F. E., REITHEL, F. G., FLETCHER, E. and MALPRESS, F. H. Comparative studies of some sugar-phosphate fractions of early post-natal and normal milks. *Biochem. J.*, 1954, **58**, xxi-xxiii. [Dept. Midwifery, Univ. Aberdeen.]

- 1764
JORGE JANZ, G. and PINTO, G. L. Contribuição para o estudo do estado de nutrição da população de S. Tomé. 4. Sobre a composição do leite materno nas naturais de S. Tomé. [State

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of nutrition of the population of São Tomé. 4. Composition of breast milk of natives of São Tomé.] *An. Inst. Med. trop., Lisbon*, 1953, **10**, 1535-1541 (with discussion 1541-1543). *Proc. English summary.*

4. Samples of breast milk were obtained from 50 mothers, natives of São Tomé, aged from 17 to 43 years. Of these samples 28 gave an average protein content of 0.94 g. per 100 ml., range 0.59 to 1.26, and 47 samples gave an average fat content of 2.93 g. per 100 ml., range 1.4 to 4.8. Compared with European or American standards the protein content is slightly below, and the fat content much below, normal. The possible relation between the values found and the diet of the mothers is discussed.—M. B. Richards.

- 1765
WALKER, A. R. P., ARVIDSSON, U. B. and DRAPER, W. L. The composition of breast milk of South African Bantu mothers. *Trans. Roy. Soc. Trop. Med. Hyg.*, 1954, **48**, 395-399. [Human Biochem. Unit, S. African Inst. Med. Res., Johannesburg.]

Two hundred and sixty-six samples of breast milk mainly from South African mothers in a state of poor, average or good nutrition were found on analysis to contain total solids, ash, protein, fat, lactose, Ca and P in amounts comparable with milk from British and American mothers. Ascorbic acid was somewhat less. No relation was found between the composition of the milk and the nutritional state of the mothers. The milk yield was satisfactory for 6 months and babies exclusively breast fed were well nourished. It was concluded that either the role of diet in lactation is over-emphasised or that the body was able to adapt itself to the inferior diet largely composed of maize, bread and legumes.—A. Hepburn.

- 1766
HIETARANTA, M. and NIEMELÄ, K. Rasva- ja valkuaisainepitoisuuden suhteesta suomalaissessa maidossa. [Relation between the fat and protein contents of Finnish milk.] *Maataloust. Aikakausk.*, 1954, **26**, 148-158. [Dept. Dairy Sci., Univ. Helsinki.] English summary.

In Finland the protein:fat ratio of milk is lower than in other northern countries. During the last 30 years it has fallen, probably owing to an increase in fat content as a result of improved breeding and feeding.

The correlation coefficient for protein and fat in bulk milk was $+0.76 \pm 0.06$, in milk from different herds $+0.535 \pm 0.05$ and in milk from individual cows $+0.432 \pm 0.07$. For fat and casein the correlations were $+0.735 \pm 0.05$, $+0.590 \pm 0.03$ and $+0.277 \pm 0.09$.

Casein in milk from different herds and from individual cows was estimated by the formol titration method. The method was accurate to only ± 5 per cent. in the first case and ± 13 per cent. in the second. Seasonal fluctuations in the relations between casein and the other protein components were also observed, so that the estimation of casein by formol titration cannot be considered of much practical value.—T. D. Bell.

1767

OVERMAN, O. R., KEIRS, R. J. and CRAINE, E. M. Composition of herd milk of the Brown Swiss breed. *Illinois Agric. Exp. Stat. Bull.* No. 567, September 1953, pp. 22. [Urbana, Ill.]

Composite samples representing the 24-hr. milk from each of 39 herds containing in all 933 Brown Swiss cows were analysed monthly for a year. The procedures are described and the results are tabulated in detail.

The average butterfat percentage was 3.97, solids-not-fat 9.16 and total solids therefore 13.13. Total protein was 3.5, lactose 4.9 and ash 0.74 per cent. The mean energy value was 756 Cal. per kg. Results are also given for N fractions and Ca, P, Na, K, Mg and Cl, but these were much more variable.—T. D. Bell.

1768

TRUCCO, R. E., VERDIER, P. and REGA, A. New carbohydrate compounds from cow milk. *Biochim. biophys. Acta*, 1954, 15, 582-583. [Inst. Invest. Bioquím., Fund. Campomar, Buenos Aires.]

Examination by paper chromatography of an extract of cow's milk free from lactose revealed 7 carbohydrate compounds. After acid hydrolysis spots 1 and 2 were shown to contain galactose, glucose, mannose and acetylglucosamine; 3 and 4 were identical with compounds E and D previously isolated from rat mammary glands (Abst. 2555, Vol. 22) and later shown (Trucco and Caputto, *J. Biol. Chem.*, 1954, 206, 901 and unpublished results) to contain lactose and neuraminic acid; 5, 6 and 7 contained lactose, glucose and galactose, the last in greater amount than glucose. Carbohydrates obtained from human milk by Gauhe *et al.* (Abst. 3509, Vol. 24) differed chromatographically, both before and after hydrolysis, from those isolated from cow's milk.—A. Hepburn.

1769

BENNERTS, W. T. Goitre and iodine content of cow's milk. *Nature*, 1954, 174, 973-974. [Lab. Animal Physiol., Agric. Univ. Coll., Wageningen.]

Iodine was estimated in hundreds of samples of milk from dairies in goitre, transitional, non-goitre and coastal areas of the Netherlands. All the

samples were taken on one specified day in summer and in winter in order to get strictly comparable results. The results were statistically analysed by the author's method (Abst. 2771, Vol. 24). The mean percentage I content of summer milk from the 4 areas was approximately half that of milk from the same areas in winter. The mean values for the samples from the goitre areas were approximately half the values from the non-goitre areas. The samples from the coastal areas had the highest mean I content.—B. W. Simpson.

1770

STORRS, F. C. and HIETT-BROWN, W. The incidence of penicillin in milk supplies. *J. Dairy Res.*, 1954, 21, 337-341. [United Dairies Res. Labs., London.]

Two surveys were made during May to September 1951 and February to March 1953 in which, with a strain of *Sarcina lutea*, penicillin was detected qualitatively at a level of 0.08 unit per ml. or above. In positive samples it was estimated. The first survey included 1082 samples from 5 milk plants, of which 2 were cheese factories. Of these, 191 from bulk supplies were negative but of 891 samples from producers' individual churns 15 were positive. The second survey included 557 samples taken at a cheese factory and bulk samples numbering 33 again were negative. Of 441 samples from individual producers 14 were positive and of 23 samples from milk intended for starter culture 2 were positive.

In a herd where 70 per cent. of the cows were being treated all milkings up to the fifth after the administration of penicillin contained amounts likely to inhibit starter action.

The veterinary use of penicillin does not, as yet, give rise to difficulties at cheese factories, but if use of it or other antibiotics becomes more general a system of reporting such use to cheese-makers will become desirable.—D. Harvey.

1771

SADEK, S. E. Penicillin concentration in bovine blood and milk after intramuscular injection and its application in the treatment of mastitis. *J. Amer. Vet. Med. Assoc.*, 1954, 125, 387-390. [Dept. Vet. Pathol. Hyg., Coll. Vet. Med., Univ. Illinois, Urbana.]

1772

MCDOWELL, A. K. R. The properties of New Zealand butters and butterfats. 4. Refractive index and density of the butterfat. *J. Dairy Res.*, 1954, 21, 383-390. [Dairy Res. Inst. (N.Z.), Palmerston North.]

For previous parts see Abst. 2873, Vol. 18; Title 174, Vol. 20; Abst. 2769, Vol. 23.

The refractive index and sp. gr. of the fat of butter from 20 factories were measured every 8 weeks for 3 years. The refractive index ranged from 1.4535 to 1.4571, average 1.4549. Maximum values were found in winter and minimum in summer butterfats. Sp. gr. ranged from 0.8885 to 0.8916, average 0.8904, with maximum in late spring and minimum in autumn.

In both refractive index and sp. gr. there was a difference between the North and South Islands only during the winter.

From samples taken in one year significant correlations were found between refractive index and iodine value, between sp. gr. and saponification value and between sp. gr. and Reichert value.

T. D. Bell.

1773

HANSEN, R. P., SHORLAND, F. B. and COOKE, N. J. The branched-chain fatty acids of butterfat. 5. The isolation of 12-methyltridecanoic acid. *Biochem. J.*, 1954, 58, 358-359. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

For earlier studies see Abst. 4086, Vol. 24.

By methods which included hydrogenation, fractional distillation and low-temperature crystallisation, 2 fatty acid fractions were isolated, the analytical characteristics of which corresponded to a C_{14} iso-acid, 12-methyltridecanoic acid. The total amount of this acid present in the original butterfat was estimated to be about 0.05 per cent. of the total fatty acids.—G. A. Garton.

1774

SCHÖRMÜLLER, J. and HUTH, H. Beiträge zur Biochemie der Käsebereitung. 7. Phosphor-bilanzen in reifendem Sauermilchkäse. [Biochemistry of cheese ripening. 7. Phosphorus balances in ripening sour milk cheese.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, 69, 280-299. [Inst. Lebensmittelchem., Tech. Univ., Berlin, Charlottenburg.]

For previous parts see Absts. 4263, Vol. 24; 220, Vol. 25.

Phosphorus fractions were estimated in sour milk cheese at different stages of ripening, and the P content in several cases was related to that of N. The P:N ratio in the total mass of the ripening cheese was constant, about 1/34. The average P content of the dry substance of skimmed milk cheese was 0.94 per cent., much higher than in pure casein (0.79 per cent.). In the course of ripening a considerable amount of the P and N became acid-soluble. The P:N ratio of the trichloroacetic acid extract tended towards a limiting value of about 0.06. During ripening inorganic phosphate was liberated in considerable amounts in the later stages. Organic P compounds soluble in trichloroacetic acid

increased steadily during ripening. These afford an approximate measure of the stage of ripening of the cheese, are remarkably stable towards acids, exceptionally labile to alkali, and consist mainly of phosphopeptides. The proteins got from cheese by treatment with trichloroacetic acid showed at all stages a constant P:N ratio of about 1/43, which corresponds approximately to that of pure casein. From cheese ripened without salt an alkali-labile phosphopeptide was isolated. It contained 4.32 per cent. P and 11.06 per cent. N, and showed, even with fractionated precipitation, a constant P:N ratio of 1/5.6.

M. B. Richards.

1775

DE VERDIER, C. H. Phosphorus-containing amino acids and peptides from acid hydrolysates of casein and pepsin. *Acta chem. scand.*, 1954, 8, 1302-1303. [Inst. Med. Chem., Univ. Upsala.]

1776

FABRIANI, G., FRATONI, A. and SPADONI, M. A. Amino acidi liberi in alcuni formaggi italiani. [Free amino-acids in some Italian cheeses.] *Quad. Nutrizione*, 1952, 12, 475-485. [Ist. Naz. Nutriz. C.N.R., Rome.] French, English and German summaries.

Free amino-acids were estimated by paper chromatography in extracts of Italian cheeses of 4 types, Parmesan, Pecorino, Provolone and Emmenthal. The total and soluble N and amino-acid contents of 16 samples are tabulated.

Parmesan, Provolone and Emmenthal were very rich in glutamic acid, leucine, valine and proline, which were thought to be important in the development of their flavour. Pecorino was more variable in composition; glutamic acid appeared to be decarboxylated during ripening, with formation of γ -aminobutyric acid. Asparagine and glutamine were present in appreciable amounts in Provolone and Emmenthal.—D. Dunnean.

1777

BOOGAERDT, J. Instability of milk due to a high content of calcium ions. *Nature*, 1954, 174, 884. [Lab. Vet. Biochem., Univ. Utrecht.]

In 4 samples of milk showing the Utrecht abnormality (see Absts. 4240, Vol. 17; 1289, Vol. 23) the amount of Ca ions was estimated by the method of Smeets and Seekles (Abst. 1565, Vol. 22). The amounts of ultrafiltrable Ca were 44, 34, 45 and 54 mg. per cent., normal 26 to 46, and of Ca ions in the ultrafiltrate 14.8, 15.2, 20 and 27 mg. per cent., normal 8.0 to 14.4. The data confirm that a high content of Ca ions is the cause of the abnormality.—D. Harvey.

1778

JOSHI, N. V. and RAJ, H. **Microbiological assay of essential amino acids in the milk of Indian buffalo.** *Indian J. Dairy Sci.*, 1954, 7, 139-146. [Maharashtra Assoc. Cultivation Sci., Poona 4.]

The 8 essential amino-acids plus histidine, arginine and cystine estimated microbiologically in the milk protein from Mehsana buffaloes were in amounts similar to those reported for cow's milk. A. Hepburn.

1779

LEONHARD, I. **Poiównanie składu chemicznego mleka owiec różnych ras.** [Comparison of the chemical composition of milk from ewes of different breeds.] *Rocz. Nauk rol. [B]*, 1954, 68, 21-52. [Inst. Zootech., Lab. Centralne, Pracownia Mleczarska.] Russian and English summaries.

Observations were made on the yield and composition of milk from ewes of different breeds in the Grodziec area between April and September 1952. All the breeds, except the Friesian, showed a slightly higher yield than previously recorded. The Friesians had a higher yield in lowland (Grodziec) areas than in highland, and the better feeding and care on the Grodziec farms improved the yield of primitive Zacksels.

The highest yielding breeds were Polish Highland and Friesian. The highest dry matter (DM) content was found in the Berichons and Transylvanian Zacksels. The primitive Zackel, Raczki, Zigay and Zackel-Friesian were intermediate in yield and DM.

Higher milk yield was related to lower fat content; protein and fat increases were related, and increase of fat was associated with decrease of lactose.

Yield dropped during lactation, especially at weaning, and there was a corresponding increase in the percentage of all DM components except lactose, which decreased rapidly during the suckling period. Sp. gr. increased with DM. Higher environmental temperatures caused the fat content to fall.—T. D. Bell.

1780

RZENDOWSKA, F. **Układ enzymatyczny mleka koziego.** [Enzyme studies of goat's milk.] *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 269-286. [Zakł. Badania Żywności i Przedmiotów Użytku PZH.] Russian and English summaries.

1781

KORSHAKOV, P. N. **O nekotorykh osobennostyakh moloka kobylytz.** [Certain characters of mare's milk.] *Konevodstvo*, 1954, No. 5, 32-34. [Dept. Animal Husb., Voronezh Agric. Inst.]

From 2½ to 3¼ months after foaling mare's milk was found to contain from 12.4 to 16 µg. Co per cent., as compared with cow's milk which contained from 3.5 to 7.2 µg. The curative effect of koumiss is ascribed by Prof. Berlin to the high vitamin C content of mare's milk, but the author considers that Co is also of considerable importance. As the Co in the milk depends on the amount in the soils and fodder, mare's milk has a considerably higher Co content in the eastern steppe regions, where the soils and the fodder have a higher Co content. For example, in the Voronezh, Kustanaisk and Aktubinsk regions, the Co content of oats in mg. per kg. dry matter is 1.2, 1.6 and 1.95, and that of hay 0.60, 0.85 and 1.86, respectively. If in the Voronezh region the Co content of a mare's ration of hay and oats, 10 kg. hay, 4 kg. oats [period not mentioned] is taken as 100 per cent., then in the Kustanaisk region it would be 140 per cent. and in the Aktubinsk region 251 per cent. Therefore there would be more cobalt in mare's milk in these 2 regions and the curative quality of koumiss from these sources would be greater.

The increased Co content of the fodder might also be expected to favour synthesis of vitamin B₁₂.—H. Scherbatoff.

Eggs

1782

GRAU, C. R., ALLEN, E., NAGUMO, M., WORONICK, C. L. and ZWIEGART, P. A. **A distinctive yolk component in the fresh eggs of hens fed gossypol.** *J. Agric. Food Chem.*, 1954, 2, 982-986. [Dept. Poultry Husb., Univ. California, Davis.]

Laying hens given cottonseed meal frequently produce eggs with discoloured yolks. A study has been made of this discolouration by comparing the absorption spectra of hexane:acetone (3:1 by volume) extracts of the yolks of eggs from hens fed on diets containing cottonseed meal or pure gossypol with those from hens fed on a standard stock diet. The absorption at 400 mµ. was related quantitatively to the level of gossypol in the diet. The absorption spectra of eggs obtained from hens given cottonseed meal or pure gossypol were qualitatively similar.

It is suggested that the estimation of this yellow component of eggs will serve as a measure of the amount of biologically active gossypol in the diet. D. H. Shrimpton.

See also Abst. 1794.

Meat (all kinds)

1783

WILSON, G. D., BRAY, R. W. and PHILLIPS, P. H. **The effect of age and grade on the collagen and elastin content of beef and veal.** *J. Animal N.A. and R.*, April 1955

Sci., 1954, **13**, 826-831. [Dept. Animal Husbandry, Univ. Wisconsin, Madison.]

Samples of lean meat between the twelfth and thirteenth ribs of 24 cows, 32 steers and 32 calves were allocated to 3, 4 and 4 grades, respectively, 8 in each grade, and collagen and elastin were estimated. In each age group variation in collagen and elastin was considerable within grades, but the differences between grades were not significant. Meat from cows, steers and calves contained, on the average, 1.84, 1.89 and 2.96 per cent. collagen and 0.49, 0.52 and 1.03 per cent. elastin on a dry, fat-free basis. As veal is more tender than meat from older animals, collagen and elastin were concluded not to be a measure of toughness.

A. Hepburn.

1784

SHORLAND, F. B. Occurrence of fatty acids with uneven-numbered carbon atoms in natural fats. *Nature*, 1954, **174**, 603. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

Pure *n*-pentadecanoic acid was isolated from hydrogenated mutton tallow and from hydrogenated liver oil of the shark (*Galeorhinus australis*). The same acid was obtained also from butterfat without recourse to hydrogenation.—G. A. Garton.

1785

HANSEN, R. P., SHORLAND, F. B. and COOKE, N. J. The occurrence of *n*-heptadecanoic acid (margaric acid) in hydrogenated mutton fat. The occurrence of *n*-pentadecanoic acid in hydrogenated mutton fat. *Biochem. J.*, 1954, **58**, 513-515; 516-517. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

From the same hydrogenated external carcass fat of sheep as was used in previous investigations (Absts. 1933, 4039, Vol. 23), fractions were isolated which were identified as *n*-heptadecanoic (margaric) and *n*-pentadecanoic acids, accounting for 1.2 and 0.15 per cent., respectively, of the fats.

G. A. Garton.

1786

HANSEN, R. P., SHORLAND, F. B. and COOKE, N. J. The occurrence of 10-methyldecanoic acid in mutton fat. *Chem. and Indust.*, 1954, No. 40, 1229-1230. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

A fraction was isolated which corresponded in analytical characteristics to the C_{13} *ante*-*iso*-acid, 10-methyldecanoic acid.—G. A. Garton.

Fish

1787

PATHAK, S. P. and SUWAL, P. N. Component fatty acids of marine fish liver oils. *J. Amer. Oil Chem. Soc.*, 1954, **31**, 332-334. [Dept. Indust. Chem., Banaras Hindu Univ., India.]

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The mixed fatty acids were obtained by saponification of the liver oils of the shark *Carcharias melanopterus* and the saw-fish, *Pristis cuspidatus*, both caught in the Bay of Bengal. The acids were separated into groups of differing unsaturation by the lithium salt and acetone and lead salt and ethanol procedures and were then converted to methyl esters which were analysed by fractional distillation *in vacuo*.

The saturated acids totalled 31.1 and 36.9 per cent. of the total acids of the shark and saw-fish oils, respectively, and contained mainly palmitic and stearic acids, with small amounts of myristic acid. The unsaturated acids of both oils were mainly C_{16} , C_{18} , and C_{20} , of a similar order of unsaturation in both; C_{22} and C_{24} unsaturated acids were also present in both oils, to a greater extent in shark oil; this accounted for the higher iodine value of the original oil.—G. A. Garton.

1788

SWAIN, L. A. Fatty acid composition of fish oils. 3. Sockeye salmon offal oil. *Fish. Res. Board Canada, Progr. Rep. Pacific Coast Stat.*, 1954, No. 99, 6-8. [Pacific Fish. Exp. Stat.]

Methyl esters were prepared from the fatty acids of 6 samples of alkali-refined offal oil of sockeye salmon (*Oncorhynchus nerka*). The composition was established by the usual ester-fractionation technique. The major component acids were palmitic and unsaturated acids of the C_{18} , C_{20} and C_{22} series.—G. A. Garton.

See also Abst. 1784.

FOODSTUFFS OF VEGETABLE ORIGIN

General

1789

TAHA, M. M. Phytic acid distribution in foodstuffs. Its relation to calcium and total phosphorus. *J. Egypt. Med. Assoc.*, 1954, **37**, 629-637. [Biochem. Dept., Fac. Med., Alexandria.]

Egyptian foods were analysed for Ca, total P by Brigg's method, and phytic acid P by the method of McCance and Widdowson (Abst. 4339, Vol. 5). Of the cereals tested, maize flour, wheat flour, wheat bran, millet and barley, the last 3 had the highest content of phytic acid P, amounting to from 43 to 53 per cent. of the total P; all had a relatively low Ca content. Polished rice, with 102 mg. Ca per 100 g. and no phytic acid P, was an exception.

The legumes analysed, lentils, kidney beans, peas, cowpeas, broad beans and fenugreek, had a high Ca content ranging from 121 to 217 mg. per 100 g., but also a very high total P, from 400 to 660 mg. per 100 g., of which from 20 to 67 per cent. was phytic acid P. If the ratio of P to Ca in Ca phytate is taken as 1.25 (Abst. 766, Vol. 17),

it is calculated that all the Ca would be precipitated, leaving no available residue.

All the nuts tested were rich in total and phytic acid P; the almond and hazelnut contained more Ca and less phytic acid P than the walnut. Vegetables and fruits were generally relatively rich in Ca and poor in phytic acid P. None or a trace only was detected in tomatoes, carrots, green beans, spinach, cauliflower, cabbage, radishes, celery and beetroot. Of the fruits tested, significant amounts of phytic acid P were found in apricots and dates.

H. Chick.

1790

DOS SANTOS CARVALHO, J. Composição de alguns alimentos exóticos e seus nomes vulgares. [Composition of some foreign foods and their common names.] *An. Inst. Med. trop., Lisbon*, 1953, 10, 1555-1561. *Proc.* English summary.

Nutritionists are often seriously hampered in their efforts to improve the native diet in overseas territories through lack of knowledge of the composition and energy value of the local foods, information which is generally not to be found in current treatises on tropical medicine. A vocabulary is given of 36 foods, with the botanical name, the English (and sometimes the French) equivalent, and the native name in different territories such as Angola, Timor, Mozambique, Zambesi and Congo. The chemical composition, including in most cases values for protein, fat, carbohydrate, fibre, energy, Ca, P and vitamins A, B₁, B₂, C and PP, is given.—M. B. Richards.

1791

DE LIZ GRILLO ABREU VELHO, H. Composição química de alguns produtos de origem vegetal utilizados na alimentação dos indígenas. [Chemical composition of plant products used as food by natives.] *An. Inst. Med. trop., Lisbon*, 1953, 10, 1563-1582. *Proc.* English summary.

The nutrition problems of the natives of Angola are presented in a general way. A regional map shows the zones of predominance of the different cereals, cassava, maize and different types of millet, which in the form of flour mixed with water make up the basis of the diet. For 13 samples of cassava flour, decorticated and sun-dried, the average percentage composition was protein 1.74, carbohydrates 79.75, fat 0.78, fibre 2.02, minerals 1.78, moisture 13.93. For cassava flour, previously macerated in water, the values for 11 samples were about the same, except for protein 1.47, fat 0.41 and fibre 1.84. For 11 samples of maize flour the percentage of protein was 8.37, carbohydrate 72.44, fat 3.71, fibre 1.11, minerals 1.43, and moisture 12.94. For great millet, protein 10.84,

carbohydrate 60.13, fat 4.31, fibre 2.03, minerals 1.99 and moisture 11.66. For 6 samples of sweet potato, which is universally cultivated, the percentage composition was protein 1.56, carbohydrate 33.62, fat 0.36, fibre 0.88, minerals 1.02 and moisture 62.54.

Fifteen samples of bean gave protein 20.99, carbohydrate 57.34, fat 1.76, fibre 4.26, minerals 3.91, and moisture 11.74, and 7 samples of groundnut gave protein 29.00, carbohydrate 12.29, fat 45.19, fibre 3.60, minerals 2.33 and moisture 7.60. Other vegetable foods used, some cultivated, some wild, include pumpkins, yams, mushrooms, the green leaves and tender parts of plants and trees, and fruits. Foods of animal origin are little used in general, although cattle are reared in some parts and milk is used to a certain extent. River fish, which are abundant, are dried for commerce, and sea fish, dried and salted, are sent into the interior.

It is suggested that regional investigations should be made with a view to the solution of food problems in the African territories.

M. B. Richards.

1792

LANTZ, E. M., GOUGH, H. W. and JOHNSON, M. M. Nutritive values of some New Mexico foods. *New Mexico Agric. Exp. Stat. Bull.* No. 379, June 1953, pp. 20.

Foods common to the Spanish-speaking inhabitants were examined. Tortillas and other foods made from whole maize treated with lime contained more Ca, vitamin B₁, riboflavin and nicotinamide than tortillas now mostly made from unenriched wheat flour. Beans, which form a large part of the diet, are rich in protein, B vitamins and Fe. Chilli (pepper) is a good source of carotene and ascorbic acid. Much is lost on drying, ascorbic acid almost completely. The nicotinamide content is high and the amount of chilli eaten makes it a valuable source also of vitamin B₁ and riboflavin. Wild greens commonly eaten in rural districts compare favourably in nutritional content with cultivated varieties.

A. Hepburn.

1793

ARROYAVE, G., PIZZATI, S., BRESSANI, R. and MÉNDEZ, J. Contenido de diversos nutrientes en alimentos procedentes de Centro-América. 1. Verduras subterráneas, verduras herbáceas, frutos-verduras y frutas. [Nutrient content of foods from Central America. 1. Roots and tubers, green vegetables, vegetable-fruits and fruits.] *Arch. venezol. Nutricion*, 1954, 5, 61-70. [Inst. Nutricion, Centro-América y Panamá, Guatemala.] English and German summaries.

Seventy-two samples of tubers and roots, green vegetables, vegetable-fruits, and fruits from different parts of Central America were analysed for

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moisture, ether extract, crude fibre, N, ash, Ca, Fe, P, carotene, vitamin B₁, riboflavin, nicotinic acid and ascorbic acid. Some of the foods were notable for a relatively high content of certain constituents: for example, blede (*Amaranthus hybridus*), chipilin (*Crotalaria longirostrata*), and macuy (*Solanum nigrum*) were high in Ca, and were good sources of Fe, carotene and ascorbic acid. They had also the highest amounts of riboflavin, although none of the foods analysed could be considered a good source of this vitamin. The plants were in general low in vitamin B₁, except for 3 samples of tamarind; numerous plants are mentioned as good sources of carotene, nicotinic acid and ascorbic acid. The table contains the scientific names of all the products analysed, and indicates their origin.

M. B. Richards.

1794

INTENGEN, C. L., ALEJO, L. G., CONCEPCION, I., YAPINCHAY, C., POERRE, V. L. SALUD, R. D. and MANALO, J. D. **Composition of Philippine foods. 1.** *Philippine J. Sci.*, 1953, **82**, 227-252. [Inst. Nutrit., Manila.]

Analyses were made for moisture, ether extract, N, crude fibre, ash, Ca, P, Fe, carotene, vitamin B₁, riboflavin, nicotinic acid and ascorbic acid in 108 samples of 73 foods collected round Manila in 1950-51, all of vegetable origin except duck eggs. The values are tabulated per 100 g. edible portion, and the local, English and Latin names are given.

E. M. Hume.

1795

SCHARER, K. and JUNG, J. Der Einfluss der Pflanzenernährung auf den ernährungsphysiologischen Wert der Futtermittel. [Effect of plant nutrition on the nutritive value of feedingstuffs.] *Arch. Tierernährung*, 1954, **4**, No. 4, Beihefte, 107-118. [Agrik. Chem. Inst., Justus Liebig Hochschule, Univ. Giessen.]

In a review of the literature, and with emphasis on the authors' own published and unpublished work, it is shown that fertilisers can influence to an important extent the composition and nutritive value of crops for human and animal consumption. In particular, the oxalic acid content of beet tops and the formation of carotene in fodder plants are discussed; both are influenced by the application of phosphate, nitrogen and potash fertilisers of different forms.—D. Duncan.

Cereals

1796

DEUTSCH, T. Die N-endständigen Aminosäuren der Weizen- und Roggengliadine. [The N-terminal amino-acids of wheat and rye gliadins.] *Acta physiol. hung.*, 1954, **6**, 209-224. [Biochem. Inst., Ungarisch. Akad. Wissenschaften, Budapest.] Russian summary.

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N-terminal amino-acids in gliadin of whole wheat flour from spring varieties of ordinary and durum wheat, commercial mixed flour and whole rye flour from 2 varieties were estimated by the 2:4-dinitrofluorobenzene method of Sanger (*Biochem. J.*, 1945, **39**, 507: see also Title 1170, Vol. 23). The dinitrophenyl derivatives of the amino-acids were identified by paper chromatography with citrate as solvent. The reliability of the method was tested with insulin. Full details are given and chromatograms are reproduced.

Gliadin from ordinary wheat was found to have 2 phenylalanine terminal groups and that from durum wheat one, but, contrary to the finding of Kőrös (*Magyar Kém. Folyóirat*, 1950, **56**, 131), no histidine terminal group. Gliadin from rye had glutamic acid and phenylalanine terminal groups; one variety was thought to have 4 of the latter, the other 2, but further investigations are in progress.—W. M. Deans.

1797

PENCE, J. W., WEINSTEIN, N. E. and MECHAM, D. K. Differences in the distribution of components in albumin preparations from durum and common wheat flours. *Cereal Chem.*, 1954, **31**, 396-406. [W. Utilization Res. Branch, Dept. Agric., Albany, Calif.]

1798

GILLES, K. A. and SMITH, F. The carbohydrates of the *Gramineae*. 3. A note on the nature of wheat gum.

MONTGOMERY, R. and SMITH, F. 4. Identification of the sugars of the flour of wheat (*Triticum vulgare*). *Cereal Chem.*, 1954, **31**, 488-489; 490-494. [General Mills Res. Lab., Minneapolis, Minn.]

3. A water extract of wheat starch yielded on precipitation with methanol a polysaccharide mixture shown to contain as a percentage glucose 63.2, arabinose 5.3 and xylose 3.2. More highly purified wheat starch contained a glucosan but little or no pentose. The sulphite wash-water from the commercial separation of starch from wheat flour contained a directly precipitable polysaccharide, wheat gum, of percentage composition glucose 58, arabinose 17 and xylose 25.

4. An aqueous alcohol extract of wheat flour was separated by column chromatography on charcoal-Celite into 8 fractions. Each fraction was further separated on large paper chromatograms and corresponding spots from 10 papers were combined and re-chromatographed. By comparison with standard chromatograms glucose, fructose, sucrose and maltose were identified. Elution of the respective spots and conversion to crystalline derivatives verified their identity. The quantities isolated agreed with data reported in part 1 (Abst

4656, Vol. 21). Three unknown spots were obtained; one which behaved chromatographically like melibiose gave only fructose and glucose on hydrolysis, a second was apparently a mixture of raffinose and a glucrofructosan and the third with a mobility between that of raffinose and melibiose was obtained with glucrofructosans.—A. Hepburn.

1799

HARSHBARGER, K. E., NEVENS, W. B., TOUCHBERRY, R. W., LANG, A. L. and DUNGAN, G. H. **Yield and composition of corn forage as influenced by soil fertilization.** *Illinois Agric. Exp. Stat. Bull.* No. 577, June 1954, pp. 19. [Urbana, Ill.]

The yield and composition of 5 maize hybrids under a manurial treatment varying little over the 5 years of the experiment was compared with that of the unmanured crop. Fertiliser increased the dry matter yield of the leaf-stalk and ear fractions proportionately, the response varying with weather conditions in each year. The interpretation of conflicting results on crude protein content is that effects on the ear are influenced by season and that fertiliser increases crude protein in the leaf-stalk fraction only when the crop is grown on soils low in available plant food. Crude fibre percentage is unaffected.—J. L. Corbett.

1800

SNIEGOWSKI, M. S. and BALDWIN, A. R. **Fatty acid compositions of corn oils in relation to oil contents of the kernels.** *J. Amer. Oil Chem. Soc.*, 1954, **31**, 414-416. [George M. Moffett Res. Labs., Corn Products Refining Co., Argo, Ill.]

The oil was extracted with ether from 392 samples of maize kernels. The iodine values of the oils were estimated by the Wijs method and the content of linoleic acid spectrophotometrically after alkali-isomerisation.

The oil content ranged from 1.13 to 13.8 per cent. Iodine values, which decreased with increasing oil content, ranged from 88.4 to 147.4.

The linoleic acid content of the oils also decreased as the percentage of oil in the kernels rose.

G. A. Garton.

1801

LOFLAND, H. B., QUACKENBUSH, F. W. and BRUNSON, A. M. **Distribution of fatty acids in corn oil.** *J. Amer. Oil Chem. Soc.*, 1954, **31**, 412-414. [Dept. Biochem., Purdue Univ., Lafayette, Ind.]

The fatty acid composition of the oil from 13 samples of maize kernels was estimated spectrophotometrically or by ester fractionation. With increasing oil content of the kernels, from 1.6 to

11.5 per cent., a decrease in iodine value and linoleic acid content of the oils was observed.

G. A. Garton.

See also Absts. 1724, 1729, 1733, 1781, 2505.

Roots

1802

WALKER, T. W., ADAMS, A. F. R. and ORCHISTON, H. D. **Some effects of sulphur and phosphorus on the yield and composition of rape (*Brassica napus*).** *N.Z. J. Sci. Technol.*, 1954, **36**, 103-110. [Canterbury Agric. Coll., Lincoln.]

In 2 trials the application of 96 lb. P_2O_5 per acre as monocalcium phosphate significantly increased the yield of rape. The addition of gypsum to supply the amount of sulphur present with this quantity of phosphorus in superphosphate fertiliser gave a further significant yield increase and a higher content of inorganic S in the dry matter in one of the trials. In the other case it is thought possible that the sulphate ion supplied in the gypsum reduced the uptakes of the phosphate and nitrate ions.—J. L. Corbett.

Legumes

1803

MELIÇO SILVESTRE, A. **Contribuição para o estudo da alimentação do indígena das nossas Províncias Ultramarinas. [Contribution to the study of the nutrition of natives of our overseas provinces.]** *An. Inst. Med. trop., Lisbon*, 1953, **10**, 1545-1553. *Proc.*

In connection with the tropical disease kwashiorkor, which is due to deficiency of proteins of high quality, some laboratories are studying the seeds of Leguminosae for their possible prophylactic value. Analytical values are presented for 10 samples of seeds of tropical legumes sent from the Colonial Garden of Lisbon and analysed in the University of Coimbra. The data include moisture, fat, protein, total sugar, reducing sugar, cellulose, ash, Ca, P, K and the vitamins B₁, B₂, PP and C. It is intended to complete the work by estimating the amino-acids of the proteins in these legumes, in which the protein content ranged from 17.0 to 23.0 per cent.

M. B. Richards.

1804

KLIMENKO, V. G. **Formy azota semyan i belkov nekotorykh sortov soi. [Forms of nitrogen in the seeds and proteins of some kinds of soya.]** *Biokhimiya*, 1954, **19**, 3-9. [Plant Biochem. Lab., Univ. Kishinev.]

A study with special reference to varietal differences and the effect of weather in different harvest years on total N and proteins in soya seeds. Variety had no effect and weather had very little on the total N content of the seeds. Preparations

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of proteins from soya seeds of different varieties did not differ in S, N or amino-acid content. The amino-acid contents, however, did differ in different harvest years.—H. Scherbatoff.

1805

CALÉ, M. T., SPADONI, M. A. and TECCE, G. Frazione dell'azoto solubile dei semi di pisello in germoglio. [The soluble nitrogen fraction in the germinating pea.] *Quad. Nutrizione*, 1952, 12, 527-530. [Ist. Naz. Nutrizione C.N.R., Rome.]

Contrary to previous results with seeds of *Ricinus communis* (*Quad. Nutrizione*, 1952, 12, 389), the increase in soluble N during the germination of peas was not paralleled by a rise in free amino-acids; on the 4th day chromatography revealed appreciable amounts only of α -alanine, and small amounts of glycine, proline, valine and the leucines. On the other hand, acid hydrolysis of the soluble N fraction liberated considerable amounts of aspartic acid, glutamic acid, arginine and lysine and smaller amounts of alanine, γ -aminobutyric acid, serine, valine and the leucines. It is suggested that these amino-acids may be present as acyl derivatives or cyclic compounds, or, as is also possible from Synge's work on ryegrass (*Abst.* 4670, Vol. 21), bound with carbohydrates as in the Maillard reaction.—W. M. Deans.

See also *Abst.* 1735.

Fruits

1806

TANNER, H. and RENTSCHLER, H. Über die Zusammensetzung der Fruchtsäuren von schweizerischen Obstsorten. 2. Die Fruchtsäuren der schweizerischen Mostäpfelsäfte. [Composition of organic acids of Swiss fruit juices. 2. Organic acids of juice of Swiss cider apples.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 305-311. [Eidg. Versuchsanst., Wädenswil.] French and English summaries.

The fermented juice of 14 kinds of Swiss cider apples was studied by the methods previously used for pear juice (*Abst.* 287, Vol. 25). On the average malic acid accounted for about 85 per cent. of the organic acids, citric acid for only 1 to 3 per cent., much less than in pear juice. Quinic acid was very variable, from 3 to 20 per cent. in different varieties. Glycolic acid was also present in small amount.—W. M. Deans.

1807

DICKINSON, D. and GAWLER, J. H. The chemical constituents of Victoria plums: preliminary qualitative analysis. *J. Sci. Food Agric.*, 1954, 5, 525-529. [Fruit and Veg. Canning and Quick Freezing Res. Assoc., Chipping Campden, Glos.]

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1808

SCHADE, G. Über den Pektingehalt der Feigen. [Pectin content of the fig.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, 99, 264-267. [Inst. Chem. Tech., Tech. Hochsch., Karlsruhe.]

1809

ANET, E. F. L. J. and REYNOLDS, T. M. Isolation of mucic acid from fruits. *Nature*, 1954, 174, 930. [Div. Food Preservation and Transport, C.S.I.R.O., Homebush, N.S.W.]

1810

PATHAK, S. P. and MATHUR, S. S. The component acids and glycerides of areca-nut (*Areca catechu*) fat. *J. Sci. Food Agric.*, 1954, 5, 461-465. [Dept. Indust. Chem., Banaras Hindu Univ.]

Details of an investigation into the component fatty acids and glycerides of areca nut oil are presented and discussed in relation to the findings of other workers.—T. D. Bell.

Other Types

1811

THATCHER, F. S. Foods and feeds from fungi. *Annu. Rev. Microbiol.*, 1954, 8, 449-472. [Microbiol. Sect., Food and Drug Div., Dept. Nat. Health Welfare, Ottawa.]

See also *Absts.* 2502, 2761.

Pasture, Hay and Silage

1812

DIJKSTRA, N. D. What has the State Agricultural Experiment Station at Hoorn contributed to research into the feeding value of roughage? *Netherlands J. Agric. Sci.*, 1954, 2, 273-297. [State Agric. Exp. Stat., Hoorn.]

A review and summary of work, mostly published, done at Hoorn on the digestibility and feeding value of fresh grass, hays, silages, and artificially dried herbage. For each feed, regression equations are presented relating crude protein to digestible crude protein, and crude fibre to digestible crude protein, to digestible organic matter and to starch equivalent.—J. L. Corbett.

1813

DE LA HUNT, T. E. The value of browse shrubs and bushes in the lowveld of the Gwanda area, S. Rhodesia. *Rhodesia Agric. J.*, 1954, 51, 251-262. [Dept. Conservation and Extension.]

The growth habits, chemical composition of the edible parts, and attractiveness to animals of the more common browse species are described.

J. L. Corbett.

1814

VIKELAND, N. Forsøk med beiting og hâslått på eng i Troms og Finnmark. [Experiments in

grazing and haymaking on pastures in Troms and Finnmark.] *Forskning og Forsøk Landbruket*, 1954, 5, 393-409. [Statens Forsøks-gard Holt, Trondheim.] English summary.

It is common practice in these districts to graze either in spring or autumn pastures that are cut for hay in summer. Experimental grazing and cutting of both natural and cultivated (collegiate) fields showed that grazing in spring reduced the yield of hay, probably by more than was harvested by grazing, and that grazing in autumn or cutting twice reduced the total yield of hay in the next season and increased the danger of frost damage in winter and the spread of weeds.—I. Leitch.

1815

HILDER, E. J. and SPENCER, K. The influence of sulphur on a natural medicago pasture. *J. Austral. Inst. Agric. Sci.*, 1954, 20, 171-176. [Div. Plant Indust., C.S.I.R.O., Reg. Pastoral Lab., Armidale, N.S.W.]

On a property in New South Wales lambs were reported to be unthrifty and their wool suggested Cu deficiency. No sign of Cu deficiency was seen in the pasture, but phalaris and burr medic contained only 0.08 and 0.13 per cent. S, respectively. The soil was a black silty clay loam which had never received fertiliser.

Experimental plots were treated with superphosphate and gypsum to give from 9.2 to 67.2 lb. S per acre and from 8.1 to 18.6 lb. P. Both fertilisers gave marked improvement in pasture growth, especially in medic. The total yield of pasture components rose with the amount of S, from 7.7 cwt. dry matter per acre on untreated plots to 30.17 on the plots given 34.8 lb. S and 11.6 lb. P per acre. The percentage of medic rose from 47 to 85, that of total N from 3.64 to 5.14 and that of S from 0.17 to 0.38. There was no effect of the P in superphosphate.

Yellowing of leaves was not seen on control plots, so in severe S deficiency it is not a reliable guide. It appeared in plants given a small dressing of copper sulphate. [The effect on grazing animals is not reported.]—D. Duncan.

1816

RAMAGE, C. H., EBY, C., MATHER, R. E., PURVIS, E. R., POULTON, B. R. and WRIGHT, F. Chemical composition and yield of forages fertilized with 0 to 400 pounds of nitrogen per acre. *J. Animal Sci.*, 1954, 13, 1011. *Proc. [New Jersey Agric. Exp. Stat.]*

1817

BIELIŃSKI, K. and BIELIŃSKA, KR. Zmiany ilości i wartości odżywczej sprzętu lucerny w okresie rozwoju jej vegetacji. [Quantitative changes in feeding value of alfalfa in relation

to stage of growth.] *Rocz. Nauk. rol. [B]*, 1954, 67, 449-472. [Inst. Zootech., Zakł. Doświad. Kółka Wielka.] Russian and English summaries.

Sampling of the alfalfa was at 3-day intervals over 6 weeks from late May to early July. Yield of dry matter per unit area increases up to flowering and thereafter decreases. During the period of growth studies, first nitrogenous and later fat and ash constituents fell and simultaneously fibre content rose. For feeding young stock and high-yielding cows it is therefore advantageous to harvest the crop before budding and flowering. [From English summary.]—D. Harvey.

1818

HARDWICK, N. E. Changes in the major chemical constituents of subterranean clover (*Trifolium subterraneum* L.) during growth. 1. The carbohydrates. 2. The non-carbohydrate fractions and their relationship to the carbohydrates. *Austral. J. Agric. Res.*, 1954, 5, 372-382; 383-391. [Inst. Agric., Univ. W. Australia, Nedlands.]

1. Twelve samples of the Dvalganup variety of subterranean clover were collected at stages between 6 weeks after germination and 3 months after death of the plants. Free and total reducing sugars were low in the vegetative growth stage; at the appearance of buds both rose and later, with the onset of wilting, they fell rapidly. Reserve carbohydrate was highest at the first sampling; fructosans were not detected. Cellulose remained low for a long period but rose, more especially in early wilting; encrusting hemicelluloses were remarkably constant. In these respects subterranean clover resembles other legumes.

2. Four non-carbohydrate components were studied in the same samples. Lignin remained low during growth but rose greatly during wilting. Ethanol-benzene extractives fell rapidly during wilting. In estimations made on only half the samples, ash increased gradually and then fell, and crude protein decreased slowly from the level at the early sampling. The ratio cellulose: lignin was 7 to 8:1 in earlier stages and 4 to 2:1 after wilting.—D. Harvey.

1819

ROBERTSON, H. and BARNETT, A. J. G. The free amino-acids present in fresh and in fermented marrow stem kale. *J. Agric. Sci.*, 1954, 45, 36-40. [Div. Agric. Biochem., Dept. Biol. Chem., Univ. Aberdeen.]

Kale-water slurries were allowed to ferment at room temperature under conditions of aeration, anaerobiosis and partial sterilisation with SO_2 for 16 weeks. Samples withdrawn daily and later weekly were shown by paper chromatography to

contain the following amino-acids: aspartic acid, glutamic acid, serine, glycine, threonine, alanine, arginine, lysine, γ -aminobutyric acid, tyrosine, proline, valine and leucines.

In anaerobic conditions serine and tyrosine disappeared within a week and threonine after 8 weeks with simultaneous appearance of α -aminobutyric acid in considerable quantity. The latter acid, present only in traces in the other 2 slurries, was possibly formed from threonine by micro-organisms. Under continuous aeration there was an apparent maximum at 3 days followed by a rapid loss of the amino-acids, some being present only in traces after 14 days. In the presence of SO_2 and absence of oxygen the amino-acids remained constant and increased slightly in the later stages.

The beneficial effects of excluding air and the presence of SO_2 are evident in maintaining the amino-acid content in silage.—A. Hepburn.

1820

WARD, R. M., ALLEN, R. S. and JACOBSON, N. L. Polyunsaturated fatty acid content of legume-grass silages. *J. Animal Sci.*, 1954, 18, 1013. *Proc.* [Iowa State Coll.]

See also Absts. 1584, 1618, 1679, 1744, 1745, 1748, 1781.

MISCELLANEOUS

1821

BISERTE, G. and SCRIBAN, R. Protéines, peptides et acides aminés du malt, du moût et de la bière: origine, évolution, valeur alimentaire. [Proteins, peptides and amino-acids in malt, must and beer: origin, evolution and food value.] *Ann. Nutrit. Alimentation*, 1954, 8, 699-721. [Lab. Chim. Biol., Fac. Méd., Lille.]

1822

AMERINE, M. A. Composition of wines. 1. Organic constituents. *Advances in Food Res.*, 1954, 5, 353-510. [Dept. Viticult. Encl., Coll. Agric., Univ. California.]

1823

THALER, H. Die löslichen Kohlenhydrate der Kakaobohne. [Soluble carbohydrates of cocoa

beans.] *Naturwissenschaften*, 1954, 41, 432. [Deutsch. Forschungsanst. Lebensmittelchem., Munich.]

Paper chromatography of extracts of Arriba cocoa revealed the presence of 2 carbohydrates in addition to glucose, fructose and sucrose, one a trisaccharide, the other probably a tetrasaccharide. It is suggested that these are raffinose and stachyose. Traces of a pentose and a methylpentose were also detected. The same carbohydrates were also found in a sample of cracked beans from Accra, as well as another carbohydrate, possibly a trifructose anhydride.

It is pointed out that the presence of raffinose and stachyose implies that the normal estimation of "sucrose" in raw cocoa or its products does not give a true picture.

The Arriba sample contained much glucose but hardly any fructose and the Accra one very little of either. Further studies are in progress.

W. M. Deans.

1824

CARTWRIGHT, R. A. and ROBERTS, E. A. H. Theogallin, a polyphenol occurring in tea. *J. Sci. Food Agric.*, 1954, 5, 593-597. [Indian Tea Assoc. Chem. Lab., Butler's Wharf, London.]

1825

CARTWRIGHT, R. A., ROBERTS, E. A. H. and WOOD, D. J. Theanine, an amino-acid *N*-ethyl amide present in tea. *J. Sci. Food Agric.*, 1954, 5, 597-599. [Indian Tea Assoc. Chem. Lab., Butler's Wharf, London.]

1826

CARTWRIGHT, R. A. and ROBERTS, E. A. H. The sugars of manufactured tea. *J. Sci. Food Agric.*, 1954, 5, 600-601. [Indian Tea Assoc. Chem. Lab., Butler's Wharf, London.]

1827

HÖGL, O., RUFFY, J. and WYLER, O. Liste der als Lebensmittel zugelassenen Kräuterteesorten. [List of herb teas recognised as foods.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 241-250. [Lab. Eidg. Gesundheitsamt., Berne.]

3. VITAMINS

GENERAL

1828

- UNGLAUB, W. G., GOLDSMITH, G. A. and GIBBENS, J.
Recent advances in nutrition and metabolism.
2. Review of the literature on vitamins. 1952.
Arch. Int. Med., 1954, **94**, 618-647. [Div.
Metabol. Nutrit., Dept. Med., Sch. Med.,
Tulane Univ., New Orleans, La.]

1829

- HARRIS, L. J. Re-appraisal of the rôle of vitamins.
Chem. and Indust., 1954, No. 49, 1494-1499.
[Dunn Nutrit. Lab., Univ. Cambridge.]

1830

- USCELLI, F. and PIANA, G. Zehn Jahre Erfahrungen und Beobachtungen in der Vitaminforschung auf zootechnischen Gebiete. [Ten years' progress in vitamin research in animal husbandry.] *Arch. Tierernährung*, 1954, **4**, Beihefte, No. 4, 87-106. [Versuchsstat. Zootec., Univ. Milan.]

A review is given of progress in the knowledge of vitamins A, D, E, K, B complex and C in relation to improvement of animal husbandry.

A. M. Copping.

1831

- SCHNEUR, A. and BRÜGGEMANN, J. Fragen der Vitaminierung von Futtermitteln. [Questions of adding vitamins to feedingstuffs.] *Arch. Tierernährung*, 1954, **4**, 74-75. *Proc.* [Potsdam, Rehbrücke.]

1832

- CROSBY, M. W., FICKLE, B. E., ANDREASSEN, E. G., FENTON, F., HARRIS, K. W. and BURGAIN, A. M. Vitamin retention and palatability of certain fresh and frozen vegetables in large-

scale food service. *Cornell Agric. Exp. Stat. Bull.* No. 891, June 1953, pp. 47. [Ithaca, N.Y.]

The study was made in the cafeteria of the College of Home Economics, University of New York. Ascorbic acid, vitamin B₁ and riboflavin were estimated before and after bulk cooking of Brussels sprouts, cabbage, cauliflower, rutabagas, spinach, frozen broccoli, Lima beans and peas. They were cooked by steaming and by boiling in a steam-jacketed kettle or open pot. Such variables as the amount of salt or water and the length of cooking time were recorded. The length of time for which the cooked vegetables were kept hot before serving was investigated also.

The retention of vitamins in vegetables cooked by the same method was not always the same. When boiled in an open pot or steam-jacketed kettle, the vegetables retained over 50 per cent. of each of the vitamins. Most of the vegetables retained more vitamins when steamed than when boiled; though still acceptable, some vegetables cooked by steaming were not as palatable as when boiled.

When vegetables were kept hot in a dry-heat counter, a steam counter or a bain-marie there was no further loss of vitamin B₁ or riboflavin; but ascorbic acid continued to be destroyed, and palatability decreased.

Starting in cold water instead of boiling water did not affect vitamin retention. None of the vegetables showed a difference in vitamin B₁ or riboflavin retention whether cooked with or without salt; the same was true for ascorbic acid in all vegetables except cabbage, which retained more when the water was salted.—G. F. Garton.

See also Abst. 1803.

VITAMIN A

1833

- ROSENER, L. and KAN, H. A chromatographic-spectrophotometric method for determination of vitamin A in margarine. *J. Assoc. Off. Agric. Chem.*, 1954, **37**, 887-894. [Lab. Vitamin Technol., Chicago, Ill.]

The unsaponifiable fraction of 10 g. of the margarine was dissolved in light petroleum and passed through a column of alkali-treated alumina. The vitamin A was eluted with light petroleum containing increasing concentrations of ethyl ether, and the course of the vitamin A was followed in weak ultraviolet light. The spectrophotometric measurement was made in isopropanol at 325 mμ. Recovery of from 95 to 105 per cent. was obtained

when vitamin A was added to unfortified margarine and from 102 to 108 per cent. when carotene was added.—R. J. Ward.

1834

- HENRY, K. M. and THOMPSON, S. Y. The determination of vitamins A and D in milk and milk products. *Milchwissenschaft*, 1954, **9**, 14-15. [Nat. Inst. Res. Dairying, Univ. Reading.] German and French summaries.

The methods are described in detail which are used at the National Institute for estimating vitamin A by physicochemical and biological methods, and vitamin D by a biological method.

E. M. Hume.

N.A. and B., April 1955

1835

WILKIE, J. B. and JONES, S. W. **Standardization of alumina adsorbents for vitamin A chromatography.** *J. Assoc. Off. Agric. Chem.* 1954, **37**, 880-887. [Food and Drug Admin., Dept. Health, Education and Welfare, Washington 25, D.C.]

A sample of 1 g. of the alumina in 5 ml. petrol was mixed with 0.5 mg. of the dye FD and C Yellow No. 4 in 1 ml. light petroleum, and transferred to a chromatographic tube of 12 mm. diameter. Suction was applied to the column until it was just dry and 25 ml. petrol was poured through. The entire filtrate was made to volume, and the amount of dye in the filtrate was measured at 438 m μ . in a spectrophotometer. The dye retention of several untreated and alkali-treated samples of alumina was estimated, and compared with their efficiency in the estimation of vitamin A in margarine. From the results obtained it appeared that a dye retention of from 20 to 50 per cent. provided an adequate working range of adsorbent activity.—R. J. Ward.

1836

BURNASHEVA, S. A. **Kristallicheskie efiry vitamina A. [Crystalline esters of vitamin A.]** *Biokhimiya*, 1954, **19**, 246-256. [Inst. Biokhim. A. N. Bakha, Akad. Nauk SSSR, Moscow.]

Vitamin A concentrates containing from 76 to 78 per cent. of vitamin A were obtained by a process of molecular distillation, saponification, gradual freezing-out and repeated high-vacuum distillation. A complex ester of vitamin A and anthraquinone-carboxylic acid was obtained in crystalline form. Complex esters were formed also with acetic acid and β -naphthoic acid. The biological activity of the crystalline compound was 1,256,500 I.U. per g.—D. W. Taylor.

1837

AMES, S. R. and HARRIS, P. L. **Identification of the so-called "lard factor" as vitamin A.** *Science*, 1954, **120**, 391-393. [Res. Labs., Distillation Products Indust., Div. Eastman Kodak Co., Rochester 3, N.Y.]

Freshly rendered lard was subjected to molecular distillation at 215° C. and 10⁻³ mm. mercury pressure. The first fraction, representing about 10 per cent. of the original lard, was removed and saponified and vitamin A was estimated in it by the Carr Price reaction. Eight samples of lard were examined, and contained from 5.5 to 28 "units" [probably U.S.P.U.] per g. distillate, representing from 0.5 to 2.5 "units" per g. original lard. When a lard distillate and a sample of the unsaponifiable matter from it were tested by the U.S.P. biological method, the potency of the original lard distillate was 5.01 \pm 1.18 "units"

per g. and of the unsaponifiable matter 62.5 \pm 9.9 "units" per g., compared with 6.18 and 135 "units" per g. by the Carr Price test. Positive identification of vitamin A in two distillates was made by applying the anhydrous HCl dehydration of Shantz *et al.* (Abst. 2012, Vol. 13).

R. J. Ward.

1838

LAUGHLAND, D. H. **The biosynthesis of ¹⁴C- β -carotene and its use in metabolic studies with chickens.** *10th World's Poultry Congr. Sect. Papers*, Edinburgh, 1954, 157-160. [Chem. Div., Sci. Serv., Canada Dept. Agric.]

1839

GLOVER, J. and REDFERN, E. R. **The mechanism of the transformation of β -carotene into vitamin A in vivo.** *Biochem. J.*, 1954, **58**, xv-xvi. [Dept. Biochem., Univ. Liverpool.]

1840

MILLEN, J. W., WOOLLAM, D. H. M. and LAMMING, G. E. **Congenital hydrocephalus due to experimental hypovitaminosis A.** *Lancet*, 1954, **267**, 679-683. [Dept. Anat., Univ. Cambridge.]

Female rabbits were given a diet deficient in vitamin A for up to 38 weeks before mating and during pregnancy. Twelve litters from 11 dams were examined, 4 from dams fed on the deficient diet for from 16 to 21 weeks before mating. The 13 young from the latter group were stillborn or died within 24 hr. after birth. The young in the remaining 8 litters were removed when the dams were killed on the 29th day of pregnancy; the dams had been on the deficient diet for from 14 to 38 weeks before mating. Animals fed on the same diet with supplements of vitamin A were killed on the 29th day of gestation also. Coronal sections were cut through the heads of the young from deprived and non-deprived dams. Hydrocephalus was present in 47 of the total 51 young from the depleted dams. Estimation of vitamin A in the liver of the dams which were killed showed from 0 to 10 I.U. per g. The cause of hydrocephalus is obscure, but it is suggested that there may be an overproduction of cerebrospinal fluid and possibly also some constriction of the cerebral aqueduct.—I. M. Sharman.

1841

LAMMING, G. E., WOOLLAM, D. H. M. and MILLEN, J. W. **Hydrocephalus in young rabbits associated with maternal vitamin A deficiency.** *Brit. J. Nutrition*, 1954, **8**, 363-369. [Agric. Res. Council Unit Animal Reproduction, Huntingdon Rd., Cambridge.]

Rabbits from an inbred strain were fed on a pelleted diet without vitamin A or with a weekly supplement of 7500 μ g. vitamin A acetate. After 14 weeks all were mated. Nine litters were obtained from 8 females with incipient vitamin A deficiency and were compared with 9 litters obtained from 8 non-deprived females. The young from the non-deprived females received no vitamin A other than that obtained from the mother's milk. The young from the deprived females developed convulsions, paralysis and head retraction from 21 to 74 days after birth. After they had died their skulls were sectioned in the coronal plane, the brain remaining *in situ*. Similar sections were made from the young of the non-deprived females. Twenty-six of 35 young from does fed on the deficient diet had hydrocephalus with stenosis of the cerebral aqueduct, but such abnormalities were not seen in any of the young of the non-deprived females. The results suggest that the papilloedema and compression of the optic nerve observed in vitamin A deficiency may be a direct result of increased pressure in the subarachnoid space in the region of the optic foramen.

I. M. Sharman.

1842

MOURRIQUAND, G., ROLLET, J. and EDEL, V. Avitaminose A du rat et problèmes nutritionnels posés par la nécrophagie. [Vitamin A deficiency in the rat and nutritional problems set by cannibalism.] *C.R. Soc. Biol.*, 1954, **148**, 1260-1262.

During researches on the toxicity of naphthalene it was found that the ocular signs associated with deficiency of vitamin A were delayed in rats that had resorted to cannibalism. A rat given a diet deficient in the vitamin for 14 days devoured another rat in the same cage which had eaten the same diet for the same time. Signs of xerophthalmia, measured by the ophthalmoscope, were delayed for 3 months. The same observation was made on 3 other rats. Dietary deficiency is not, however, responsible for cannibalism, since rats fed on a complete mixed diet also eat their dead.

I. M. Sharman.

1843

ROBERTSON, W. van B. and CROSS, V. Collagen formation in vitamin A-deficient rats. *J. Nutrition*, 1954, **54**, 81-86. [Div. Exp. Med., Coll. Med., Univ. Vermont, Burlington.]

Numerous weanling rats were given a basal diet deficient in vitamins A and C for 3 weeks, some only of them being given liberal doses of vitamin A or C or both. All were then injected subcutaneously with an extract of Irish moss to promote formation of new fibrous tissue, further rats being at the same time included in the groups given

vitamins A and C. Fourteen days after the injection of Irish moss extract the rats were killed, and collagen was estimated in the repair tissue round the site of injection. The concentration of collagen in the deficient rats was the same as in normal animals which had been injected with moss extract, and was not influenced by the administration of vitamin A or C. The results are at variance with the view that vitamin A deficiency produces deficiency of vitamin C in the rat as a secondary effect. [Data on the total amount of collagen formed, as opposed to its concentration, are not included.]—T. Moore.

1844

FORTNER, J. G. (with KOHEN, A. N.) Experimental studies of gallstone formation. *Surgery*, 1954, **36**, 932-940. [Div. Exp. Surg., Sloan-Kettering Inst., New York.]

The fat-free purified diet, described by Dam and Christensen as giving rise to gallstones in hamsters (*Acta pathol. microbiol. scand.*, 1952, **30**, 236; *Abst.* 4874, Vol. 23), was given to weanling Syrian hamsters with modifications of the vitamin A and D supplements. If vitamin A or vitamin D was omitted the incidence of gallstones rose. The effect of vitamin A deficiency was statistically significant; that of vitamin D deficiency was not but was considered highly suggestive. Gallstones were not found in hamsters receiving a normal laboratory diet, but on the purified diet even with vitamins A and D they occurred in 10 per cent. of the animals. The stones were composed mainly of crystalline cholesterol and were frequently embedded in a gelatinous mucoid mass in the lumen of the gallbladder. Attempts to discover the mechanism of gallstone formation are in progress.—A. M. Copping.

1845

ERICHSEN, S., HARBOE, A. and LINDBERG, W. An attempt to produce manifest toxoplasmosis in vitamin A deficient rats. *Nord. Vet.-Med.*, 1954, **6**, 791-794. [Vet. Coll. Norway, Oslo.] German and Norwegian summaries.

Weanling rats were given a diet low in vitamin A until, after 4 weeks, deficiency was shown by loss of weight or xerophthalmia. Half the animals were then given vitamin A at the rate of 2 I.U. daily, which was barely adequate for survival. The remainder were given 25 I.U. vitamin A daily, which sufficed for rapid growth. One week after treatment began, half the animals receiving each dose were injected subcutaneously with peritoneal exudate from mice infected with the R.H. strain of *Toxoplasma*. The animals were continued for 4 more weeks and were then killed. The differences between the groups during life and at autopsy depended on the amount of vitamin A given, and

N.A. and R., April 1955

not on the infection with *Toxoplasma*, which could not be found in any of the animals. Vitamin A deficiency did not, therefore, increase the liability to infection by *Toxoplasma*.—T. Moore.

1846

GALLIGANI, G. Malattie della sfera genitale femminile e vitamina A. [Disorders of the female genital tract and vitamin A.] *Riv. Zootec.*, 1954, 27, 274-275.

It is considered that vitamin A can be given with advantage to cows that have infections of the epithelium of the genital tract leading to sterility.—E. M. Hume.

1847

BALAKHOVSKIĖ, S. D., VOSKRESENSKAYA, E. V. and FEDOROVA, V. N. Raspreделение ^{35}S v organakh i tkanyakh normal'nogo i A-avitaminizirovannogo organizma posle vnutribryushnogo vvedeniya mechen'nogo po sere metionina. [Distribution of ^{35}S in organs and tissues of the normal and vitamin-A-deficient organism after intraperitoneal injection of sulphur-labelled methionine.] *Dokl. Akad. Nauk. S.S.S.R.*, 1954, 97, 115-118. [Inst. Biokhim. A. N. Bakha, Akad. Nauk SSSR.]

The distribution of sulphur (^{35}S) in tissues of normal and vitamin-A-deficient rats was estimated at intervals after intraperitoneal injection of labelled methionine. After 48 hr. there was a significantly higher content of ^{35}S in the liver and kidneys of the deficient animals. Between 5 and 10 days after injection the values were much lower in both groups, and there was no significant difference between the groups. It is suggested that vitamin A deficiency may inhibit intracellular oxidation and excretion of sulphur.—D. W. Taylor.

1848

LEUTSKIĖ, K. M. and LYUBOVICH, E. N. O soderzhanii fosfatidov i nenasyshchennykh zhernykh kislot v svyazi s izmeneniem oksitel'nykh protsessov b tkanyakh krysa pri nedostatochnosti vitamina A. [Relation between phosphatide and unsaturated fatty acid content, and altered oxidation processes in the tissues of vitamin-A-deficient rats.] *Dokl. Akad. Nauk S.S.S.R.*, 1954, 96, 341-342. [Chernov. Gosud. Univ.]

Phosphatides and unsaturated fatty acids were estimated in the tissues of normal and vitamin-A-deficient white rats. The experiments lasted for from 2 to 2½ months, the initial weight of the animals being about 50 g. In the deficient rats, the phosphatide content of the kidneys, lungs and brain was significantly raised, by 91, 73 and 31 per cent., respectively, and the iodine value for the

fat in the liver, kidney and lungs was increased by 25, 14 and 17 per cent., respectively.

D. W. Taylor.

1849

HIGH, E. G., SMITH, H. C. (JR.), TAYLOR, H. H. and WILSON, S. S. Antioxidant studies concerned with the metabolism of carotene and vitamin A. *J. Biol. Chem.*, 1954, 210, 681-686. [Lab. Biochem. Res., Prairie View Agric. and Mech. Coll., Tex.]

When albino rats deprived of vitamin A were given 33 μg . carotene in cottonseed oil daily for 25 days, 78.0 μg . were deposited in the liver and 16.0 in the kidneys. When 10 mg. 2:5-ditertiary butylhydroquinone were given with the same amount of carotene, the liver and kidneys had 45.0 and 14.5 μg .; with 10 mg. octylhydroquinone the amounts were 32.2 and 19.2 μg .; and with 10 mg. ditertiary butyl-4-hydroxyanisole 39.1 and 13.0 μg . respectively. When 13 μg . vitamin A were given for 20 days alone or with 10 mg. α -tocopheryl acetate, 10 mg. monotertiary butylhydroquinone or 10 mg. octylhydroquinone, the total amounts of vitamin A deposited in the liver and kidneys were, respectively, 47.5, 47.0, 46.1 and 46.4 μg . Young rats with low initial vitamin A reserves were given 33 μg . carotene alone or with 10 mg. 2:5-ditertiary butylhydroquinone or 10 mg. ditertiary butyl-4-hydroxyanisole and faeces were collected every 24 hr. for 4 days. The percentage of carotene excreted was 47.6, 46.8 and 52.4, respectively. When the supplements were given in rancid olive oil the percentage excretions were 31.5, 51.0 and 50.0, respectively.

All the anti-oxidants protected carotene from oxidative decomposition at 60° C. *in vitro*.

R. J. Ward.

1850

GANGULY, J. Intracellular distribution of vitamin A esterase activity in rat liver. *Arch. Biochem. Biophys.*, 1954, 52, 186-189. [Dept. Biochem. Nutrit., Univ. S. California, Los Angeles.]

Livers from rats which had been depleted of vitamin A were chilled and homogenised in 0.25 M sucrose solution. Cell constituents in the homogenate were separated with the ultracentrifuge into mitochondrial, microsomal, nuclear and supernatant fractions, each of which was incubated with purified vitamin A acetate, and the amount of vitamin A alcohol formed was estimated. The nuclear, mitochondrial and supernatant fractions were almost inactive, but the microsomal fraction was almost as active as the whole homogenate.

R. J. Ward.

1851

MONTAGNA, W. Penetration and local effect of vitamin A on the skin of the guinea pig. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 668-672.

[Arnold Biol. Lab., Brown Univ., Providence, R.I.]

The penetration of vitamin A through the skin of guinea pigs was studied by clipping the hair from the backs and giving one topical application of a 0.5 per cent. solution of the vitamin in alcohol, chloroform, oleic acid, or linoleic acid, or of a preparation of the vitamin made up with petrolatum, zinc oxide and talcum. Specimens of skin were taken by biopsy 10 min. 1 hr. and 2 hr. later, and sometimes after 4 and 8 hr. Frozen sections were cut without fixation, and the penetration of the vitamin was studied by fluorescence microscopy. With the alcoholic solution the stratum corneum and the sebium in the pilosebaceous orifices exhibited the greenish-yellow fluorescence characteristic of vitamin A after 10 min., and after 1 hr. the fluorescence had reached the sebaceous glands. In chloroform the penetration was even more rapid, but in the other media it was much slower.

In order to study the behaviour of the vitamin dissolved in oleic or linoleic acid, an open aluminium tube, 0.6 cm. wide by 1.2 cm. deep, was attached to the back of the animal by means of methyl methacrylate and adhesive tape. The tube, filled with the solution under investigation, was sealed and left in contact with the skin for up to 12 days. In alcoholic solution the vitamin was applied to the skin twice daily. With vitamin A dissolved in the fatty acids there was hypertrophy of the skin, but the same change was produced by the acids alone. The vitamin dissolved in alcohol also caused hypertrophy, which with alcohol alone was slight. The fatty acids, with or without vitamin A, appeared to retard keratinisation, but vitamin A in alcohol did not. Even massive doses of vitamin A in alcohol did not impair the growth of hair.—T. Moore.

1852

ARNRICH, L. and MORGAN, A. F. The utilization of carotene by hypothyroid rats. *J. Nutrition*, 1954, 54, 107-119. [Dept. Home Econ., Univ. California, Berkeley.]

Young male rats depleted of vitamin A were fed on a diet deficient in vitamin A supplemented with 35 μ g. carotene daily. On attaining 200 g. weight the animals were divided into 4 groups, and those in 2 groups were made hypothyroid by inclusion in the diet of 0.15 per cent. thiouracil. One control and 1 hypothyroid group were next given 86 μ g. vitamin A daily for 7 weeks. The remaining 2 groups were given 440 μ g. carotene daily for the same period. After a subsequent depletion period of 2 weeks the rats were autopsied. Vitamin A in the livers of the hypothyroid rats given vitamin A averaged 495 \pm 27 μ g., the corresponding value for the control rats being 370 \pm 33 μ g. The groups given carotene had average values of

271 \pm 40 μ g. vitamin A for the hypothyroid animals and 106 \pm 23 μ g. for the controls.

In further tests male and female rats, both normal and hypothyroid, were given similar and twenty times the previous amounts of carotene. With the twenty-fold dose the amount of vitamin A stored in the liver was similar for the hypothyroid and control rats, average values ranging from 352 to 465 μ g. In another trial rats were allowed to build up uniform liver stores of vitamin A. In 12 of them steres averaged 335 μ g. for males and 513 μ g. for females. The remaining rats were grouped into sets of three of the same sex and bodyweight, each set including one control animal, one hypothyroid and one pair-weighted control, which was matched in bodyweight gain against a deficient animal by restricting food intake. They were killed after 10 weeks during which no carotene was given. Average values for vitamin A in the liver were then found to be greatly reduced, the respective values for the control, hypothyroid and pair-weighted control animals being 18, 57 and 50 μ g. for males and 47, 100 and 95 μ g. for females. The control male rats retained 5 per cent. of the initial amount after the depletion period, the hypothyroid animals retained 16 per cent. Corresponding values for females were 9 and 19 per cent. The calorie-restricted animals retained almost the same percentages as the hypothyroid rats.

I. M. Sharman.

1853

LAUGHLAND, D. H. and PHILLIPS, W. E. J. The effect of sodium bentonite administration on vitamin A metabolism in the rat. *Canad. J. Biochem. Physiol.*, 1954, 32, 593-599. [Chem. Div., Sci. Serv., Canada Dept. Agric., Ottawa.]

Sodium bentonite, an acid clay, has been recommended as a lubricant for the dies of machines used for the manufacture of diet pellets. It has been claimed that a harder and more attractive pellet results when 2 per cent. of the compound is included in the diet. It is reported now that inclusion of the compound severely limits the ability of rats deficient in vitamin A to store the vitamin. Six groups of albino rats were given a diet deficient in vitamin A. After 3 weeks vitamin A acetate was added to the diet of 5 of the groups at the rate of 10,000 I.U. vitamin A per kg. diet, and they received 0, 0.5, 1.0, 1.5 or 2.5 per cent. of sodium bentonite. After a further 3 weeks, vitamin A was estimated in the liver and the amount averaged 12 I.U. per liver for the rats not given vitamin A, and 181, 109, 47, 44 and 15 I.U., respectively, for the groups having bentonite in the order given above.

In a second, similar experiment the supplement of vitamin A was increased to 20,000 I.U. per kg. diet, and the animals were killed after 6 days.

N.A. and R., April 1955

The corresponding average content of vitamin A in the liver was then 8, 152, 61, 57, 28 and 7 I.U. When similar amounts of sodium bentonite were given to normal rats no significant change was found in the amount of vitamin A stored in the liver. In a further experiment 7 groups of rats were given for 14 days a diet deficient in vitamin A, but supplemented with 24 mg. β -carotene per kg., without sodium bentonite or with 0.5, 1.0, 1.5, 2.0 or 3.0 per cent. A seventh group received 3 per cent. Alphacel, a ground cellulose preparation providing bulk without energy value. The average content of vitamin A in the liver of the 7 groups as shown above was 622.5, 492.3, 495.2, 385.5, 445.0, 313.3 and 539.6 I.U., respectively. The weight of the liver per 100 g. bodyweight was significantly increased in all the groups receiving more than 0.5 per cent. sodium bentonite. The group having Alphacel also had a significantly higher liver weight. Storage of vitamin A was thus less in all groups given sodium bentonite than in those without it.—I. M. Sharman.

1854

LAUGHLAND, D. H. and PHILLIPS, W. E. J. **The adsorption of vitamin A by sodium bentonite.** *Canad. J. Biochem. Physiol.*, 1954, **32**, 610-620. [Chem. Div., Sci. Serv., Canada Dept. Agric., Ottawa.]

Sodium bentonite was added to solutions of vitamin A in Skellysolve B and allowed to stand in the dark; a blue adsorption complex was formed so that 17.50 μ mol. vitamin A alcohol were adsorbed by 1 g. bentonite from a solution containing 21.22 μ mol. of the vitamin. Sodium bentonite had a greater affinity for vitamin A alcohol than for the acetate or palmitate. In addition to the physical adsorption of the vitamin on sodium bentonite, spectrographic analysis of the resulting solutions revealed that a chemical change occurred in the vitamin A molecule, giving rise to anhydrovitamin A with an absorption maximum at 370 $m\mu$. When excess vitamin A had been removed with fresh Skellysolve B, the adsorbed product could be extracted with diethyl ether, but the blue colour was destroyed and a secondary reaction product was formed as an orange-coloured oil. Experiments were made with different proportions of vitamin A and sodium bentonite, the mixture being allowed to stand for varying times before removal of the supernatant fraction. From spectrographic results obtained with the reaction mixtures, equations were evolved from which it was possible to calculate the amount of vitamin A alcohol and anhydrovitamin A present at any time after the beginning of the reaction. Satisfactory agreement between calculated and observed values was obtained. The

compound extracted with ether had the characteristics of triene conjugation and an absorption maximum at about 290 $m\mu$.—I. M. Sharman.

1855

BRIGGS, G. M. and SPIVEY, M. R. **Vitamin A deficiency in chicks produced by feeding bentonite in synthetic diets.** *Poultry Sci.*, 1954, **33**, 1044-1045. *Proc.* [Nat. Inst. Health, Pub. Health Serv., Bethesda, Md.]

1856

HAYS, R. L. and KENDALL, K. A. **The maintenance of pregnancy in the vitamin A deficient rabbit with progesterone.** *J. Animal Sci.*, 1954, **13**, 1020-1021. *Proc.* [Univ. Illinois.]

1857

KENDALL, K. A., HAYS, R. L., McDONALD, L. E. and ROLLER, G. D. **Carotene and vitamin A levels in bovine plasma and colostrum associated with parturition progesterone administration.** *J. Animal Sci.*, 1954, **13**, 1023. *Proc.* [Univ. Illinois.]

1858

SHEFFY, B. E., DROULISOS, N., LOOSLI, J. K. and WILLMAN, J. P. **Vitamin A requirements of baby pigs.** *J. Animal Sci.*, 1954, **13**, 999. *Proc.* [Cornell Univ.]

1859

HARMS, R. H. and COUCH, J. R. **The effect of dietary supplements on the storage of vitamin A in chick livers.** *Poultry Sci.*, 1954, **33**, 1089. *Proc.* [Texas Agric. and Mech. Coll. System, College Station.]

1860

BAKER, F. H., POPE, L. S. and MACVICAR, R. **The effect of vitamin A stores and carotene intake of beef cows on the vitamin A content of the liver and plasma of their calves.** *J. Animal Sci.*, 1954, **13**, 802-807. [Oklahoma Agric. Exp. Stat.]

Hereford cows in 4 groups of 5 were given a basal ration with no added carotene, or with 300 mg. carotene per head during lactation, or with 60 mg. during gestation, or with 60 mg. during gestation and 300 mg. during lactation. Values are presented for vitamin A and carotene in the liver and plasma of the cows 5 months before parturition, at parturition, and 3 months afterwards, and of the calves at birth and at 3 months of age, and for colostrum at parturition, and for milk after 1 week and 3 months.—R. J. Ward.

1861

ROUSSEAU, J. E. (JR.), DEMBICZAK, C. M., DOLGE, K. L., EATON, H. D., BRALL, G. and MOORE, L. A. Relationship between plasma vitamin A and liver vitamin A in calves fed a vitamin A depletion ration and calves fed minimum levels of vitamin A or carotene. *J. Dairy Sci.*, 1954, **37**, 1376-1382. [Dept. Animal Indust., Storrs Agric. Exp. Stat., Conn.]

Calves were given a ration deficient in vitamin A until the blood plasma concentration had decreased to the desired value of 2.0 μg . per 100 ml., when they were slaughtered. Other calves were given the same ration until the blood plasma value had decreased to 10 μg . per 100 ml., when they were given 2, 4, 6, 8 or 10 μg . vitamin A, or 12, 18, 24, 30 or 36 μg . carotene, per lb. bodyweight daily for 142 days. Vitamin A was estimated in the plasma and liver at the time of slaughter, and the log of the value in μg . per 100 ml. plasma was plotted against the log of the value in μg . per 100 g. liver. In both the depleted group and the groups receiving vitamin A or carotene, a straight line relationship was found of the type $Y = a + bX$, where $Y = \log$ plasma concentration and $X = \log$ liver concentration. For the depleted group a was found to be 0.30 and b 0.2964; for the supplemented a was 0.50 and b 0.2846.—R. J. Ward.

1862

ELLMORE, M. F. and SHAW, J. C. The effect of feeding soybeans on blood plasma carotene and vitamin A of dairy calves. *J. Dairy Sci.*, 1954, **37**, 1269-1272. [Dairy Dept., Maryland Agric. Exp. Stat., College Park.]

Twenty-two calves, mainly Holsteins, about 3 months old, were fed on a deficient diet for from 50 to 80 days until the plasma vitamin A fell to about 4 μg . per cent. They were then assigned to one of 6 groups, 2 calves in each group being used as controls and 2 for test. For 2 groups the same 2 calves acted as controls. Test animals in groups 1, 2 and 3 were given a concentrate mixture containing 30 per cent. ground raw soya beans, the controls a mixture containing cottonseed oil, and both test animals and controls received, respectively, 32, 48 or 64 μg . carotene daily per lb. bodyweight. Group 4 were given 32 μg . carotene per lb. bodyweight daily; the test animals were given roasted soya beans and the controls were the same animals as for group 1. Group 5 all received the raw soya bean diet and 32 μg . carotene, the test calves having iodinated casein in addition. In group 6, 8 μg . vitamin A ester per lb. bodyweight daily was given instead of carotene; the diets were the same as for groups 1, 2 and 3. In groups 1 and 2 the soya beans depressed the mean plasma vitamin A value from 9.60 to 6.12 and

from 12.17 to 7.71 μg . per 100 ml., respectively. Calves in group 3 showed no significant depression of the plasma vitamin A. The roasted soya beans depressed plasma vitamin A from 9.60 to 4.75. There was no appreciable difference in the plasma values for group 5 but in group 6 the value was depressed from 8.54 to 5.05. The results show that, to allow a safety margin, a minimum of 64 μg . carotene per lb. bodyweight daily should be provided when soya beans constitute 30 per cent. of the ration.—I. M. Sharman.

1863

JACOBSON, N. L., ALLEN, R. S., BLAKE, J. T. and HOMMEYER, P. G. The effect of method of administration on the absorption and storage of vitamin A by dairy calves. *J. Nutrition*, 1954, **54**, 143-153. [Iowa Agric. Exp. Stat., Ames.]

Twenty-four dairy calves were reared on a diet without vitamin A until the concentration of the vitamin in the plasma was on the average 8 μg . per 100 ml. The animals were divided into 4 groups, each containing 5 Holsteins and one Brown Swiss. Vitamin A was then given twice weekly to each group at the rate of 10,500 μg . per 100 lb. bodyweight for 6 weeks. Calves in groups 1 and 2 were given the vitamin in skimmed milk from a nipple bottle. In group 1 the vitamin was dissolved in maize oil; in group 2 it was emulsified with Tween 80. The calves in groups 3 and 4 were given their supplement by capsule, the vitamin being dissolved in maize oil for group 3 and emulsified with Tween 80 for group 4. After the period with supplements each calf continued to receive the same deficient diet until the concentration of vitamin A in the blood plasma fell to an average for 2 successive weeks of 5 μg . per 100 ml. Carotenoids and vitamin A were estimated in venous blood specimens taken at weekly intervals. The estimations showed that the best absorption of vitamin A was by the calves given their supplement emulsified in milk, values of between 15 and 17 μg . vitamin A per 100 ml. plasma being obtained for the period between 2 and 6 weeks after the supplement began. Corresponding values for the other forms of supplement were about 13 μg . or less per 100 ml. The depletion times after the supplements were stopped showed that the animals given the vitamin emulsified in milk had the largest stores of vitamin A, the times for groups 1, 2, 3 and 4 being approximately 24, 43, 19 and 34 days, respectively. Possible causes for the good absorption with the aqueous dispersion of the vitamin are discussed.—I. M. Sharman.

1864

DAVIDOV, R. and ERMAKOVA, M. Soderzhanie vitamina A v moloke. [Vitamin A content of N.A. and R., April 1955]

milk.] *Mol. Prom.*, 1954, 15, No. 6, 32.

[Timiryazev Acad. Agric., Moscow.]

Vitamin A in milk was estimated by the $SbCl_5$ method. Samples from an experimental farm contained from 175 to 300 $\mu g.$ per kg. in the autumn and from 27 to 50 in the spring. The lag in change of vitamin A content after transfer to summer or winter feeding is attributed to the building up or use of reserves. Enrichment of the diet with silage led to a substantial increase in vitamin A content, especially in the spring months. D. W. Taylor.

1865

SHROFF, N. B., SAMPATH, S. R., ANANTAKRISHNAN, C. P. and SEN, K. C. Vitamin A in dairy products. 3. Heat stability of vitamin A in ghee. *Indian J. Dairy Sci.*, 1954, 7, 159-170. [Indian Dairy Res. Inst., Bangalore.]

Ghee was prepared from fresh buffalo and cow's milk by heating the separated cream to 115° C. until clarified. Samples were heated in an aluminium container to 125° C. for 4 hr., to 150° C. for 1 hr., to 175° C. for 15 min. and to 200° C. for 10 min. The tests were repeated in an iron container and in an aluminium container immersed in a glycerine bath. Vitamin A was estimated in the ghee initially and in samples taken at intervals during heating.

The higher the temperature the greater was the destruction of vitamin A, 11 per cent. being destroyed in buffalo ghee after heating for 1 hr. at 125° C. in an aluminium container, and 100 per cent. after 10 min. at 200° C. Corresponding values obtained with the iron container were variable, some showing smaller and others larger losses of vitamin A. Losses were distinctly less with the aluminium container immersed in glycerine, amounting to 7 per cent. after 1 hr. at 125° C. and 45 per cent. after 15 min. at 200° C.

In further tests ghee was fortified with vitamin A acetate so that the final concentrations of vitamin A were 50, 100, 200 and 300 I.U. per g. The fortified samples were heated alone and with 0.02 per cent. hydroquinone. Losses of vitamin A were generally relatively less the greater the amount added; thus, when fortified buffalo ghee was heated at 175° C. for 15 min. the loss was 95 per cent. when the vitamin A content was 50 I.U. per g., and 58 per cent. when it was 300. In the presence of hydroquinone the corresponding values were only 3 and 8 per cent. Vitamin A was less stable to heat in stored than in fresh ghee.

In other tests with cow's colostrum and milk fat it was found that more carotene than vitamin A was lost when samples were heated for up to 1 hr.—I. M. Sharman.

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1866

WECKEL, K. G. and CHICOYE, E. Factors responsible for the development of hay-like flavor in vitamin A fortified low-fat milk. *J. Dairy Sci.*, 1954, 37, 1346-1352. [Dept. Dairy and Food Indust., Univ. Wisconsin, Madison.]

When low-fat milk which had been fortified with 2000 I.U. vitamin A per quart was exposed in clear glass bottles for 2 min. to sunlight or at a distance of 12 in. from a 40-watt fluorescent lamp, a strong hay-like flavour developed in from 48 to 72 hr., but milk without added vitamin A did not develop any such flavour. Copper added in an amount of from 0.5 to 1.5 p.p.m. caused the development of oxidised flavour in about 72 hr. in both fortified and unfortified milk, and hay-like flavour in fortified milk after 120 hr. Addition of ascorbic acid delayed the changes. Butylated hydroxyanisole in an amount of 0.1 p.p.m. prevented the formation of both flavours, but 10 p.p.m. of nordihydroguaiaretic acid reduced the intensity only of the hay-like flavour.—R. J. Ward.

1867

MITCHELL, H. L., BEAUCHENE, R. E. and SILKER, R. E. Stability of carotene in dehydrated alfalfa meal with effect of antioxidants, oil, and heat. *J. Agric. Food Chem.*, 1954, 2, 939-941. [Kansas Agric. Exp. Stat., Manhattan.]

A new anti-oxidant, NN'-diphenylhexamethylenediamine, was tested as preservative for carotene in stored alfalfa meal and found to be about as effective as the best of those previously reported in the literature. The diamine was applied by spraying different concentrations in solution in vegetable oil in a rotary mixer at the rates of 16, 32 and 80 lb. oil per ton meal. The greater the amount of diamine applied, the greater the protective effect, and the efficacy of any given amount was greatest in the heavily oiled meal. The efficacy was increased by heating the meal after application of the diamine. When 0.02 lb. of the anti-oxidant was applied in 80 lb. oil per ton meal, and the treated meal was heated, the percentage loss of carotene during storage was reduced from 54 in the untreated meal to 17.

V. H. Booth.

1868

KON, S. K. Vitamine A des invertébrés marins et métabolisme des caroténoïdes du plancton. [Vitamin A in marine invertebrates and the metabolism of carotenoids in plankton.] *Bull. Soc. Chim. biol.*, 1954, 36, 209-225. [Nat. Inst. Res. Dairying, Univ. Reading.]

Extensive results are presented or reviewed on the vitamin A and astaxanthin content of krill

and other marine invertebrates which provide food for whales. Of numerous species examined the krill, *Meganyctiphanes norvegica* and *Thysanessa raschii*, were found to be outstandingly rich in vitamin A, which was located mainly in the eyes. In tests with rats on 8 extracts obtained from krill the growth-promoting power was only from 38 to 81 per cent. of the potency measured by the $SbCl_3$ method. It seems probable, therefore, that the vitamin A in krill is an unfamiliar isomer. It is suggested that marine invertebrates may be able to convert astaxanthin to vitamin A.

T. Moore.

1869

OWEN, E. C. The carotene, carotenoid and chlorophyll contents of some Scottish seaweeds. *J. Sci. Food Agric.*, 1954, 5, 449-453. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Specimens of certain species of red, green and brown algae were analysed for carotene, total carotenoids except fucoxanthin, and total chlorophylls. Carotenoids were extracted after alkaline digestion and separated chromatographically. Chlorophylls were extracted with methanol and estimated spectrophotometrically. Red and green algae resembled land plants in having less carotene than xanthophylls. The content of pigments varied considerably. The ratios between groups of pigments were more nearly constant, and are discussed in relation to the ratios found by other observers. It is concluded that in marine algae, as in land plants, the carotenoid content is related more closely to the content of chlorophylls than of total solids.—V. H. Booth.

1870

STABURSVIK, A. The carotenoids of *Shepherdia canadensis* (L.) Nutt. *Acta chem. scand.*, 1954, 8, 1305-1306. [Inst. Org. Kjemi, Norg. Tekn. Högsk., Trondheim.]

1873

THOMAS, J. W., OKAMOTO, M. and MOORE, L. A. The ulnar epiphyseal cartilage width in normal and rachitic calves and its use compared to other methods of detecting rickets. *J. Dairy Sci.*, 1954, 37, 1220-1226. [Dairy Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

The method of measuring radiographically the width of the ulnar epiphyseal cartilage in young calves is exactly described. Results are presented for groups of from 9 to 37 male and female Jersey and Holstein calves with pictures taken 9 times at intervals from birth to the age of 240 days, in order to show the process of gradual closure in normal animals. A similar series is given for 2

The intensely red fruits of *Shepherdia canadensis*, which are eaten in Alaska, were extracted with acetone. The pigments were transferred from acetone to light petroleum and chromatographed on calcium carbonate. The column was developed with light petroleum containing a trace of acetone. Nineteen zones were separately eluted and most of them rechromatographed on calcium hydroxide. Absorption curves for each pigment fraction were recorded on a Beckman spectrophotometer.

The main bulk of the carotenoids was made up of 4 pigments among which lycopene and lycopanthin acetate were identified with good probability. Several other pigments were described but not definitely identified. Among them were 3 xanthophyllic esters and 5 suspected carotenes.

V. H. Booth.

1871

DE NICOLA, M. and GOODWIN, T. W. Carotenoids in the developing eggs of the sea urchin *Paracentrotus lividus*. *Exp. Cell. Res.*, 1954, 7, 23-31. [Dept. Biochem., Univ. Liverpool.]

1872

MÜLLER, Z. and LAUTNER, V. Krmné hodnoty některých našich vodních rostlin. 2. [The feeding value of some water plants. 2.] *Sborn. čsl. Akad. Zéměd.*, 1954, 27, 451-472. [Biochem. Lab., Krajského Výzkumného Ústavu Zeměd., Prague.] Russian and German summaries.

For part 1, see Abst. 1331, Vol. 25.

Experiments on feeding chickens and ducks with fresh or dried duckweed (Lemnaceae) are described. Tests with chickens showed that carefully dried material contained 280 mg. β -carotene per kg. (From German summary).—W. M. Deans.

See also Absts. 1736, 1792, 1793, 1795.

VITAMIN D

groups of about 10 calves given a diet of dried beet pulp and grain with or without vitamin D. The values for plasma Ca, serum phosphatase and cartilage width were significantly different between the groups, sufficiently so to permit detection of rickets. The relative rate of bodyweight gain was not so valuable for the purpose. For satisfactory diagnosis of rickets, it is recommended that the value for one criterion should be determined twice with an interval to establish the rate of change.

E. M. Hume.

1874

EWING, D. T., SCHLABACH, T. D., POWELL, M. J., VAITKUS, J. W. and BIRD, O. D. Spectrophotometric determination of vitamins D in

presence of vitamin A. *Anal. Chem.*, 1954, **26**, 1406-1409. [Kedzie Chem. Lab., Michigan State Coll., East Lansing.]

Chromatography in two stages was used to get rid of interfering substances in samples of irradiated ergosterol in maize oil, and in mixtures of vitamins A and D, when the concentration of vitamin D was less than 50,000 U.S.P.U. per g. A column of Superfritrol was used to remove vitamin A, carotenoids, pigments, some sterols and irradiation products of ergosterol other than vitamin D. Activated alumina was used to remove unsaturated compounds of the squalene type, decomposition products of vitamin A and other residual impurities. Combinations of ether, hexane and 0.6 per cent. ethanol were used as solvents and eluents. Spectral absorption of the eluate dissolved in hexane was measured at 265 $m\mu$, and the readings were converted to U.S.P. units with a conversion factor of 87,000. Details are given for the preparation of the adsorbents. Results are shown for samples containing different mixtures of vitamins A and D tested by the present method and biologically. For only 5 of 110 samples did the two sets of results differ from one another by more than ± 20 per cent. The oil tested should not contain less than 4000 U.S.P.U. per g. or accuracy will be less.—E. M. Hume.

1875

RAOUL, Y., LE BOULCH, N., BARON, C. and GUÉRILLOT-VINET, A. Purification de la substance antirachitique obtenue à partir du cholestérol sans irradiation. [Purification of the antirachitic substance obtained from cholesterol without irradiation.] *C.R. Acad. Sci.*, 1954, **239**, 1250-1252.

Separation was effected of an antirachitic substance previously described (Abst. 2948, Vol. 24) into an active, unstable oil and an inactive, stable solid.—E. M. Hume.

1876

KODICEK, E. Vitamin D balance studies in rats. *Biochem. J.*, 1954, **58**, xxxvi. [Dunn Nutrit. Lab., Univ. Cambridge.]

1877

CLAASSEN, V. Onderzoekingen over de invloed van rachitis en vitamine D toediening op de opening van radio-phosfaat door het skelet. [Studies of the effect of rickets and administration of vitamin D on the uptake of radio-active phosphate by the skeleton.] *Thesis, Univ. Amsterdam*, 1952, pp. 120.

The experiments were made with Wistar albino rats given the rachitogenic diet of Steenbock and Black with added B vitamins and carotene.

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The protein of the diet is not of optimum composition, as shown by the amino-acid make-up. Only those animals were used which showed rickets of grade 3 as assessed by measurements of the metaphyses in X-ray photographs. Controls were given vitamin D₂.

The measurement of ion exchange between bone and the supplying fluid and the nature of that exchange are discussed at some length. The first experimental work described is the measurement of radio-activity of "mineralised bone tissue" (bone from a cow boiled for 90 min. in a 3 per cent. solution of KOH in ethylene glycol; also called glycol-ash = glycol ash), ground and suspended in a solution of Na₂HPO₄ with some radio-active P. The rate of uptake of ³²P by the bone salt was fast at first and became very slow when only a small part of the solid phase could be in equilibrium with the solution. The more concentrated the solution, the sooner the exchange became stationary.

When bone from rachitic and normal rats was compared in the same way, no important difference was found, and none was found between fat-free dry bone powder from the shafts of rachitic and normal femur and tibia.

In the studies of the living animal, from 15 to 20 μ C. ³²P in saline were injected directly into the left femoral vein. The rats were decapitated after intervals of from 5 min. to 24 hr. and the blood was collected. Radio-activity was measured in the right femur and deproteinised blood. The rate of disappearance of ³²P from the blood, 90 per cent. in the first hr., 98 per cent. in 24 hr., was similar in normal and rachitic rats, but the rate of fixation of ³²P in the bone after the first hour was much higher in the normal than in the rachitic rat. The first fixation is therefore thought to be by ion exchange and the later by growth and new formation of bone.

When 3000 I.U. vitamin D₂ in 0.1 ml. olive oil were given to rachitic rats 72 hr. before injection of ³²P, and the rats were killed 60 min. later, the amount of ³²P in the femur was much increased, but there is no information about what happened later or about how much of the P was exchanged at the surface and how much built into the bone. Vitamin D given 5 hr. before injection of ³²P had no effect, nor had vitamin D at either time any effect on normal rats.

A second effect of giving vitamin D 72 hr. before injection of ³²P was to restore inorganic P in the plasma of rachitic rats to normal values. To study the change further, plasma proteins were removed in stages by different precipitants and plasma was also passed through a column of Amberlite 400 (Cl). The experiments showed that plasma inorganic P had more than one component so that, for instance, ³²P was almost entirely held by the Amberlite column but another, inactive,

fraction passed through. If the observation is confirmed, its significance for bone formation is still to be explained.—I. Leitch.

1878

BUCKLEY, G. F. and HARTROFT, W. S. **Effects of choline on cardiovascular lesions induced by feeding large doses of vitamin D.** *Amer. J. Clin. Nutr.*, 1954, 2, 396-404. [Banting and Best Dept. Med. Res., Univ. Toronto.] Spanish summary.

One hundred and sixteen male rats weighing from 120 to 150 g. were maintained on a diet low in choline for from 31 to 42 days. There were 10 groups of from 8 to 15 rats. Two groups received no supplement, 2 received 0.85 per cent. choline chloride in the diet, 3 groups received vitamin D₂ in the diet to provide from 15,000 to 20,000 I.U. daily, and 3 groups received both supplements. At the end of the experiment tissue was taken for histological examination from the heart, aorta, liver, kidneys, spleen and pancreas.

In the heart and aorta of the groups having the low-choline diet alone, sclerotic lesions occurred in from 25 to 60 per cent. The lesions were completely prevented by choline. Vitamin D₂ in the low-choline diet more than doubled the incidence of cardiovascular lesions. Choline suppressed the lesions of aortic sclerosis in the rats given vitamin D₂, and the heart lesions were few and slight. The histological picture of the lesions is described. Damage to the kidneys reflected that to the heart. In the liver of the choline-deficient rats, whether given vitamin D₂ or not, there were abnormal deposits of stainable fat, but there was no fibrosis or cirrhosis, probably because the time was too short. The possibility that the lesion in the kidneys caused by the choline deficiency is the primary one is discussed.

Use of choline to combat human atherosclerosis is not considered justified at present, but it is suggested that when very large doses of vitamin D are given therapeutically, lipotropic factors might be given also as a protection.—E. M. Hume.

1879

BRUNE, H. and EGER, W. **Vergleichende Studien an wachsenden Ratten über chemisch-analytische, histologische und röntgenologische Knochenveränderungen bei der Vitamin D₃-Hypervitaminose.** [Comparative studies on growing rats of the chemical, histological and radiographic changes in bone in vitamin D₃ excess.] *Arch. Tierernährung*, 1954, 4, Beihefte, No. 4, 221-239. [Inst. Tierphysiol., Univ. Göttingen.]

Four groups of 30 rats weighing about 50 g. were given a diet of oat flakes 10, fishmeal 1.5,

soya meal 1, and fodder yeast 0.5 parts. The Ca and P content was considered optimum. Vitamin A, 100 I.U., was given twice during the experiment. One group received no addition. Vitamin D₃ was given by mouth to 3 groups for 5 weeks; one group received 10,000 I.U. daily for one week, 15,000 I.U. daily for 2 weeks and 7500 daily for 2 weeks; 2 groups received 5000 I.U. daily for 1 week and 7500 for 4 weeks, and of these last 2 groups, one had the parathyroid glands removed. The heaviest and the lightest rat in each group were killed at the end of each week. The femur and tibia were investigated.

The rats given vitamin D increased little in weight. The content of total ash and of Ca and P in the tibia of rats given vitamin D decreased at first and then began to increase, but never reached the values for those not given vitamin D. Histological examination was made of the distal end of the femur metaphysis, and X-ray photographs were taken of the distal end of the tibia. These findings are related in detail to those of chemical analysis, and their significance is discussed at length. In the conditions of the experiment, parathyroid removal did not appear to affect the results.—E. M. Hume.

1880

LANDAUER, W. **The effect of estradiol benzoate and corn oil on bone structure of growing cockerels exposed to vitamin-D deficiency.** *Endocrinology*, 1954, 55, 686-695. [Storrs Agric. Exp. Stat., Univ. Connecticut, Storrs.]

Crossbred cockerels were reared to the age of 45 days on a complete diet. Groups of 5 or 6 birds were given a high-cereal, rachitogenic diet without vitamin D, which it was subsequently realised might have been somewhat deficient in vitamins A and E as well. The result is not, however, thought to have been affected. In addition, daily intramuscular injections were given of 500 or 2000 µg. oestradiol benzoate or of 0.25 or 1.0 ml. Mazola oil. One group had no addition. Of 2 other groups given a complete diet, one of 5 birds had 2000 µg. oestradiol benzoate daily, and one of 10 had no addition. The birds were killed after 30, 41 or 57 days. At the end of the experiment, in the birds on the rachitogenic diet alone, loss of muscle tone was so great that they could not stand upright and their wings dropped, but those given oestradiol or Mazola had normal muscle tone. Weight increase was greatest in those given the complete diet; addition of oestradiol somewhat depressed the performance. With the diet deficient in vitamin D there was almost no growth; addition of either dose of oestradiol or of Mazola increased it to about the same extent. There was considerable parathyroid enlargement in all the groups given the diet deficient in vitamin D, and the

effect was not modified significantly by the supplements. Ossification of the long bones was excessive with the complete diet and oestradiol. It was defective with the diet deficient in vitamin D, but less so with the supplements of oil or hormone; histological examination showed corresponding degrees of rachitic change.

It is concluded that oestradiol treatment corrected to some extent the failure of Ca absorption brought about by lack of vitamin D. It is accepted that fat has a certain antirachitic action.

E. M. Hume.

1881

BENDANDI, A., DELLA CASA, O. and BENATTI, G. Azione della vitamina D₂ a dosi massive sull'accrescimento e sull'attività fosfatase di un fibrosarcoma trapiantabile del ratto. [Effect of vitamin D₂ in massive doses on the growth and phosphatase activity of a transplantable fibrosarcoma of the rat.] *Arch. internat. Pharmacodyn.*, 1954, 99, 91-96. [Ist. Clin. Med. Gen., Univ. Modena.]

Twenty rats weighing about 120 g., maintained on a diet of, per cent., whole flour, 70, casein 15, seed oil 13 and salts 2, with vitamins A, K, B₁, B₆ and C, riboflavin, nicotinic acid, and vitamin D 15 "units", were implanted with a sarcoma, and given subcutaneously every third day for 23 days 200,000 "units" vitamin D₂ in oil. Twenty other rats were treated in the same way except that the oil injected contained no vitamin D.

In the rats given and not given vitamin D, respectively, the mean values were for the body weight without the neoplasm 107 and 112 g., for the weight of the neoplasm 34 and 69 g., for P in the neoplasm 144 and 106 mg. per cent., and for alkaline β -glycerophosphatase in the neoplasm 307 and 181 Bodansky units.—E. M. Hume.

1882

GLOVER, J., LEAT, W. M. F. and MORTON, R. A. Studies on the absorption and metabolism of ergosterol in the guinea pig. *Biochem. J.*, 1954, 58, xvii-xviii. [Dept. Biochem., Univ. Liverpool.]

1883

COATES, M. E., HARRISON, G. F., HENRY, K. M. and KON, S. K. Der Vitamin-D-Gehalt von nach dem Scholl-Scheer-Steinheilverfahren bestrahlter Milch. [The vitamin D content of milk irradiated by the process of Scholl, Scheer and Steinheil.] *Milchwissenschaft*, 1954, 9, 258-261. [Dept. Nutrit., Nat. Inst. Res. Dairying, Univ. Reading.]

The absence of vitamin D from milk irradiated with ultraviolet light as in Frankfurt am Main was reported by Wagner (*Milchwissenschaft*, 1952, 7, 396). At the request of Professor Scheer, the

authors undertook to test a sample of milk specially prepared under the supervision of Professor Scheer and others. For convenience the milk was condensed and tinned. It was tested for vitamin D on chicks by measurement of the tarsal-metatarsal distance, and on rats by measuring the ash content of the femur and humerus, against the international standard. From the chick tests the value per litre was calculated to be 377 I.U. and from the rat tests 340. The similarity of the two results showed that vitamin D must be present entirely as vitamin D₂. The milk could not be tested before irradiation, but there could be no doubt that the process must have raised the potency at least 10 times.—E. M. Hume.

1884

HORN, V., BOGUTH, W. and JAHN, U. Untersuchungen über den Vitamin-D-Gehalt ultraviolett (u. v.) bestrahlter Vollmilch. [Vitamin D content of whole milk irradiated with ultraviolet light.] *Arch. Tierernährung*, 1954, 4, Beihefte, No. 4, 214-220. [Vet. Physiol. Inst., Justus Liebig Hochschule, Giessen.]

Weanling rats 3 weeks old received for 16 days McCollum's rachitogenic diet No. 3143. The test dose was given daily for 14 days at the end of which an X-ray photograph was taken of the knee joint. The protective dose was taken as that amount which protected 8 out of 10 rats; it had been previously established with vitamin D₂ as 0.008 μ g. Irradiated "Zentra" milk from Frankfurt am Main was tested in doses of 1 and 2 ml., but afforded no protection, from which it was concluded that the milk contained less than 350 I.U. vitamin D per litre. Milk from Giessen was irradiated in the Steinheil apparatus used in Frankfurt; known amounts of vitamin D₂ were added to it and to untreated milk, but there was no significant difference in potency between the 2 samples of milk, which, it was concluded, contained less than 156 I.U. per litre. In a further experiment 1.5 ml. cream from irradiated and untreated milk gave no protection. When a suspension of ergosterol was irradiated in the Steinheil apparatus in the same way as milk, the concentration of ergosterol had to be raised to 5000 μ g. per litre before 1 ml. provided a protective dose, which corresponded with an activation of only 0.16 per cent. of the original ergosterol.

Irradiated milk is not considered suitable for feeding young animals liable to rickets.

E. M. Hume.

1885

KEENER, H. A. The effect of various factors on the vitamin D content of several common forages. *J. Dairy Sci.*, 1954, 37, 1337-1345. [Dept. Dairy Husb., New Hampshire Agric. Exp. Stat., Durham.]

Samples of mixed hay, soya bean hay, grass silage, maize silage, clover hay and timothy hay were harvested in two successive summers and stored with special precautions. Some of the material was irradiated with a mercury vapour quartz lamp after it had been dried and ground. The vitamin D potency was measured with rats by the method of the U.S. Pharmacopoeia XII against a curve of response. The values for the grass and clover hays in I.U. per lb. as fed ranged from 170 to 1724, and for the silages from 62 to 85, or from 193 to 282 if calculated on the hay equivalent basis. The value of 170 was for early cut, mow-cured hay, and of 1724 for a second cutting of mow-cured hay. Later cuts had

higher potencies than early cuts. Most field-cured hay increased in potency the longer it was left in the field up to 3 days. Some silages had higher potency when used than when first ensiled. When irradiated some samples attained their maximum potency within 5 min., others in 10 or 20; after the maximum was reached further irradiation induced a decrease. Samples differed in the maximum potency attainable. The content of both provitamin D and vitamin D increased with increasing maturity and with advance of the season. The mean value after irradiation for 4 samples of grass or clover, on a dry basis, was 150 for the first cutting and 384 for the second.

E. M. Hume.

VITAMIN E

1886

EDISBURY, J. R., GILLOW, J. and TAYLOR, R. J. **The determination of total tocopherol.** *Analyst*, 1954, **79**, 617-623. [Unilever, Ltd., Port Sunlight, Cheshire.]

Samples that contained more than 40 μ g. tocopherol per g. were saponified directly with potash in the presence of gallic acid or pyrogallol; samples that contained less than that amount were extracted with ether and then saponified. Purification of the unsaponifiable residue was achieved by adsorption on alkaline alumina, followed by elution of vitamin A, carotenoids and probably some other contaminants with 36 per cent. diethyl ether in light petroleum, and of the tocopherol with chloroform. A correction was made for highly oxidised carotenoids which were eluted with the tocopherol. The chloroform solution containing the tocopherol was reduced to 0.5 ml.; 0.2 ml. of 0.2 per cent. ferric chloride and 0.5 ml. of 1 per cent. $\alpha\alpha'$ -dipyridyl, both in chloroform, were added and the mixture was allowed to stand for 5 min. The resulting pink complex was extracted with 3-6 ml. water and absorption at 520 $m\mu$. was measured in a spectrophotometer. The sensitivity of the test is claimed to be 5 times that of the original method of Emmerie and Engel.—R. J. Ward.

1887

DEACON, B. D. and WAMBLE, A. C. **Vitamin E analytical procedure for cottonseed and its products.** *J. Amer. Oil Chem. Soc.*, 1954, **31**, 284-287. [Cottonseed Products Res. Lab., Texas Eng. Exp. Stat., Texas Agric. and Mech. Coll. System, College Station.]

Solid cottonseed products were extracted in a Soxhlet for 4 hr. with *n*-hexane, the resulting oil was washed with alkali and a portion was evaporated and distilled in a molecular still at 230° C. and a pressure below 25 μ . A portion of the molecular distillate was analysed for total tocopherols by

the ferric chloride, $\alpha\alpha'$ -dipyridyl method. The γ -tocopherol was estimated by the *o*-dianisidine diazo reaction. The total tocopherol content per ton of cottonseed ranged between 105 and 158 g. The α -tocopherol content varied between 58.2 and 72.4 per cent., and the γ -tocopherol between 41.8 and 27.6 per cent., of the total tocopherol content. The 1952 crop of cottonseed had a mean content of 84.6 g. vitamin E per ton of seed compared with 69 for the 1951 crop. Methanol extraction of rolled and of cooked cottonseed meats gave oils containing 0.11 and 0.18 per cent. vitamin E, values which compared favourably with that of 0.12 per cent. for wheat germ oil.—R. J. Ward.

1888

LINDAHL, P. E. and KIHLESTRÖM, J. E. **A constituent of male sperm antagglutin related to vitamin E.** *Nature*, 1954, **174**, 600-601. [Inst. Zoophysiol. Univ. Upsala.]

An alcoholic solution of a substance isolated from sperm antagglutin, which is the name given to a protein obtained from the prostate gland and able to prevent the agglutination of sperm, had absorption maxima at about 290 and 310 $m\mu$., which were ascribed to vitamin E. After oxidation with nitric acid, absorption was seen at 405 $m\mu$., typical of the red oxidation product of α -tocopherol. When the extract was dissolved in *n*-hexane the absorption spectrum had no well defined maximum, and none appeared, even after the solvent was changed to ethanol.—T. Moore.

1889

FERGUSON, T. M., ATKINSON, R. L. and COUCH, J. R. **Relationship of vitamin E to embryonic development of avian eye.** *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 868-871. [Dept. Poultry Husb., Texas Agric. and Mech. Coll. System, College Station.]

Eggs were collected from mated turkey hens which had received a vegetable diet containing soya bean oilmeal and yellow maize; the eggs were incubated artificially. The embryos were removed at intervals from selected fertile eggs, and from all eggs in which the embryo died or failed to hatch after 29 days. Failure in the development of the lens, with cloudiness of the central portion, was seen in many of the embryos. Haemorrhage in the vitreous humour and oedematous areas on the neck and feet occurred also. The embryos were undersized, and many died between the 24th and 28th days of incubation. Supplements of α -tocopheryl acetate given to the hens prevented the abnormalities. Fish solubles or dried whey or combinations of the two gave no protection. By chemical methods the egg yolks from turkeys given tocopherol were found to contain 3-6 times as much tocopherol as those from birds that received only the vegetable diet.

T. Moore.

1890

BUNNELL, R. H., MATTERSON, L. D., SINGSEN, E. P., POTTER, L. M., KOZEFF, A. and JUNGHER, E. L. Studies on encephalomalacia in the chick. 3. The influence of feeding or injecting various tocopherols or other antioxidants on the incidence of encephalomalacia. *Poultry Sci.*, 1954, **33**, 1046. *Proc.* [Univ. Connecticut, Storrs.]

1891

STURKIE, P. D., SINGSEN, E. P., MATTERSON, L. D., KOZEFF, A. and JUNGHER, E. L. The effects of vitamin E deficiency on the electrocardiogram of chickens. *Poultry Sci.*, 1954, **33**, 1083-1084. *Proc.* [Rutgers Univ., New Brunswick, N.J.]

1892

ATKINSON, R. L. and COUCH, J. R. Effect of vitamin E and other supplements on hatchability of turkey eggs. *Poultry Sci.*, 1954, **33**, 1039-1040. *Proc.* [Texas Agric. and Mech. Coll. System, College Station.]

1893

TEDESCHI, G. G. and DE CICCO, A. Distrofia muscolare conseguente alla somministrazione di succinato di o-cresolo. [Muscular dystrophy after administration of o-cresol succinate.]

Ricerche sulla azione antivitaminica E del meta- e para-cresolo e degli xilenoli. [Action of meta- and para-cresols and xyleneols antagonistic to vitamin E.] *Quad. Nutrizione*, 1952, **12**, 521-526; 1953, **13**, 166-173. [Ist. Fisiol. Gen., Univ. Rome.]

Of 46 rats weighing about 80 g., 2 groups of 8 were given a diet without vitamin E but otherwise complete, containing, per cent., casein 25, butter 9 and cod liver oil 2. One of the 2 groups received every 8 days a subcutaneous injection of 25 mg. o-cresol succinate. Three other groups received a diet deficient in vitamin E and similar to the first but low in protein, containing only 5 per cent. casein; one group of 8 had no addition, one of 16 received o-cresol as just described, and one of 6 received a subcutaneous injection of 10 mg. α -tocopherol every 8 days. The experiment lasted 45 days, and rats were killed at intervals after 15 days for histological examination of the hind-leg muscles. In the groups given a complete diet except for vitamin E, or a low-protein diet with vitamin E, signs of muscular dystrophy were apparent by the end of 45 days. In the rats given a low-protein diet without vitamin E, signs of muscular dystrophy had appeared by the 35th day and were severe by the 45th day. In the groups deprived of vitamin E and given o-cresol the signs were present by the 15th day and progressed in severity, which was greatest with the low-protein diet.

Female rats which had had a litter were maintained on a diet, per head daily, of boiled pasta, 5 ml. milk, 5 g. horseflesh, and cabbage or lettuce leaf. They received a single intramuscular injection of the test substance as the acetate dissolved in olive oil just before mating. With 25 or 50 mg. m-cresol acetate normal litters were born and reared. With 25 or 50 mg. p-cresol acetate the results were variable. Some rats showed immediate signs of intoxication; a small number reared litters. Simultaneous administration of 10 mg. α -tocopherol permitted the birth and rearing of normal young, but did not prevent the early signs of toxicity. With 50 mg. of 2-hydroxy-1:4-dimethylbenzene acetate the rats were all killed about the 17th day and showed placentas that were small, haemorrhagic and necrotic, and embryos that were in an advanced state of autolysis. With 50 mg. of 5 other hydroxydimethylbenzene acetates normal young were born and reared.

E. M. Hume.

See also Abst. 2391.

VITAMIN K

1894
OLVIN, J. H. Methods for prothrombin assay. Theoretical and practical considerations. *Schweiz. med. Wochenschr.*, 1954, **84**, 817-820. [Dept. Surg., Presbyterian Hosp. City of Chicago, Univ. Illinois Coll. Med.] German summary.

1895
FORGÁCS, J., KOVÁCS, E. and PÁSZTOR, J. Die Rolle des Vitamin K in der Prothrombinaktivität. [The part played by vitamin K in prothrombin activity.] *Ztschr. ges. inn. Med.*, 1954, **9**, 503-508. [Sanitätsdienst Ungar. Volksarmee.]

1896
OTORI, T. Pharmacological studies of synthetic vitamin K (menadione). *Acta med. biol.*, 1953, **1**, 171-179. [Dept. Pharmacol., Univ. Niiigata Sch. Med.]

1897
MARTIUS, C. and STRUFE, R. Phyllochinoreduktase. Vorläufige Mitteilung. [Phylloquinone reductase. Preliminary note.]

MARTIUS, C. Die Stellung des Phyllochinons (Vitamin K₁) in der Atmungskette. Vorläufige Mitteilung. [Position of phylloquinone (vitamin K₁) in the respiratory chain. Preliminary note.] *Biochem. Ztschr.*, 1954, **326**, 24-25; 26-27. [Physiol. Chem. Inst., Univ. Würzburg.]

1. The reduction of phylloquinone (vitamin K₁) by an enzyme preparation from liver mitochondria was investigated. The reductase was not highly specific and reduced quinones other than vitamin K₁. Vitamin K₁, on the other hand, appeared to be the only quinone concerned in respiratory phosphorylation. Reduction of vitamin K₁ was inhibited by dicoumarol, by thyroxine and by *p*-chloromercuribenzoic acid. The effect of thyroxine was greater in acid than in alkaline medium, that of *p*-chloromercuribenzoic acid was less in acid medium.

2. Because of the pyridine nucleotide associated with the reductase for vitamin K₁, further studies were made of the role of the vitamin in the respira-

tory enzyme chain with preparations of cytochrome from heart muscle. It seemed that vitamin K₁ was directly concerned in the formation of cytochrome *b*, and a possible scheme for the oxidation system is suggested.—A. M. Copping.

1898
JAQUES, L. B., MILLAR, G. J. and SPINKS, J. W. T. The metabolism of the K-vitamins. *Schweiz. med. Wochenschr.*, 1954, **84**, 792-796. [Dept. Physiol., Univ. Saskatchewan, Saskatoon.] German summary.

Studies of the mode of absorption of K vitamins made in rats receiving vitamins K₁ and K₂ labelled with ¹⁴C are summarised and discussed together with investigations of prothrombin time in dogs in which the bile was diverted from the intestine. Diversion of bile reduced the absorption of vitamin K₁ but had little effect on that of vitamin K₂. Both bile and pancreatic juice were required for the efficient absorption of vitamin K₁. Vitamin K₁ and K₂ were both excreted in the urine; they were not fixed in the liver or any other specific tissue. Considerable rearrangement of the vitamin K molecule seemed to occur during absorption. The deficiency of proconvertin and Ac-globulin in dogs with diverted bile was remedied by both forms of vitamin K. The deficiency of prothrombin was less readily repaired.—A. M. Copping.

1899
VAN KOETSVELD, E. E. and ONRUST, H. Een beschouwing over omzettingmogelijkheden van vitamine K₃ in voedingspreparaten. [Survey of the possible reactions of vitamin K₃ in foods.] *Chem. Weekblad*, 1952, **48**, No. 2, 22-24. [Netherlands Inst. Volksvoeding, Amsterdam.]

The chemical reaction between vitamin K₃, 2-methyl-1:4-naphthoquinone, and amino-acids is discussed. When vitamin K₃ was added to egg white it was almost all destroyed during storage for from 3 to 7 weeks, but with lactose or coconut fat little or no destruction occurred. Estimation was made by colorimetric and polarographic methods. The probable loss of vitamin K₃ from preparations for animal feeding is considered in relation to the findings.—A. M. Copping.

VITAMIN B COMPLEX: GENERAL

1900
MACACCARO, G. A. and LUGLI, A. M. Il dosaggio microbiologico di aminoacidi e vitamine secondo un nuovo criterio. 3. Il dosaggio di tre aminoacidi e di tre vitamine. [Microbiological estimation of amino-acids and

vitamins with a new criterion. 3. Estimation of three amino-acids and three vitamins.] *Arch. Sci. biol., Bologna*, 1954, **38**, 437-448. [Inst. Igiene Microbiol., Univ. Pavia.]

For previous parts see Abst. 2991, Vol. 24.

Strains of *Bacterium coli* were selected as having individual needs of certain metabolites. They were grown on 4 large plates of agar containing a basal culture medium and 4 graded concentrations of the essential metabolite under investigation. The 4 plates and 4 control plates without the metabolite were inoculated with a standard, very dilute suspension of the test organism. After 48 hours' incubation the diameter of from 60 to 100 colonies was measured. When the logarithm of the values for the mean diameter of the colonies was plotted against that of the values for the concentration of the metabolite a straight line was obtained which could be used to estimate the metabolite. Graphs are given of the results thus obtained with methionine, leucine and lysine, and for nicotinic acid, Ca pantothenate and vitamin B₁. The results are treated statistically.—E. M. Hume.

1901

BERGAMINI, C. Elettroforesi su carta da filtro di vitamine del complesso "B". [Electrophoresis on filter paper of vitamins of the B complex.] *Sperimentale, Sez. Chim. biol.*, 1953, 4, 85-92. [Ist. Chim. Anal., Univ. Florence.]

1902

BOURNE, G. H. The histochemical dephosphorylation of riboflavin phosphate (flavin mononucleotide) and pyridoxal phosphate (co-decarboxylase). *Quart. J. Microscop. Sci.*, 1954, 95, 359-369. [Dept. Histol., London Hosp. Med. Coll.]

1903

AFONSKY, D. Oral lesions in experimental vitamin B deficiencies in adult dogs. *J. Dent. Res.*, 1954, 33, 645-646. [Sch. Med. Dent., Univ. Rochester, N.Y.]

1904

DE WATTEVILLE, H., JÜRGENS, R. and PFALTZ, H. (with SCHENKER, N. P., FUST, B., BORTH, R., PELEMON, B. and LUNENFELD, B.) Einfluss von Vitaminmangel auf Fruchtbarkeit, Schwangerschaft und Nachkommen. [Effect of vitamin deficiency on fertility, pregnancy and offspring.] *Schweiz. med. Wochenschr.*, 1954, 84, 875-883. [Clin. Gynéc. Obstét., Univ. Geneva.] English and French summaries.

For 13 days before pairing, adult female Wistar strain rats, 2600 in all, were fed on a diet containing, per cent., extracted casein 26, rice starch 56, oxidised coconut oil 13 and salts 5, with a daily supplement of B vitamins, and a weekly supplement of fat-soluble vitamins and choline chloride, the vitamins being in amounts 10 times those established as sufficient. Vitamin B₁, B₆ and A, pantothenic acid and riboflavin were withheld

singly. The experiments were of 4 types, the vitamin being withheld from pairing or before, from 13 days after pairing, from parturition, or not at all. In all groups some rats were killed every 2 days for histological investigation and autopsy. Normal males were used.

When the time of deprivation before pairing was 35 days, rats deprived of any of the vitamins were sterile. When it was 28 days, all were sterile except those deprived of vitamin A; when it was 13 days, from 17 to 40 per cent. of the rats deprived of the individual vitamins became pregnant. The course of pregnancy was followed by daily weighing. Weight curves are shown for those that eventually gave birth to litters and for those that did not. [No numbers are given.] Examination of the embryos from females killed between the 16th and 20th day of pregnancy showed haemorrhages in the head, and oedema of the head and body, in rats deprived of vitamin B₁; occurrence of haemorrhages was not, however, specific. With deprivation of riboflavin, abnormalities and monsters were frequent; rats deprived 13 days after mating usually had living young with malformation of the jaw and face. Young of deprived rats of vitamin B₆ or pantothenic acid had haemorrhages and oedema, syndactyly and club foot. With vitamin A deficiency the young had no eyes or rudimentary ones. With all deficiencies, the number of young and degree of damage depended on the duration of the mother's deprivation. The mean birthweight of full-term young decreased with the severity of the deprivation from 5.0 g. when all the vitamins were given. It was lowest at 3.4 g. with rats deprived of vitamin B₁ from 13 days before mating till parturition. The young from mothers deprived of vitamin A succumbed to infection with *Salmonella typhimurium* much more quickly than young from normally fed rats. (See also Title 320, Vol. 25.)—E. M. Hume.

1905

SCHREIBER, M. and ELVEHJEM, C. A. The influence of flavonoid compounds on the nasal excretion of a red pigment by rats subjected to stress conditions. *J. Nutrition*, 1954, 54, 257-270. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Weanling albino rats given a complete diet or a diet lacking vitamin B₁, riboflavin, nicotinic acid, pyridoxine, pantothenic acid or choline were housed at a relative humidity of 90 per cent. and a temperature of from 24° to 26° C. These conditions had been found to induce nasal excretion of a red pigment in vitamin-deficient rats (Abst. 4107, Vol. 23). If a mixture of rutin, quercetin and quercitrin was included in diets lacking riboflavin or pyridoxine the appearance of the red pigment was prevented and consumption of water rose.

Restriction of water intake with a complete diet could cause the red nasal discharge and the incorporation of rutin or quercetin in the diet was again protective. Reduction of the relative humidity to 70 per cent. also prevented the discharge.

A series of experiments was made with deficiency of the several B vitamins and addition of flavonoid substances. The greatest protection was obtained with quercetin and rutin. Quercitrin and naringin were less effective and hesperetin, hesperidin, naringenin and hesperidin-methylchalcone had little effect. A large excess of menadione was protective; penicillin, streptomycin, aureomycin, salicylic acid and ascorbic acid were inactive. The requirement of flavonoid compounds in adverse physical conditions and in vitamin deficiencies is discussed.—A. M. Copping.

1906

HUNT, C. H., HERSHBERGER, T. V., BENTLEY, O. G. and MOXON, A. L. Effect of certain adsorbents and mineral mixtures on the availability of riboflavin and other B-vitamins in rations. *Ohio Agric. Exp. Stat. Res. Bull.* No. 748, August 1954, pp. 15. [Wooster, Ohio.]

Studies were made with rats of the availability of riboflavin, pantothenic acid and nicotinic acid adsorbed on fillers or mineral mixtures before addition to stock rations; B vitamins were estimated also by microbiological methods.

Riboflavin mixed with bonemeal, limestone, dicalcium phosphate and one brand of fuller's earth was available for rats and micro-organisms. If it was mixed with two other samples of fuller's earth, bone black or norite A, its availability was much less. Some fillers interfered with the availability of riboflavin in natural feeds such as alfalfa. Pantothenic acid and nicotinic acid were tested with two mineral mixtures. In one the vitamins were available and in the other their activity was considerably reduced. Pantothenic acid was lost also from rations stored at temperatures permitting the development of rancidity. The findings suggested that careful tests were needed to find suitable mixtures for feed supplements.—A. M. Copping.

1907

SHRIMPTON, D. H. The utilisation of the intestinally synthesised riboflavin and vitamin B₁₂ by poultry. *10th World's Poultry Congr. Sect. Papers*, Edinburgh, 1954, 161-163. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

1908

HOLLIS, L., CHAPPEL, C. F., MACVICAR, R. and WHITEHAIR, C. K. Effect of ration on vitamin synthesis in rumen of sheep. *J. Animal Sci.*,

1954, 13, 732-738. [Dept. Agric. Chem. Res., Oklahoma Agric. Exp. Stat.]

Yearling wether lambs were fed for 30 days before slaughter on 8 different rations, and riboflavin, nicotinic acid and pantothenic acid were estimated in the rumen contents by microbiological methods. When prairie hay was given alone there was little synthesis of the vitamins in the rumen. Synthesis was increased when maize and soya bean meal were given with the hay. Additional nitrogen in the form of urea also increased the amount of synthesis. Replacement of prairie hay by maize cobs, sorghum silage or alfalfa hay did not cause much change in vitamin synthesis. Addition of alfalfa ash to the maize cob ration increased the amount of all 3 vitamins in the rumen.

A. M. Copping.

1909

TERLIZZI, L. Avitaminosi "B" e dieta proteica esclusiva di origine vegetale o animale. [Deficiency of vitamin "B" and a diet exclusively of protein of animal or vegetable origin.] Avitaminosi "B" e dieta proteica esclusiva mista. [Deficiency of vitamin "B" and a diet exclusively of protein of mixed origin.] *Bol. Soc. ital. Biol. sper.*, 1954, 30, 315-317; 317-318. [Ist. Fisiol., Univ. Bari.]

Four young male rats weighing about 140 g. were maintained on a diet of, per cent., wheat gluten 91 and ovalbumin 9; 3 others received a diet of, per cent., purified casein 35, ovalbumin 10 and ox fibrin 55; another 2 received a diet of purified casein 16, purified dextrin 40, cane sugar 20, olive oil 15, agar 2 and salts 2 parts. All 3 groups were given salts and fat-soluble vitamins but no B vitamins. The rats given only animal protein lost weight and died within 56 days. All except one animal in the other groups made some growth. Those having the mixed diet lived about 100 days and those having the vegetable protein diet lived about 150. Signs of deficiency were muscular inco-ordination and spasticity.

In a similar experiment, the protein diet contained wheat gluten, ox fibrin and purified casein. Of 4 rats given the diet, 3 lost weight and died in less than 100 days. The fourth increased in weight to some extent and survived as long as 2 rats given the same mixed diet as in the first experiment; all 3 died after between 100 and 150 days.

E. M. Hume.

1910

WAHLSTROM, R. C. The effect of penicillin and B-vitamins on the growth of pigs fed different levels of protein. *J. Animal Sci.*, 1954, 13, 918-926. [Dept. Animal Husb., S. Dakota Agric. Exp. Stat.]

Growth from weaning to 200 lb. was studied in pigs receiving from 10 to 18 per cent. of protein in

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a basal diet of maize, soya bean oilmeal and digester tankage, with or without supplements of B vitamins and penicillin. A significant increase in rate of gain with all protein intakes occurred when penicillin or a mixture of riboflavin, nicotinic acid, pantothenic acid, vitamin B₁₂ and choline was added to the diet. The rations containing 10 per cent. protein appeared to be limited by their content of B vitamins, and more than 12 per cent. protein was desirable for satisfactory growth up to 100 lb. weight. Carcase measurements suggested that a larger proportion of the meat was lean in pigs given B vitamin supplements or high-protein diets than in those given less protein. Diets containing medium amounts of protein with supplements of vitamins, minerals and penicillin appeared to be most suitable for economic pig production.—A. M. Copping.

1911

HENSON, J. N., BEESON, W. M. and PERRY, T. W. Vitamin, amino acid, and antibiotic supplementation of corn-meat by-product rations for swine. *J. Animal Sci.*, 1954, **13**, 885-898. [Dept. Animal Husbandry, Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Pigs receiving a basal ration of maize, mineral mixture, alfalfa meal and meat tankage were given supplements of riboflavin, calcium pantothenate and nicotinic acid, with or without vitamin B₁₂ and terramycin. Those having the three B vitamins showed no improvement in response over those having no supplement. With the addition of terramycin and vitamin B₁₂ there was improvement in feed utilisation and weight gain. In a second trial vitamin B₁₂ alone was less beneficial than riboflavin, pantothenic acid and nicotinic acid. Terramycin alone or vitamin B₁₂ alone gave good weight gains but allowed signs of pantothenic acid deficiency to develop. In a third trial supplements of lysine, methionine and tryptophan were given, and the results indicated that tryptophan in the maize and tankage ration was inadequate. With a diet of maize and meat scraps tryptophan was again the most important amino acid lacking.—A. M. Copping.

1915

JANSEN, B. C. P. Vitamine B₁ (thiamine; aneurine). [Vitamin B₁ (thiamine; aneurin.)] *Voeding*, 1954, **15**, 188-205.

A review.

1916

JANSEN, J. D. and THYSSE, G. J. E. Een microbiologische thiamine-bepaling in bloed met behulp van een E. coli mutant. [*Microbio-* Vol. 25, No. 2

1912

SMITH, Q. T. and ALLEN, R. S. B-vitamin levels in the blood of young dairy calves fed a milk replacement diet with and without aureomycin. *J. Dairy Sci.*, 1954, **37**, 1190-1197. [Dept. Chem., Iowa State Coll., Ames.]

Vitamin B₁, riboflavin, pantothenic acid, nicotinic acid, and vitamin B₁₂ were estimated in venous blood of 10 male and 10 female Holstein calves 4 days old. Individual values varied widely; no significant difference was found between the sexes.

Eight four-day-old Holstein calves, 4 of each sex, were fed on a milk replacement diet, primarily of dried whey reconstituted with water, for 7 weeks. Cereals, minerals and hay were then given. Whole milk was included during the first 2 weeks. To 4 of them aureomycin was supplied by mouth at the rate of 40 mg. daily for 7 weeks and then 80 mg. up to 12 weeks. Four received no aureomycin. The vitamins enumerated above were estimated in venous blood samples taken at the beginning and after 1, 2, 4, 8 and 12 weeks. Aureomycin had no significant effect; there was no apparent difference between the sexes.

A. Hepburn.

1913

ADRIAN, J. Étude de quelques vitamines du complexe B₂ dans l'œuf de poule. [Study of vitamin B₂ complex components in hen's eggs.] *10th World's Poultry Congr. Sect. Papers*, Edinburgh, 1954, 148-149. [Lab. Biochim. Nutrit., C.N.R.S., Bellevue, Seine et Oise.]

1914

JANSEN, A. P. Het vitamineren van wit meel en wit brood. [Addition of vitamins to white flour and white bread.] *Conserva*, 1953, No. 6, 170-171. [Lab. Physiol. Chem., Univ. Amsterdam.]

The evidence for and against the addition of vitamin B₁, riboflavin and nicotinic acid to white flour and white bread is discussed. The advantages are considered to outweigh the disadvantages, and it is suggested that enrichment of flour and bread should be encouraged.—A. M. Copping.

See also Absts. 1724, 1733, 1792-94.

VITAMIN B₁ (ANEURIN, THIAMINE)

logical estimation of vitamin B₁ in blood with a mutant of *Bacterium coli*.] *Chem. Weekblad*, 1954, **50**, No. 2, 18. [Lab. Physiol. Chem., Univ. Amsterdam.]

A microbiological method is described for estimating vitamin B₁ in 0.2 ml. blood with a mutant of *Bacterium coli* in a simple glucose and ammonium sulphate medium. Up to 100 µg. vitamin B₁ per ml. whole blood could be satisfactorily measured.—A. M. Copping.

1917

CASTER, W. O. and MICKELSEN, O. **Thiamine-pyrimin assay. Factors influencing the yeast fermentation methods for thiamine and pyrimin.** *J. Agric. Food Chem.*, 1954, **2**, 1073-1076. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

In the yeast fermentation method for estimating vitamin B₁ and its metabolite pyrimin, potential sources of error were the amount of peroxide used in the sulphiting stage, the adequacy of shaking, and the presence of 4-methyl-5- β -hydroxyethyl-thiazole. There was interference also in certain foods from mixtures of active pyrimidines of different stability, and changes in vitamin B₁ and non-vitamin B₁ activity during the fermentation period. Sources of difference between different laboratories are discussed, and it is suggested that new limitations in the A.O.A.C. method for estimating vitamin B₁ will increase the reliability of the method.

A. M. Copping.

1918

DE RENZO, E. C., OLESON, J. J., HUTCHINGS, B. L. and WILLIAMS, J. H. **Vitamin B₁ activity of disulfide forms of thiamine.** *J. Nutrition*, 1954, **54**, 133-141. [Chem. Biol. Res. Sect., Lederle Labs. Div., Amer. Cyanamid Co., Pearl River, N.Y.]

Allithiamine and propylallithiamine, which are disulphide forms of thiamine, were tested with rats and chicks and gave a growth response equivalent to that of thiamine when the compounds were injected. When they were included in the diet the disulphide forms tended to give a greater growth response than thiamine. The thiamine content of the liver was slightly higher in rats receiving allithiamine than in those given the equivalent amount of thiamine. Allithiamine was antagonised by oxythiamine in the same way as thiamine.

Tests on 4 healthy men showed that allithiamine given by mouth produced a greater excretion of thiamine in the urine than equivalent amounts of thiamine.—A. M. Copping.

1919

GÉRO, E. **L'action inhibitrice de l'aneurine sur l'oxydation de l'acide L-ascorbique. 1. Propriétés de la cuprothiamine et hypothèse sur sa constitution. [Inhibiting action of vitamin B₁ on the oxidation of L-ascorbic acid. 1. Properties of cuprothiamine and a hypothesis as to its constitution.]** *Bull. Soc. Chim. biol.*, 1954, **36**, 1003-1008. [Lab. Physiol. Nutrit., C.N.R.S., 16 rue de l'Estrapade, Paris.]

When a solution of copper sulphate reduced by ascorbic acid was added to a solution of vitamin

B₁ hydrochloride, a precipitate was formed and was identified as a complex between one molecule of vitamin B₁ and two atoms of monovalent copper. The presence of chloride ions was essential for the formation of the cuprothiamine complex, which was soluble in excess of vitamin B₁ hydrochloride.—A. M. Copping.

1920

DAGLIANTI, A. **L'esame elettrocardiografico nel colombo. Contributo di tecnica. [Electrocardiographic examination of the pigeon. Technique.]** Contributo alla conoscenza del quadro elettrocardiografico del colombo beriberico per dieta orizanicca. [Electrocardiogram of the pigeon with beriberi from a rice diet.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 82-83; 84-86. [Ist. Fisiol., Univ. Rome.]

A wooden box is described in which a pigeon could be confined with the possibility of only a very little movement, and the bird could become accustomed to remain quite still. The electrodes could then be attached to the bird, and satisfactory readings with the electrocardiograph were obtained.

Fifteen pigeons weighing from 350 to 450 g. were maintained for a month on a diet of maize and sunflower seed, and electrocardiograms were recorded daily with the apparatus described above. The diet was then changed to polished rice and the observations were continued until signs of beriberi appeared, usually after 16 or 17 days. The birds were then cured with vitamin B₁. In normal birds the rate of the heart beat was from 140 to 200 a minute; as beriberi developed it fell to from 90 to 120. The electrocardiograms showed no significant changes. Tracings are shown.

E. M. Huine.

1921

LA GRUTTA, G. and CILENTO, A. **Azione della vitamina B₁₂ sul beri-beri sperimentale del colombo. [Effect of vitamin B₁₂ on experimental beriberi in pigeons.]** *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 51-54. [Ist. Fisiol., Univ. Palermo.]

Eight young pigeons weighing about 360 g. were given a diet of polished rice till signs of beriberi appeared. The amount of rice consumed was recorded, and the beriberi quotient of Amantea (Abst. 4092, Vol. 3) was calculated. The birds were then cured with a single injection of 5 mg. vitamin B₁₂, and fed on maize until the weight lost was regained. The experiment was then repeated with a daily intramuscular injection of 50 μ g. vitamin B₁₂, and again, after a second cure, without the vitamin. There was no significant difference between the 3 sets of results.—E. M. Huine.

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1922

DE LA FUENTE, G. and DÍAZ-CADAVEIRO, R. Co-carboxylase activity of thiamine phosphoric esters. *Nature*, 1954, 174, 1014. [Dept. Bioquím., Inst. Español Fisiol. Bioquím., Fac. Farm., Ciudad Univ., Madrid.]

Mono-, di- and triphosphoric esters of vitamin B₁ were separated by paper chromatography with *n*-propanol, water and 1 *M* acetate buffer at pH 5. Their separate co-carboxylase activities were measured in the presence of pure apocarboxylase prepared by the method of Green *et al.* (Abst. 1016, Vol. 11). The monophosphoric ester showed no activity in concentrations of from 0.025 to 0.13 μ mol. per ml. The diphosphoric ester liberated CO₂ at the rate of 2.3×10^3 μ l. per hr. in a concentration of 0.04 μ mol. per ml. The triphosphoric ester was inactive in concentrations of from 0.005 to 0.02 μ mol. per ml.—A. M. Copping.

1923

ONRUST, H. De functie van thiamine pyrophosfaat bij de oxydatieve decarboxylering van pyrodruienzuur in dierlijk weefsel. [The function of vitamin B₁ pyrophosphate in the oxidative decarboxylation of pyruvic acid in animal tissues.] *Thesis, Univ. Amsterdam*, 1953, pp. 63. [Lab. Physiol. Chem., Univ. Amsterdam.] English summary.

In studying the mode of action of vitamin B₁ pyrophosphate as coenzyme in decarboxylation and in the oxidation of pyruvate in animal tissue, methods of preparing and estimating vitamin B₁ pyrophosphate were elaborated. Oxythiamine, oxythiamine triphosphate, pyrithiamine triphosphate and *p*-chloromercuribenzoic acid were prepared as inhibitors. All of them inhibited the decarboxylation of pyruvic acid by dehydrogenase prepared from pigeon breast muscle. The inhibition was more complete with oxythiamine triphosphate than with pyrithiamine triphosphate. With both the enzyme system was re-activated by dried brewer's yeast, which provided a carboxylase without oxidising capacity. Inhibition by *p*-chloromercuribenzoic acid was overcome by substances such as glutathione and thiomalic acid which contain active sulphhydryl groups. Addition of excess vitamin B₁ pyrophosphate did not re-activate the system when sulphhydryl groups were lacking, which was taken as evidence that the essential sulphhydryl groups of the carboxylase system were not derived from vitamin B₁ pyrophosphate. From discussion of the findings it is concluded that vitamin B₁ pyrophosphate has no oxidative function in the oxidative decarboxylation of pyruvate in animal tissue but is concerned primarily with the decarboxylation process.

A. M. Copping.

1924

NAIDOO, D. and PRATT, O. E. The activity and localisation of adenosine 5'-phosphatase in the thiamine deficient chicken brain. *Biochem. biophys. Acta*, 1954, 15, 291-292. [Inst. Psychiat., Univ. London, Maudsley Hosp.]

Adenosine 5'-phosphatase activity was studied histologically, and estimated as described previously (*Enzymologia*, 1954, 16, 289), in brains from normal chicks and chicks deprived of vitamin B₁. In the optic tectum and cerebral hemisphere from deprived chicks the fibres failed to stain, but the staining of the nuclei was strongly maintained. The phosphatase activity of the brains of normal chicks lay within the range from 18.1 to 20.6 "units"; that of deficient birds was from 22.7 to 26.0 "units". The findings suggested that adenosine 5'-phosphatase is in some way involved in the reaction of brain tissue to vitamin B₁ deficiency.—A. M. Copping.

1925

KRING, J. P. and WILLIAMS, J. N. (JR.) Dietary conditions affecting oxidation of tyrosine by rat liver, with particular reference to thiamine. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 97-100. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Manometric methods were used to measure the oxygen uptake of liver enzymes from rats given purified diets with or without vitamin B₁. Tyrosine oxidase activity was raised in livers from animals deprived of vitamin B₁. After dialysis activity was restored to deficient but not to normal liver preparations by addition of ascorbic acid and glutathione, and was further increased by addition of 2:6-dichlorophenolindolphenol. Injection of vitamin B₁ for one day did not affect the tyrosine oxidase activity of the liver of deprived animals, but after 12 or 13 days' treatment activity decreased to that of normal livers. In rats given vitamin B₁, starvation for from 4 to 7 days raised the tyrosine oxidase activity of the liver. Stimulation of the enzyme by ascorbic acid and glutathione was less in livers of starved animals than in livers from rats deprived of vitamin B₁.

A. M. Copping.

1926

TATARSKAYA, R. I., KUDRYASHOV, YU. B. and FAIN, F. S. Rasprostraneniye i svoystva tiaminazy. [Distribution and properties of thiaminase.] *Biokhimiya*, 1954, 19, 229-235. [Inst. Biokhim. A. N. Bakha, Akad. Nauk SSSR, Moscow.]

A list is given of the species of White Sea fauna investigated for the presence of thiaminase. The implications are discussed.—D. W. Taylor.

1927

HARRINGTON, R. W. (Jr.) **Contrasting susceptibilities of two fish species to a diet destructive to vitamin B₁.** *J. Fish. Res. Board Canada*, 1954, **11**, 529-534. [Dept. Biol., Trinity Coll., Hartford, Conn.]

During a study of reproduction, the banded sunfish (*Enneacanthus obesus*) and the tadpole madtom (*Schilbeodes mollis*, catfish) were fed on carp eggs for prolonged periods. Within a month on the diet the latter exhibited signs of distress including irritability, loss of balance and finally paralysis. The onset was earlier and the signs more marked in those subjected to prolonged artificial illumination. A change of diet and addition of vitamin B₁ to the aquarium water prevented the condition. The sunfish showed no ill effect.

A. M. Copping.

1928

CACIOFFO, F. **Sul meccanismo d'azione della "orizotossina".** Contenuto di acido piruvico nei tessuti di colombi trattati con "orizotossina". [Mode of action of the "rice toxin". Pyruvic acid content of tissues of pigeons treated with "rice toxin".] *Quad. Nutrizione*, 1952, **12**, 505-520. [Ist. Fisiol. Umana, Univ. Palermo.]

Of 20 pigeons fed on polished rice, 10 received in addition, by intramuscular injection, an alcoholic extract emulsified with water of from 40 to 60 g. polished rice. When the birds of the second group showed signs of inco-ordination they were killed with corresponding birds of the first group. Within 8 days all the birds given the extract showed signs of polyneuritis, and lost weight and condition very rapidly. None of the birds not given the extract did so before they were killed. The mean pyruvic acid content in mg. per 100 g. for those given and not given extract, respectively, was for muscle 1.89 and 1.28, for blood 3.22 and 1.56, and for brain 0.92 and 0.47. It is concluded that the action of the rice toxin is to promote deficiency of vitamin B₁, perhaps by interfering with the phosphorylation of the vitamin. (See Absts. 235, 1415, Vol. 5.)—E. M. Hume.

1929

NATH, M. C. and CHAKRABARTI, C. H. **Studies on the effect of aceto-acetate and β -hydroxybutyrate on vitamin B₁, both *in vivo* and *in vitro*.** *Indian J. Med. Res.*, 1953, **41**, 257-266. [Dept. Biochem., Univ. Nagpur.]

Rabbits fed on germinated gram (*Cicer arietinum*) were injected intraperitoneally with from 100 to 250 mg. per kg. bodyweight daily of sodium aceto-acetate or β -hydroxybutyrate. Vitamin B₁ and pyruvate were estimated in the blood and urine at intervals. Excretion of pyruvate increased while that of vitamin B₁ decreased. The changes were

apparent in the urine earlier than in the blood, but in the latter a large increase in pyruvate and a decrease in vitamin B₁ were seen after 90 days. Administration of vitamin B₁ restored the values for pyruvate in the blood and urine to normal.

When sodium acetoacetate was added to a solution of vitamin B₁ and incubated at pH 7.4, considerable destruction of the vitamin occurred. Sodium β -hydroxybutyrate had no apparent destructive effect *in vitro*, though it was as harmful as acetoacetate *in vivo*.—A. M. Copping.

1930

ONRUST, H. **Reactivating van door triphospho-oxythiamine geremde pyruvaat dehydrogenase. [Reactivation of pyruvate dehydrogenase inhibited by triphospho-oxythiamine.]** *Chem. Weekblad*, 1954, **50**, No. 2, 17. [Lab. Physiol. Chem., Univ. Amsterdam.]

Pyruvic dehydrogenase from animal tissue was completely inactivated by triphospho-oxythiamine. The system could be re-activated by addition of dried brewer's yeast.—A. M. Copping.

1931

HULPIEU, H. R., CLARK, W. C. and ONYETT, H. P. **The effect of thiamin deficiency produced by oxythiamin, by neopyrithiamin, and by diet, on the metabolism of alcohol.** *Quart. J. Studies Alcohol*, 1954, **15**, 189-206. [Dept. Pharmacol., Indiana Univ. Sch. Med., Indianapolis.]

It has been generally held that vitamin B₁ plays no part in the metabolism of alcohol, but it was desired to investigate whether the vitamin intervenes at any point in either of the two stages of alcohol oxidation, that to acetaldehyde and then, probably, to acetate.

Certain metabolites were estimated in the blood of dogs given alcohol and made deficient in vitamin B₁ by diet or with antagonists, with and without previous administration of Antabuse (disulphiram) which interferes with the metabolism of alcohol at the second stage of oxidation. The dose of ethanol was 1 g. per kg. bodyweight, diluted and injected intravenously. With 50 dogs normal blood values were established for acetaldehyde, pyruvic acid and glucose.

With 6 subcutaneous injections of oxythiamine, deficiency was produced within 24 hr.; classical neurological signs were lacking but the dogs were ill and might die. The pyruvic acid value in the blood rose and was used as criterion of deficiency. Amounts of alcohol which in normal dogs had only a slight effect caused death; blood glucose fell but acetaldehyde did not rise. Pyruvic acid rose further after a brief preliminary fall. If Antabuse had been given previously, but not otherwise, acetaldehyde rose steeply. Simultaneous administration of vitamin B₁ completely prevented the

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effects of oxythiamine. In dogs made deficient with oxythiamine, a dose of acetaldehyde injected over 4 hr. instead of alcohol caused blood glucose to fall, but without oxythiamine it did not do so.

Deficiency could be produced with pyriethamine, only by simultaneous partial deprivation of vitamin B₁ in the diet; convulsions then occurred and pyruvic acid in the blood rose. Administration of alcohol had no adverse effect and glucose in the blood did not fall. When deficiency was produced with diet alone, the results with alcohol were the same as when it was produced with the aid of pyriethamine.

It is suggested in explanation of the results that cocarboxylase (vitamin B₁ pyrophosphate) is necessary for some phase in the metabolism of alcohol, and that oxythiamine acts by blocking or lowering tissue cocarboxylase.—E. M. Hume.

1932

BALAKRISHNAN, S. and RAJAGOPALAN, R. Effect of feeding curds, sulphaguanidine and *para*-amino benzoic acid on the coliform organisms and biosynthesis of thiamine. *Indian J. Dairy Sci.*, 1954, 7, 126-134. [Dept. Biochem., Indian Inst. Sci., Bangalore.]

During 4 successive tests, 18 rats weighing from 80 to 100 g. received a purified diet lacking vitamin B₁ without supplement for 4 days and with sulphaguanidine for 7 days; 12 of the rats were then given vitamin B₁ and 6 had milk curds and vitamin B₁ for 10 days; finally sulphaguanidine was given in addition to the vitamin B₁ and 6 rats had *p*-aminobenzoic acid as well. Urinary and faecal vitamin B₁ excretion was measured and the coliform organisms in the faeces were counted. Sulphaguanidine greatly reduced excretion of vitamin B₁ and also the number of coliform organisms in the faeces; its effect was prevented by *p*-aminobenzoic acid and by curds. When curds were given without sulphaguanidine excretion of vitamin B₁ and the number of coliform organisms increased.

A. M. Copping.

1933

BOROS, E., HÄNDEL, M., HERRMANN, G. and SÓS, J. Unterschiede in der Nahrungswahl von Ratten mit neurogener und renaler Hypertonie. [Differences in food choice of rats with hypertension of nervous and renal origin.] *Acta physiol. hung.*, 1954, 6, 321-329. [2. Med. Klin., Med. Univ., Budapest.] Russian summary.

Blood pressure was raised in adult rats by application of electric stimuli for 10 min. 3 times daily for 40 days, or by removal of one kidney and ligation of the other. Three groups of 10 rats,

normal, or with nervous, or with renal hypertension, were kept in separate cages and offered in separate containers a complete balanced diet, a high-protein diet, a low-protein diet, a diet rich in vitamin B₁ and a diet without vitamin B₁. Consumption was recorded from the eighth to the twenty-fourth day of the experiment. Normal rats ate chiefly the complete and the high-protein diets. Rats with nervous hypertension ate more of the diet rich in vitamin B₁ than of any other food. Those with renal hypertension showed a preference for the low-protein diet, though their consumption of protein, fat and carbohydrate over the whole period did not differ much from that of normal rats. They showed no desire for vitamin B₁.—A. M. Copping.

1934

BOWDEN, H. Aneurin bei der Regeneration und Degeneration. [Vitamin B₁ in regeneration and degeneration.] *Ztschr. Vitamin-, Hormon-Forsch.*, 1954, 6, 81-93. [Zool. Inst., Univ. Graz.] English and French summaries.

Vitamin B₁ was estimated with *Phycomyces* in samples of from 30 to 50 mg. of the leg muscle from guineapigs or the tail of tadpoles, killed at intervals after injury to the nerves. From the results the author considers that in nerve and muscle after such injury there is a decrease of vitamin B₁ content while any degeneration is going on, but that in the course of regeneration there is usually an increase of vitamin B₁ content in the tissue from which the regeneration emanates.

A. M. Copping.

1935

LUCKEY, T. D., PLEASANTS, J. R. and REYNIEERS, J. A. Vitamin interrelationships in germfree chicks. *Poultry Sci.*, 1954, 33, 1068. *Proc. [Lobund Inst. Res. Life Sci., Univ. Notre Dame, Ind.]*

1936

MILLER, E. R., SCHMIDT, D. A., HOFFER, J. A. and LUECKE, R. W. The thiamine requirement of the baby pig. *J. Animal Sci.*, 1954, 13, 994. *Proc. [Michigan State Coll.]*

1937

ASAHINA, K. and YOSHINAKA, K. Statistical quality control for tablets. 1. Variance of vitamin B₁ content of vitamin B₁ tablet. *J. Pharm. Soc. Japan*, 1953, 73, 501-505. [Takeda Pharmaceutical Industries, Ltd., Tokyo.]

See also Absts. 1730, 1731, 2258, 2384, 2386, 2450.

RIBOFLAVIN

1938

- PEEL, J. L. A method for the separation of riboflavin, flavin mononucleotide and flavin-adenine dinucleotide by ionophoresis on paper and its application to the determination of these compounds in micro-organisms. *Biochem. J.*, 1954, **58**, xxx. [Agric. Res. Council Unit Microbiol., Dept. Microbiol., Univ. Sheffield.]

1939

- POVOLOTZKAYA, K. L. O novoi svyazannoi s belkom forme riboflavina. [A new compound of protein with riboflavin.] *Biokhimiya*, 1953, **18**, 638-643. [Inst. Biokhim. A. N. Vakh, Akad. Nauk SSSR, Moscow.]

Experiments are described, arising out of the observation that autolysis increased the riboflavin content of certain tissues. The results pointed to the existence of a previously unknown riboflavin-protein compound, split by proteolytic enzymes such as trypsin, and not detectable by existing chemical and microbiological methods of estimating riboflavin.—D. W. Taylor.

1940

- PLAUT, G. W. E. Biosynthesis of riboflavin. 2. Incorporation of C^{14} -labeled compounds into ring A. *J. Biol. Chem.*, 1954, **211**, 111-116. [Inst. Enzyme Res., Univ. Wisconsin, Madison.]

Compounds containing ^{14}C were added to cultures of *Ashbya gossypii*, and riboflavin was isolated from the cultures and examined for the site of incorporation of the labelled C atom. Degradation of the riboflavin with chromic acid, NaN_3 and H_2SO_4 isolated the C-methyl groups and carbons 6 and 7. Degradation with strong alkali, HNO_3 , $KMnO_4$ and heat gave carbon atoms 5, 8 and 10a. When glucose-1- ^{14}C and glucose-6- ^{14}C were added to the cultures ^{14}C was found mainly in the methyl groups and in carbons 5 and 8. With $CH_3^{14}COOH$ most of the ^{14}C was incorporated into carbons 6, 7, 8a and 10a. With $^{14}CH_3COOH$ the presence of ^{14}C was less regularly distributed in the riboflavin molecule. The results are considered to suggest a possibility that 2-carbon fragments may be the basic building blocks in riboflavin biosynthesis.

A. M. Copping.

1941

- SESTAN, N. Contribution à l'étude de l'absorption et de l'excrétion de la riboflavine dans diverses conditions nutritionnelles et physiologiques. [Absorption and excretion of riboflavin under different nutritional and physiological conditions.] *Thesis, Univ. Paris*, 1954, pp. iii-119.

For the study of intestinal absorption and faecal and urinary excretion of riboflavin in the

rat a fluorimetric method of estimation with a Spekker photometer was adopted. A detailed investigation was made of methods of estimating riboflavin and of satisfactory conditions for the biological experiments. Titanium oxide was chosen as marker in the diet, and the first tests were made with diets containing adequate riboflavin.

Almost all the riboflavin present in the diet was found in the upper part of the small intestine. Absorption did not occur from the stomach but progressively along the small intestine, and the amounts remaining in the caecum, colon and faeces were almost constant. The amount of riboflavin excreted in the faeces was the same after a period of deprivation as during full supplementation. Attempts by giving sulphonamide drugs to ascertain whether faecal riboflavin is of endogenous or exogenous origin produced inconclusive results. Simpler experiments in which faecal excretion was measured during prolonged deprivation were considered as proof that faecal riboflavin was chiefly endogenous and derived from bacterial synthesis.

Urinary excretion of riboflavin was measured with varying amounts of riboflavin in the diet of normal adult rats, pregnant and lactating does, and newly weaned young. In adult rats the excretion of riboflavin was closely related to the intake. During the latter part of pregnancy and throughout lactation the amounts excreted were low. If the maternal diet was poor in riboflavin the young excreted little at weaning, but if the mother had received large amounts the young excreted a great excess in the first few days after weaning. As an indication of the state of riboflavin nutrition the urinary excretion seemed more satisfactory than the faecal excretion.

A. M. Copping.

1942

- GRAINGER, R. B., O'DELL, B. L. and HOGAN, A. G. Congenital malformation as related to deficiencies of riboflavin and vitamin B_{12} , source of protein, calcium to phosphorus ratio and skeletal phosphorus metabolism. *J. Nutrition*, 1954, **54**, 33-48. [Dept. Agric. Chem., Univ. Missouri, Columbia.]

Basal diets containing, as source of protein, maize and wheat gluten, or alpha protein, or water-washed casein, or soya bean oilmeal, were used in the study of congenital malformations in rats. Diets containing maize and wheat gluten or soya bean protein and lacking vitamin B_{12} and riboflavin produced a high incidence of hydrocephalus, ocular defects and skeletal abnormalities. With the gluten diet considerable, and with soya bean complete, protection was given by addition of vitamin B_{12} and riboflavin. Omission of vitamin B_{12} alone caused hydrocephalus, eye defects

N.A. and R., April 1955

and bone defects. Lack of riboflavin increased the incidence of skeletal abnormalities. If the Ca to P ratio was high the effect of B vitamin deficiencies on the skeleton was accentuated. Alkaline phosphatase and the rate of P deposition were estimated in some litters and were found to be less than normal in offspring of rats deprived of riboflavin and vitamin B₁₂.—A. M. Copping.

1943

BERNIER, P. E. and COONEY, T. **Black down colour and riboflavin deficiency in embryos of**

the domestic fowl. 10th *World's Poultry Congr. Sect. Papers*, Edinburgh, 1954, 66-71. [Dept. Poultry Husb., Oregon State Coll.]

1944

HILL, F. W., NORRIS, L. C. and SCOTT, M. L. **The riboflavin requirement of Single Comb White Leghorns for reproduction.** *Poultry Sci.*, 1954, **33**, 1059. *Proc.* [Cornell Univ., Ithaca, N.Y.]

See also Absts. 2013, 2384.

NICOTINIC ACID (NIACIN)

1945

QUAGLIARIELLO, G. and PORCELLATI, G. **Determinazione della nicotinamide in presenza di acido nicotinico. [Estimation of nicotinamide in presence of nicotinic acid.]** *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 64-68. [Ist. Chim. Biol., Univ. Naples.]

The method depends on measuring spectrophotometrically the absorption in ultraviolet light of nicotinic acid and nicotinamide after treatment with CNBr. The absorption maxima were at 370 and 350 mμ.—E. M. Hume.

1946

SAVOIA, F. **Determinazione cromatografica di acido nicotinico e derivati. [Chromatographic estimation of nicotinic acid and its derivatives.]** *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 29-30. [Lab. Terap. Sper. A. Bruschettini, Genoa.]

1947

MUKAIYAMA, H., OGATA, K., HIRADE, J. and GO, S. **On the anti-nicotinamide effect of isonicotinic acid hydrazide.** *Acta med. biol.*, 1953, **1**, 253-258. [Dept. Biochem., Univ. Niigata Sch. Med.]

1948

FABIANEK, J. **Observations sur le cobaye alimenté avec un régime artificiel purifié exempt d'acide nicotinique. [Observations on the guineapig fed on artificial purified ration free from nicotinic acid.]** *Bull. Soc. Chim. biol.*, 1954, **36**, 1009-1014. [Lab. Chim. Agric., Conservatoire Nat. Arts et Métiers, Paris.]

In an initial test 11 guineapigs were given a purified diet containing 21 per cent. casein and 10 mg. nicotinic acid per 100 g. diet for from 45 to 126 days, and were then deprived of nicotinic acid for from 14 to 66 days. During the period of deprivation no sign of deficiency developed and no change was seen at autopsy. In a second experiment 11 young guineapigs received the purified diet with no nicotinic acid from the start; 4 failed

to adapt themselves to the diet. The remaining 7 showed retardation of growth, except 2 animals which showed no sign of deficiency; 2 animals died in 52 and 67 days and 3 were treated with nicotinic acid but only one recovered. None of the signs of nicotinic acid deficiency shown by other species occurred in the deprived guineapig.

A. M. Copping.

1949

HOPPER, J. H. and JOHNSON, B. C. **Acute nicotinic acid deficiency in the calf.** *J. Animal Sci.*, 1954, **13**, 989. *Proc.* [Univ. Illinois.]

1950

LORENZINI, R., BOSCHI, S. and CAVAZZUTI, G. B. **Escrezione urinaria dei derivati piridinici N₁ sostituiti in ratti con danno epatico da alterata circolazione del sangue e da colestasi. [Urinary excretion of substituted pyridine N¹ derivatives in rats with signs in the liver caused by changes in blood circulation and obstruction of the bile.]**

LORENZINI, R., BENEDETTI, A. and RANCATI, G. B. **Escrezione urinaria dei derivati piridinici N₁ sostituiti in ratti sottoposti ad epatectomia parziale. [Urinary excretion of substituted pyridine N¹ derivatives in rats subjected to partial removal of the liver.]** *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 330-332; 332-334. [Ist. Clin. Med., Univ. Modena.]

Trigonellin was estimated daily for 18 days in the 24-hr. urine of 21 rats which, for from 110 to 155 days previously, had been subjected to partial interference with the blood supply to the liver or to ligation of the bile duct. Injury to the liver was subsequently confirmed histologically. Administration of a single dose of 5 mg. vitamin B₁ alone or with 35 mg. choline was followed by a small, transitory increase in the amount of trigonellin excreted. (See Abst. 1588, Vol. 23.)

In a similar experiment removal of a portion of the liver was followed by a temporary increase in the amount of trigonellin in the urine of rats. Administration of 10 mg. vitamin B₁ at the time of

operation did not affect the result. If the rats were treated with 2.5 mg. vitamin B₁ daily for 6 days before the operation, the amount of trigonellin rose and then fell again and was not affected by the operation.—E. M. Hume.

1951

VILLA, L. and DIOGUARDI, N. Ulteriori ricerche intorno a fattori influenzanti la respirazione endogena dell'omogenato di fegato: interferenza della nicotinamide nella ossidazione dell'acetato per parte dell'omogenato di fegato. [Factors influencing endogenous respiration in liver homogenates: interference by nicotinamide in the oxidation of acetoacetate by liver homogenates.] *Arch. Sci. biol., Bologna*, 1954, **38**, 449-462. [Ist. Clin. Med. Gen., Univ. Milan.]

The effect of adding nicotinamide on the oxygen consumption of liver homogenates from rats maintained on different diets was studied in a Warburg apparatus. The diets were given for from 20 to 40 days before the experiment.

When the rats had been given complete diet, addition of nicotinamide reduced oxygen consumption, but if they had been fasted for from 1 to 8 days before the experiment, addition of nicotinamide increased it. With a low-protein diet, whether the rats were fasted or fed, nicotinamide increased oxygen consumption. With a low-protein, high-fat diet, the effect was the same when the rats were fed, but was less marked or absent when they had fasted. In rats on a high-protein diet, nicotinamide reduced oxygen consumption, and still more so when the rats had fasted.

The effect of different oxidisable substrates in the presence of nicotinamide was studied with the same technique with liver from rats fed on a complete diet and not fasting. The results for 23 substances are tabulated; the effect of nicotinamide was on the whole inhibitory, but with Na acetoacetate there was marked stimulation. With acetone or ethanol or both there was no such effect. Malonate had no effect on the action of nicotinamide whether the rats had been fasted on a complete diet or fed on a low-protein diet.

It is concluded that nicotinamide increased oxygen consumption in any conditions which increased the fat content of the liver, and that the type of oxidation studied was not related to the cycle of Krebs.—E. M. Hume.

1952

FISHER, H., SCOTT, H. M. and JOHNSON, B. C. Quantitative aspects of the niacin-tryptophan relationship in the chick. *Poultry Sci.*, 1954, **33**, 1054-1055. *Proc. [Illinois Agric. Exp. Stat., Urbana.]*

1953

PATTERSON, E. B., HUNT, J. R., VOHRA, P., BLAYLOCK, L. G. and MCGINNIS, J. Niacin and tryptophan requirements of chicks and turkeys. *Poultry Sci.*, 1954, **33**, 1075-1076. *Proc. [State Coll. Washington, Pullman.]*

1954

SUBRAHMANYAM, K. Transformation of L-tryptophane into nicotinic acid in liver slices of the young rat in the presence of some of the vitamins of the "B" group. *Indian J. Med. Res.*, 1954, **42**, 359-361. [Dept. Biochem., Sri Ram Chandra Bhanj Med. Coll., Cuttack.]

Six young rats were fed on a purified diet without the vitamin B complex. After 21 days they were killed and slices of the livers were incubated in phosphate buffer with tryptophan, alone or with single vitamins of the B complex. Only in the presence of pyridoxine did any considerable conversion of tryptophan to nicotinic acid occur. With vitamin B₁, riboflavin, choline or pantothenic acid the amounts were negligible, and with no added B vitamin there was none.

A. M. Copping.

1955

MIYAKE, A., BOKMAN, A. H. and SCHWEIGERT, B. S. 3-Hydroxyanthranilic acid metabolite. 6. Chemical studies on intermediate. *J. Biol. Chem.*, 1954, **211**, 391-404. [Div. Biochem. Nutrit., Amer. Meat Inst. Found., Chicago, Ill.]

Optimum conditions were studied for obtaining an accumulation of the unstable intermediate compound formed during the conversion of 3-hydroxyanthranilic acid to quinoline by a rat liver enzyme. The reaction took place at pH 7 and formation of the intermediate was measured spectrophotometrically. Metabolism of 3-hydroxyanthranilic acid was stimulated by ferrous ions and ascorbic acid; it was inhibited by $\alpha\alpha'$ -dipyridyl, ethylenediaminetetra-acetic acid, or *o*-phenanthroline, and partly inhibited by iodoacetate and hydroxylamine. A compound isolated from the intermediate phase had quinone structure and was a degradation product of the true intermediate. It is suggested that in the metabolism of 3-hydroxyanthranilic acid an *o*-quinoneimine is formed which is readily hydrolysed to an *o*-quinone. A diagram of the probable metabolic system with spectral absorption maxima for the intermediates is given.

A. M. Copping.

1956

LONG, C. L., HILL, H. N., WEINSTOCK, I. M. and HENDERSON, L. M. Studies of the enzymatic transformation of 3-hydroxyanthranilate to quinolinate. *J. Biol. Chem.*, 1954, **211**, 405-417. [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

N.A. and B., April 1955

In the enzymic transformation of 3-hydroxy-anthranilate to quinolinate, evidence for the participation of two intermediate products was obtained. An unstable intermediate required ferrous iron for its formation; it was spontaneously converted into quinolinate, but on acid treatment it yielded a more stable product which was not converted to quinolinate. Observations on the effect of pH on the absorption spectrum of the stable intermediate are reported. It is suggested that conversion of the unstable to the stable compound involved formation of a substance with carbonyl characteristics.—A. M. Copping.

1957

QUAGLIARIELLO, E. and DELLA PIETRA, G. Sulla trasformazione dell'acido 3-ossi-antranilico in acido nicotinic. [Transformation of 3-hydroxyanthranilic acid into nicotinic acid.]

DELLA PIETRA, G., QUAGLIARIELLO, E. and AURICCHIO, S. Sulla trasformazione dell'acido chinolinico in acido nicotinic. [Transformation of quinolinic acid into nicotinic acid.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 374-376; 377-379. [Ist. Chim., Fac. Med., Univ. Naples.]

Homogenates of 12-day chick embryos were incubated at 37° C. for 24 hr. in Krebs Ringer phosphate solution with or without 3 mg. of 3-hydroxyanthranilic acid per g. homogenate. The preparations were autoclaved and nicotinic acid was estimated with *Lactobacillus arabinosus* in them, and in the hydroxyanthranilic acid separately. For the last the values were nil. The mean values, in µg. nicotinic acid per g. embryo, were 27.7 with

range 17.0 to 40.0 in the homogenate without hydroxyanthranilic acid, and 36.2 with range 23.7 to 45.2 with it. Every one of 16 preparations showed the effect.

In experiments like the last, quinolinic acid in a range of concentrations was used instead of hydroxyanthranilic acid, but no formation of nicotinic acid could be demonstrated.—E. M. Hume.

1958

DALGLIESH, C. E. Thiamine and tryptophan metabolism. *Biochim. biophys. Acta*, 1954, **15**, 295-296. [Postgrad. Med. Sch., London.]

The metabolic pathway from tryptophan to nicotinic acid is briefly outlined. Results of giving tryptophan to rats deprived of vitamin B₁ or of both vitamin B₁ and vitamin B₆ were studied. In vitamin B₁ deficiency in the rat, the conversion of tryptophan to nicotinic acid derivatives is known to be reduced. When both deficiencies were present the metabolites excreted at first were typical of those in pyridoxine deficiency, the metabolic pathway being blocked at the kynurenine stage. As the concomitant vitamin B₁ deficiency developed the excretion of the metabolites characteristic of vitamin B₆ deficiency decreased and finally disappeared except for a small amount of xanthurenic acid. If vitamin B₁ was given, the excretory pattern returned to that of pyridoxine deficiency. Further tests of giving kynurenine to animals deficient in both vitamins suggested that in tryptophan metabolism vitamin B₁ might be operative at an earlier stage than pyridoxine.

A. M. Copping.

VITAMIN B₆ (PYRIDOXINE, ADERMIN)

1959

RAMALINGASWAMI, V. and SINCLAIR, H. M. Polycythaemia in pyridoxine deficiency in the rat. *Brit. J. Nutrition*, 1954, **8**, 386-392. [Lab. Human Nutrit., Univ. Oxford.]

Blood studies were made in 3 experiments with rats taken at weaning, at 11 weeks of age, or at 6 months of age, and given a purified diet with or without pyridoxine hydrochloride. The weanling rats survived deprivation for 59 days and the older rats for up to 159 days. During deprivation there was a progressive increase in the red cell count. Estimation of plasma volume and plasma protein showed no haemoconcentration. Hb value and haematocrit were not significantly altered in the early stages of the deficiency and were only slightly decreased in the later stages. The blood picture of the deficient rats was microcytic and normochromic.—A. M. Copping.

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1960

OLSEN, N. S. and MARTINDALE, W. E. Studies on chronic vitamin B₆ deficiency in the rat. 1. Changes in the intact animal. 2. Changes in tissue metabolism. *J. Nutrition*, 1954, **53**, 317-327; 329-340. [Res. Lab., Veterans Admin. Hosp., Nashville, Tenn.]

1. Chronic vitamin B₆ deficiency was produced in rats by a purified diet containing, per cent., casein 24, dextrose 62, fat 10, salt mixture 4, and a vitamin mixture without vitamin B₆. Deoxypyridoxine was given for the first four weeks and then withdrawn; the rats survived for up to 34 weeks. Typical signs of severe deficiency appeared in some rats within a week of giving deoxypyridoxine, and the mortality rate was so high that it was not desirable to continue giving it. Rats on stock diet and rats receiving vitamin B₆ as well as deprived animals ceased to gain weight after 16

weeks but the maximum weight attained by the different groups ranged from 429 g. on stock diet to 220 g. on deficient diet. Pyridoxal hydrochloride added to the deficient diet quickly increased growth and cured the gross lesions.

Systolic blood pressure was measured throughout and showed a significant increase in animals deprived of vitamin B₆. The blood pressure was reduced when pyridoxal hydrochloride was added to the diet. No significant change in Hb content or red cell count was found, but a decrease in the white cell count occurred in deficient rats. No vascular or sclerotic lesion or histological change was seen in the heart, lung, liver, spleen, pancreas, adrenal glands, kidneys, testis or brain.

Extracellular fluid volume was measured with radio-active Na in a few rats from each group and no significant difference was found.

2. At the end of the experiment just described, the wet weights of the adrenal glands, liver, kidneys and ventricular mass of the heart were recorded. All were greater in rats deprived of vitamin B₆ than in animals on normal or purified diets or on a restricted food intake. The vitamin B₆ content of the liver and kidneys estimated with *Saccharomyces carlsbergensis* was low in deficient rats.

The oxygen uptake of broken-cell preparations measured manometrically decreased by 30 per cent. in the liver tissue, and 20 per cent. in the kidney tissue, of deprived rats. Addition of pyridoxal *in vitro* caused a rise of the oxygen uptake to normal in tissue preparations from deficient rats. The rate of oxidation of some amino-acids and amines added to the substrate did not differ for normal and deficient animals. With chemical complexes of pyridoxal and amino-acids the increase observed in the oxygen uptake of deficient tissues was less. The failure to metabolise the complexes completely is attributed to a low concentration of free vitamin B₆ in the tissues of deficient animals. The nature of the pyridoxal complexes and their relation to the transaminase and decarboxylase functions of vitamin B₆ are discussed.—A. M. Copping.

1961

CHIANCONI, F. M., GINOULIAC, E. and TENCONI, L. T. Lesioni biochimiche della carenza di piridossina e loro specificità. [Biochemical lesions of pyridoxine deficiency and their specificity.] *Acta vitaminol.*, 1954, **8**, 209-213. [Lab. Direzione Med. Cent., Lepetit S.p.A., Milan.] French, English, German and Spanish summaries.

Of 16 male rats aged from 30 to 40 days, 4 had a complete diet and the rest a diet without vitamin B₆. After 36 days all were given by mouth a single dose of 500 mg. L-tryptophan per kg. body-weight. Of those having the deficient diet, 4 were given 250 µg. pyridoxine hydrochloride and 4 were

given 250 µg. riboflavin, of which part was given by mouth 30 min. before the dose of tryptophan and part subcutaneously immediately after it; 4 had no addition. Urine was collected for the ensuing 24 hr. The amounts of N¹-methylnicotinamide and nicotinic acid in the urine were greater with the complete diet than with any of the experimental diets, for which the amounts did not differ greatly. The amount of xanthurenic acid in the urine was least with the complete diet and only slightly greater with the experimental diet with added pyridoxine; without pyridoxine, whether riboflavin was added or not, the amount of xanthurenic acid was very much greater. For kynurenine, the results were similar to those for xanthurenic acid, but the amount with a complete diet was considerably less than with the experimental diet with added pyridoxine.—E. M. Hume.

1962

KOTAKE, Y., KOTAKE, Y. (Jr.) and INOUE, A. Studies on xanthurenic acid. 7. On the "xanthurenicase".

KOTAKE, Y. (Jr.) and KAMADA, J. 8. Interactions between xanthurenic acid and acetone bodies in rat. *J. Biochem., Tokyo*, 1954, **41**, 425-433; 435-441. [Dept. Biochem., Wakayama Med. Coll.]

See Abst. 456, Vol. 25.

1963

BEATON, J. R. and GOODWIN, M. E. Studies on the effect of vitamin B₆ deprivation on carbohydrate metabolism in the rat. *Canad. J. Biochem. Physiol.*, 1954, **32**, 684-688. [Dept. Pub. Health Nutr., Univ. Toronto.]

Rats weighing about 100 g. were given a purified diet with or without pyridoxine for 5 or 22 days. After an 18-hr. fast the heart blood and liver were taken under anaesthesia or, in one experiment, after the animals were killed by stunning and decapitation. After only 5 days' deprivation there were significant decreases in the blood sugar and liver glycogen, and after 22 days the reduction was large and the pyruvic acid and lactic acid in the blood were low. The lactic acid dehydrogenase was depressed in liver homogenates from the deprived rats. The importance of the early changes in carbohydrate metabolism in vitamin B₆ deficiency is discussed.—A. M. Copping.

1964

BRIN, M., OLSON, R. E. and STARE, F. J. Metabolism of cardiac muscle. 8. Pyridoxine deficiency. *J. Biol. Chem.*, 1954, **210**, 435-444. [Dept. Nutr., Harvard Sch. Pub. Health, Boston, Mass.]

Methods were devised for manometric measurement of glutamic-aspartic and glutamic-alanine

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transaminase activity of duck heart tissues. With homogenates from the heart of ducks deprived of vitamin B₆ the transaminase activity was less than for normal heart tissue. Transaminase activity could be restored *in vitro* by addition of pyridoxal phosphate to the system. Administration of pyridoxine, pyridoxamine or pyridoxal to the deprived ducks restored full transaminase activity to their heart tissues. An attempt to relate the change in transaminase activity to the Hb content of the blood in deprived ducks failed. Slices of ventricle from deficient ducks showed no abnormality in endogenous respiration or in rate of oxidation and utilisation of pyruvate and lactate.

A. M. Copping.

1965

BLAKLEY, R. L. Participation of pyridoxal phosphate in the enzymic synthesis of serine. *Nature*, 1954, 174, 652. [Jolin Curtin Sch. Med. Res., Australian Nat. Univ., Canberra.]

An enzyme preparation from acetone-dried rabbit liver powder synthesised serine on incubation with glycine, formaldehyde, tetrahydropteroyl-glutamic acid and bicarbonate buffer. If pyridoxal phosphate was added to the system the rate of serine formation was increased by more than 100 per cent. in some experiments. The enzyme was almost inactivated by incubation at 37°C. and pH 8.6 for 30 min., but activity was restored by further incubation in the presence of pyridoxal phosphate. Synthesis with the re-activated enzyme was up to 100 times the amount of serine formed with the almost inactivated enzyme.

A. M. Copping.

1966

SINITZYNA, A. L. Vliyanie B₆-avitaminoza na dezaminirovanie L-aminokislit i na sintez ikh iz α -keto i α -okskislit i amniaka v pecheni i pockakh krysy. [Effect of vitamin B₆ deficiency on the deamination of L-amino-acids and on their synthesis from α -keto- and

α -hydroxy-acids and ammonia in rat liver and kidney.] *Biokhimiya*, 1954, 19, 80-87. [Inst. Med. Biol. Khim., Akad. Med. Nauk SSSR, Moscow.]

Deficiency of vitamin B₆ is said to reduce the activity of aminophosphatases in the rat. Oxidative deamination of L-glutamic acid in liver homogenates, and amination of α -ketoglutaric acid in liver and kidney slices, was not significantly different from normal in deficient rats. Deamination of L-alanine and L-aspartic acid in liver homogenates was disturbed. Incubation of liver and kidney slices with pyruvate and ammonia yielded only glutamic acid in appreciable amounts. Synthesis of phenylalanine and histidine from phenylpyruvic acid and imidazole-lactic acid was almost independent of added ammonia and ceased in vitamin B₆ deficiency. The results are taken to prove that the processes studied, except in respect of glutamic acid and α -ketoglutaric acid, depend on transamination.

D. W. Taylor.

1967

MAKINO, K. and KOIKE, M. Competitive inhibition of pyridoxal phosphate action by toxopyrimidine phosphate in the tyrosine decarboxylase system. *Nature*, 1954, 174, 1056-1057. [Dept. Biochem., Med. Sch., Univ. Kumamoto, Japan.]

A possible relation between pyridoxal and toxopyrimidine was shown by Makino *et al.* (*Nature*, 1954, 173, 34; Abstr. 445, Vol. 25). An attempt was made to demonstrate a biological antagonism between toxopyrimidine phosphate and pyridoxal phosphate in the activation of a cell-free preparation of tyrosine apodecarboxylase prepared from *Streptococcus faecalis* R grown on a medium deficient in vitamin B₆. Toxopyrimidine at concentrations between $1 \times 10^{-10}M$ and $1 \times 10^{-6}M$ had no inhibiting effect, whatever the concentration of pyridoxal phosphate. Toxopyrimidine phosphate at concentrations of from $1 \times 10^{-10}M$ to $1 \times 10^{-7}M$ produced from 16 to almost 100 per cent. inhibition.—A. M. Copping.

PANTOTHENIC ACID

1968

FAMIANI, V. and AMICI, A. Sull'opportunità di ricerche sistematiche relative alla reale azione dell'acido pantotenico nel metabolismo. [Action of pantothenic acid in metabolism.] *Bol. Soc. ital. Biol. sper.*, 1954, 30, 88-90. [Ist. Fisiol., Univ. Perugia.]

A brief review is given, introductory to a programme of research.—E. M. Hume.

1969

EVERSON, G., NORTHERP, L., CHUNG, N. Y., GETTY, R. and PUDELKEWICZ, C. Effect of varying

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the intake of calcium pantothenate of rats during pregnancy. 1. Chemical findings in the young at birth.

CHUNG, N. Y., NORTHERP, L., GETTY, R. and EVERSON, G. 2. Histological and histochemical studies of the liver, adrenal, duodenum, and tibia of the young at birth. *J. Nutrition*, 1954, 53, 341-350; 54, 97-105. [Nutrit. Lab., Dept. Home Econ. Res., Iowa State Coll., Ames.]

1. Young female rats were transferred immediately after the birth of a first litter to synthetic diets without calcium pantothenate or with 0.1 or

15

1.0 mg. daily. They were re-mated a week later and killed after the birth of their litters. Deprivation of pantothenate throughout pregnancy greatly reduced the size and number of the young. Those having 0.1 or 1.0 mg. produced about the same number and weight of young, but fewer than those produced by rats on stock diets. The pantothenic acid content of the tissues estimated with *Lactobacillus arabinosus* was low for the liver and carcass of the deprived mothers and for the carcass and blood of their young. A daily dose of 0.1 mg. raised the pantothenic acid content of the liver and carcass of the mother and the blood and carcass of the young to almost normal values and a dose of 1.0 mg. raised the values above normal. Newborn young with a very low concentration of pantothenic acid in the blood showed some accumulation of pyruvic acid. Ascorbic acid and alkaline phosphatase values in the serum of the young were not affected by the amount of pantothenate in the maternal diet.

2. In the young killed at birth, the liver, adrenal glands, duodenum and tibia were taken for histological study. No structural change was seen in any of the tissues and no important variation from normal could be demonstrated in the alkaline phosphatase content of the tissues. The period of pantothenic acid deficiency appeared not to affect the young that survived but a high proportion of litters was resorbed, so that any damage must have occurred in early prenatal life.

A. M. Copping.

1970

EVERSON, G., NORTHROP, L., CHUNG, N. Y. and GETTY, R. Effect of ascorbic acid on rats deprived of pantothenic acid during pregnancy. *J. Nutrition*, 1954, 54, 305-311. [Nutrit. Lab., Dept. Home Econ. Res., Iowa State Coll., Ames.]

The effect was studied of including 2 per cent. of ascorbic acid in a diet otherwise devoid only of pantothenic acid in rats again pregnant after a successful pregnancy on a normal diet. The young were removed immediately after birth and the total pantothenic acid content of the blood of the young and of the tissues of mother and young was estimated with *Lactobacillus arabinosus*. With ascorbic acid in the diet the reproductive performance was better than on the diet without pantothenic acid and ascorbic acid. The pantothenic acid content of the blood of the young and of the tissues of the mother and young was raised by including ascorbic acid almost to the values attained with a full supplement of pantothenic acid. With ascorbic acid there was no rise of pyruvic acid, such as occurred in the blood of young rats from mothers deprived of pantothenic acid. It seemed that large amounts of ascorbic acid in the diet of the mother prevented the occur-

rence of any sign of pantothenic acid deficiency in the young.—A. M. Copping.

1971

WELCH, B. E. and COUCH, J. R. Vitamin B₁₂ and sub-optimal levels of pantothenic acid in chick nutrition. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 121-123. [Dept. Poultry Husb., Texas Agric. Exp. Stat., College Station.]

In day-old chicks which received for 4 weeks a basal diet containing, per kg., 10.5 mg. pantothenic acid, and supplemented with 1.66 mg. pantothenic acid, growth was decreased by supplements of 50 µg. vitamin B₁₂ per kg. With increase in the amount of vitamin B₁₂ growth was further reduced and signs of pantothenic acid deficiency became progressively more pronounced. When the supplements of pantothenic acid were increased to 3.32 and 6.64 mg. per kg. diet growth improved and the signs of deficiency disappeared. Further additions of pantothenic acid were without effect. Addition of vitamin B₁₂ up to 100 µg. per kg. diet progressively increased the vitamin B₁₂ content of the liver, and it was still further increased by adding pantothenic acid, 3.32 and 6.64 mg. per kg. diet. The results suggested a sparing effect on vitamin B₁₂ of pantothenic acid. The pantothenic acid content of the liver was increased only when supplements of 6.64 mg. or more of pantothenic acid per kg. diet were given.—E. M. Cruickshank.

1972

CASCIO, G., DOLCINI, C. and TACCHI, V. Sul comportamento della glicemia, del glicogeno epatico, cardiaco e muscolare e dei lipidi totali del fegato di ratti albini dopo somministrazione di acido pantothenico. [Behaviour of the blood sugar, of the liver, heart and muscle glycogen, and of the total liver lipids in the albino rat after administration of pantothenic acid.] *Bol. Soc. ital. Biol. sper.*, 1954, 30, 90-92. [Ist. Fisiol., Univ. Perugia.]

Of 12 young adult male rats maintained on a mixed diet, 4 were killed without any treatment, and 8 were given a single subcutaneous injection of 100 mg. pantothenic acid; 4 of them were killed after 90 min. and 4 after 240 min. The glycogen content of the muscle decreased slightly and progressively, that of the heart was unaffected, that of the liver was considerably increased after 90 min. and had fallen again after 240 min. Blood sugar too was higher after 90 min., and had fallen again after 240 min. Total lipids in the liver increased considerably and progressively.

E. M. Hume.

1973

PENNETTI, V. and RUBINO, F. Azione dell'acido pantothenico sugli scambi gassosi respiratori dei colombi normali. [Action of pantothenic

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acid on the respiratory gaseous exchange of normal pigeons.]

- RUBINO, F. and PENNETTI, V. Azione dell'acido pantoténico sul consumo di O_2 del fegato di colombi normali e di colombi ipertiroidizzati sperimentalmente. [Effect of pantothenic acid on oxygen consumption by the liver of normal pigeons and of pigeons with experimental hyperthyroidism.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 403; 404-405. [Ist. Naz. Nutriz. C.N.R.]

The oxygen consumption and respiratory quotient were estimated in 6 pigeons fed on a normal diet, and then daily for 6 days while 100 mg. pantothenic acid were being given. The R.Q. was unchanged but oxygen consumption was reduced by the treatment.

Oxygen consumption was measured in liver homogenates of pigeons treated as just described, or as just described with addition of 0.5 mg. thyroxine daily, or with thyroxine but without pantothenic acid. The rise in oxygen consumption promoted by thyroxine was partly countered by pantothenic acid.—E. M. Hume.

1974

- DINNING, J. S., NEATROUR, R. and DAY, P. L. Interrelationships of pantothenic acid and methionine in lymphocyte production by rats. *J. Nutrition*, 1954, **53**, 557-562. [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

Weanling rats given purified soya bean protein as the only protein in a pantothenate-deficient diet survived if methionine or pantothenic acid was added to the diet. Smaller amounts of methionine were effective if given with pantothenic acid. A supplement of 20 mg. Ca pantothenate per kg. diet with 0.43 per cent. methionine gave a maximum growth response. The peripheral leucocyte count was greatly reduced in rats deprived of both methionine and pantothenate. Without pantothenate, the amount of methionine required to maintain a normal lymphocyte count was 1.75 per cent. The probable role of methionine in the metabolism of pantothenic acid is discussed.—A. M. Copping.

1975

- THOMPSON, R. Q., BIRD, O. D. and PETERSON, F. E. The utilization of pantethine as compared to calcium pantothenate by the chick. *J. Nutrition*, 1954, **53**, 365-375. [Res. Labs., Parke, Davis and Co., Detroit, Mich.]

The biological potency for chicks of the *Lactobacillus bulgaricus* factor, pantethine, was com-

pared with that of calcium pantothenate given in the diet, or directly by mouth or by intraperitoneal injection. Pantethine had about 90 per cent. of the potency of pantothenate given orally but was equally potent given parenterally. Pantetheine, which is a reduced form of pantethine, and the mercury mercaptide of pantetheine were as potent as pantethine if given directly by mouth or by injection.—A. M. Copping.

1976

- THOMPSON, R. Q. and BIRD, O. D. *In vivo* activity of pantothenylcyst(e)ine for rats and chicks. *Science*, 1954, **120**, 763-764. [Res. Labs., Parke, Davis and Co., Detroit, Mich.]

In view of reports that pantothenylcysteine had growth-promoting activity for certain micro-organisms, it was tested on young chicks and rats given diets lacking in pantothenic acid. Whether given with the diet or injected it failed to promote growth in chicks or rats deprived of pantothenic acid.—A. M. Copping.

1977

- WIELAND, T. and MAUL, W. Synthese und Wuchsstoffwirkung von "Di-äthyl-pantothen-säure" $[D(+)-N-(\alpha, \gamma$ -dioxo- β , β -diäthyl-butyl- β -alanin)]. [Synthesis and activity as a growth substance of diethylpantothenic acid $[D(+)-N-(\alpha, \gamma$ -dihydroxy- β , β -diethylbutyl- β -alanine)]. *Biochem. Ztschr.*, 1954, **326**, 18-23. [Inst. Org. Chem., Univ. Frankfurt a.M.]

An analogue of pantothenic acid was synthesised with ethyl groups instead of methyl groups in the butyrolactone part of the molecule. The analogue showed small but definite growth-promoting activity for *Streptobacterium plantarum* 10 S and *Saccharomyces carlsbergensis* 4228, the ratio of the potency of the ethyl-substituted analogue to that of the original pantothenic acid being about 1 to 1000.—A. M. Copping.

1978

- BARNHART, C. E., CATRON, D. V., QUINN, L. Y. and ASHTON, G. C. Pantothenic acid requirement of weanling pigs fed a purified ration. *J. Animal Sci.*, 1954, **13**, 974-975. *Proc. [Iowa State Coll.]*

1979

- ULLREY, D. E., BECKER, D. E., TERRILL, S. W. and NOTZOLD, R. A. Levels of pantothenic acid and reproductive performance of sows. *J. Animal Sci.*, 1954, **13**, 1002-1003. [Univ. Illinois.]

BIOTIN

1980

THOMA, R. W. and PETERSON, W. H. The enzymatic degradation of soluble bound biotin. *J. Biol. Chem.*, 1954, **210**, 569-579. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Free biotin was estimated with *Lactobacillus arabinosus*. The total biotin content of peptic digests of liver was the amount measured by *L. arabinosus* after the liver had been hydrolysed for 2 hr. at 120°C. with 4*N* H₂SO₄. The soluble, bound biotin which was made available by acid hydrolysis could be freed also by treatment with an enzyme, biotinidase, obtained from fresh or acetone-treated pig's liver, or from pig's kidney or chick pancreas. Many other enzymes, including pepsin, trypsin, papain, proteases and esterases were tested, but only one, *Fusarium* lipase, showed biotinidase activity. Biotinidase could be separated from esterases by fractional precipitation with ammonium sulphate. Concentrated biotinidase hydrolysed biocytin and *p*-(*N*-biotinyl-amino)-benzoic acid, but not *N*-biotinyl-L-aspartic ester.—A. M. Copping.

1981

DELOST, P. and TERROINE, T. Effets de la carence en biotine sur certaines glandes endocrines au cours du développement post-natal du rat. [Effect of biotin deficiency on some endocrine glands during post-natal development of the rat.] *C.R. Acad. Sci.*, 1954, **239**, 902-904.

Three groups of male rats about 1 month old and weighing 40 g. were given a basal diet deficient in biotin (Abst. 452, Vol. 24), or the same diet with added biotin, given to appetite or restricted to the amount consumed by the rats on the deficient diet. Rats were killed for histological examination after from 1 to 11 weeks of the diets.

Biotin deprivation had no significant effect on the adrenal glands or on the histology of the thyroid gland, but progressive changes appeared in the testes, in which, by the end of the experiment, the seminiferous tubules had atrophied and no longer contained spermatozoa. Simple restriction of food intake had little effect on the testes.

D. Duncan.

1982

SERVIGNÉ, M. and TERROINE, T. Troubles moteurs et teneur en potassium musculaire chez le rat carencé en biotine. [Locomotor disturbances and the potassium content of muscle in the biotin-deficient rat.] *Arch. Sci. physiol.*, 1964, **8**, 227-232. [Lab. Recherches Physicochim., Inst. Nat. Agronom., Paris.]

Young male rats weighing about 40 g. were given purified diets with or without biotin, and

when the deprived animals showed severe alopecia, hunched backs and kangaroo gait all were killed and the K content of the muscles was estimated. On the average, the values were about 15 per cent. lower in the deprived rats than in the non-deprived, but the signs of severe deficiency were not invariably accompanied by low values for K in the muscles, which did not seem to be the chief cause of the changes in posture and gait in the deficiency.—A. M. Copping.

1983

CARR, L. M. A toxic effect of fluoride. *Nature*, 1954, **174**, 884-885. [Dept. Health, Canberra.]

Experiments were made with rats to test whether fluoride, by its depressing effect on bacterial activity, might produce signs of vitamin deficiency after the manner of sulpha drugs or antibiotics. Two groups of 3 rats were given a semi-synthetic diet with a vitamin mixture but without biotin; one group had 80 p.p.m. F as NaF added to the drinking water and the other had no added F. At the end of 3 weeks the average weights were 178 and 204 g. for those with and without fluoride, respectively. The diet was then changed to a synthetic one, containing 16 per cent. raw egg white, with the same vitamin supplement, and after 16 days the respective average weights were 125 and 196 g. In the group given fluoride signs of biotin deficiency appeared and 1 rat died; the animals without fluoride were free from such signs.

Other similar experiments are mentioned which suggest that the effects may be due to a biotin deficiency complicated by other conditions or to an unknown form of toxicity resulting from the use together of egg white and fluorine. They will be reported later in detail.—D. Harvey.

1984

HOFMANN, K. and PANOS, C. The biotin-like activity of lactobacillic acid and related compounds. *J. Biol. Chem.*, 1954, **210**, 687-693. [Dept. Biochem., Sch. Med., Univ. Pittsburgh, Pa.]

Cyclopropane fatty acids of the *trans*-series were synthesised as previously described (*J. Amer. Chem. Soc.*, 1954, **76**, 1799) and tested for their growth-stimulating effect on organisms known to require biotin. Lactobacillic acid and three related acids, and oleic, elaidic, *cis*-vaccenic and *trans*-vaccenic acids all showed growth effects for *Lactobacillus arabinosus* and *L. casei*. *L. delbrueckii* did not respond to *trans*-vaccenic acid and *Clostridium butyricum* and *L. acidophilus* did not respond to most of the acids tested. The growth effect

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appeared to depend on the presence of a chain of more than 11 carbon atoms, since shorter-chain compounds failed to support growth.

A. M. Copping.

1985

GOTHOSKAR, S. S. and SREENIVASAN, A. **Biotin metabolism in micro-organisms.** 1. Biosynthesis. 2. Role of biotin in some oxidative systems. 3. Aspartic-acid oxidation and deamination. *Indian J. Med. Res.*, 1953, **41**, 51-57; 59-67; 69-84. [Dept. Chem. Technol., Univ. Bombay, Matunga.]

1. Synthesis of biotin was studied in cultures of *Bacterium coli* in a semi-synthetic medium containing a vitamin-free casein hydrolysate. Biotin was estimated with *Lactobacillus arabinosus*. Pimelic acid, urea or cystine separately added to the medium did not increase synthesis of biotin, but the three together did. Desthiobiotin in the medium caused a large increase in biotin production and no added cystine appeared to be required for the introduction of the sulphur atom into the biotin molecule.

2. The enzyme activities of normal and biotin-deficient cells of *L. arabinosus* were examined by manometric methods. Lactic and pyruvic dehydrogenases and serine oxidase systems were partly inactivated in the absence of biotin, but other enzymes were not affected. Normal *L. arabinosus* was able to dehydrogenate sodium salts of fatty acids, including laurate, myristate, palmitate and stearate, and this function, too, was impaired in biotin-deficient cells. It was increased in cells grown in media containing aspartate and oleate. Cells of *Bact. coli* contained a fatty acid dehydrogenase, the activity of which was less in cells deprived of biotin by ageing in a phosphate buffer. Biotin is considered to act indirectly, probably by influencing the synthesis of amino-acids in the enzymes studied.

3. The aspartic deaminase activity of resting cells of *Bact. coli* was not affected by addition of biotin and adenylc acid or by cultivation in media with added biotin, aspartate and oleate, or avidin. When the cells were aged at pH 4 the deaminase activity fell and was not restored by addition of biotin and adenylc acid, unless glucose and phosphate were present. The effects were the same in aerobic and anaerobic conditions. An attempt was made to correlate oxygen uptake and liberation of ammonia during oxidative deamination, but the oxygen uptake always exceeded the theoretical value. The aspartic oxidase activity was less in aged cells; it was not restored by biotin and adenylc acid alone, and was restored only to a small extent in presence of glucose and phosphate. The possible role of biotin in the different enzyme systems is discussed.—A. M. Copping.

1986

SHANMUGA SUNDARAM, E. R. B., TIRUNARAYANAN, M. O. and SARMA, P. S. **The relation between biotin and tryptophan metabolism studied in *Neurospora crassa*.** *Biochem. J.*, 1954, **58**, 469-473. [Biochem. Lab., Univ. Madras.]

By the use of mutant strains of *Neurospora crassa* unable to synthesise nicotinic acid but capable of quantitative response to the metabolites formed during conversion of tryptophan to nicotinic acid, the importance of biotin for utilisation of tryptophan was demonstrated. Biotin appeared to function only in the conversion of tryptophan to formylkynurenine, and no other step in the reaction was affected by lack of biotin. Biotin deficiency was produced in the *Neurospora* cultures with the antagonist γ -(3:4-ureylenecyclohexyl)-butyric acid. Studies *in vitro* with suspensions of *Neurospora* mycelium showed accumulation of tryptophan if the antagonist was present in the medium.—A. M. Copping.

p-AMINO BENZOIC ACID

1987

ARIËNS, E. J. **Affinity and intrinsic activity in the theory of competitive inhibition.** 1. Problems and theory.

ARIËNS, E. J. and SIMONIS, A. M. **2. Experiments with para-amino-benzoic acid derivatives.** *Arch. internat. Pharmacodyn.*, 1954, **99**, 32-49; 175-187. [Pharmacol. Lab., Univ. Utrecht.]

1. The first paper is a theoretical and mathematical discussion of the fact that "some drugs, while presumably reacting with the same receptor, were still able to produce opposite effects, depending on varying conditions". Such dualistic behaviour was explained "by extending the theory of com-

petitive inhibition with the concepts of *affinity* and *intrinsic-activity*", which are specially defined. Affinity is defined as the tendency of the drug to combine with the receptor; the intrinsic-activity determines the effect, such as velocity of enzyme action or of growth, that can be obtained with a certain amount of the metabolite-receptor complex.

2. In the second paper experimental results with some p-aminobenzoic acid derivatives and sulphanilamide compounds are described, a p-aminobenzoic-acid-deficient mutant of *Bacterium coli* being the organism used. The results of the experiments are held to support the theory put forward.—E. M. Hume.

1988

- OELSSNER, W. Zur Analytik der *p*-Aminobenzoessäure. (Bemerkungen zur gleichnamigen Veröffentlichung von F. Weiss.) [The estimation of *p*-aminobenzoic acid. Remarks on the paper with the same title by F. Weiss.] *Pharm. Zentralhalle*, 1954, 93, 8-12. [Pharmacol. Inst., Karl Marx Univ., Leipzig.]

1989

- WEISS, F. Zur Analytik der *p*-Aminobenzoessäure. (Zugleich Erwiderung auf die vorstehenden Ausführungen von W. Oelssner.) [The estimation of *p*-aminobenzoic acid. A reply to the foregoing arguments of W. Oelssner.] *Pharm. Zentralhalle*, 1954, 93, 12-13. [Pharmacol. Inst., Humboldt-Univ., Berlin.]

FOLIC ACID (PTEROYLGLUTAMIC ACID)

1990

- ANDREEVA, N. A. Flyuorometricheskii metod opredeleniya folievoi kisloty i nekotorye dannye o ee rasprostraneni. [Fluorimetric method of estimating folic acid and some results on its distribution.] *Biokhimiya*, 1953, 18, 571-575. [Inst. Biokhim. A. N. Vakh, Akad. Nauk SSSR, Moscow.]

A description is given of refinements in the author's original method for estimating folic acid, based on its adsorption from extracts on to activated charcoal, oxidation by KMnO_4 to a fluorescent derivative (pteridyl-6-carboxylic acid) and estimation of the intensity of fluorescence at 470 m μ , compared with that of a standard solution. In the course of the experiments, folic acid was estimated in a large number of cereal and leguminous products, fruits, berries, vegetables and animal products.—D. W. Taylor.

1991

- RABBI, A. Il citrovorum factor ed i fattori del gruppo dell'acido folinico. [Citrovorum factor and factors of the folinic acid group.] *Quad. Nutrizione*, 1953, 13, 1-19. [Ist. Chim. Biol., Univ. Bologna.]

A review.

1992

- AFONSKY, D. Folic acid deficiency in the dog. *Science*, 1954, 120, 803-805. [Dept. Dent. Res., Univ. Rochester, N.Y.]

Signs of folic acid deficiency occurred in a dog given a purified diet without folic acid or vitamin B_{12} . Folic acid, 30 mg., restored the blood picture to normal but vitamin B_{12} did not. After about 6 weeks the animal again became ill but was successfully treated with folic acid. When the dog was killed hypoplasia of the bone marrow and lesions of the tongue were found. In view of the findings folic acid was given to dogs having diets deficient in nicotinic acid, vitamin B_6 , riboflavin or pantothenic acid. It did not affect development of deficiency and did not enhance the effect of other vitamins when they were given in curative amounts. It is suggested that some dogs, but not all, may require folic acid.—A. M. Copping.

1993

- BAIRD, C. D. C., NELSON, M. M., MONIE, I. W. and EVANS, H. M. Congenital cardiovascular anomalies induced by pteroylglutamic acid deficiency during gestation in the rat. *Circulation Res.*, 1954, 2, 544-554. [Inst. Exp. Biol., Univ. California, Berkeley.]

Normal female rats mated at from 3 to 4 months of age were given a diet lacking pteroylglutamic acid for from 2 to 11 days at different stages of pregnancy. When the deficient diet was given between the seventh and tenth day of gestation, from 28 to 57 per cent. of the young showed congenital cardiovascular anomalies at birth, even if the deprivation was for only 48 hr. The critical period was from the ninth to the eleventh day of gestation. If the deficient diet was given after the tenth day no abnormality developed. The cardiovascular anomalies found included interventricular septal defects, persistent truncus arteriosus, double or right aortic arch, absence of ductus arteriosus, aberrant origins of subclavian arteries and other variations of the arterial pattern derived from the embryonic arch system. No anomaly was found in young from mothers given stock diet or a purified diet supplemented with pteroylglutamic acid.—A. M. Copping.

1994

- NABER, E. C., BAUMANN, C. A. and BIRD, H. R. Nucleic acids as growth factors for the folacin deficient chick. *Poultry Sci.*, 1954, 33, 1073-1074. *Proc.* [Univ. Wisconsin, Madison.]

1995

- BROWN, W. O. Nitrogen metabolism in the folic acid-deficient chick studied by a balance technique. 10th World's Poultry Congr. Sect. Papers, Edinburgh, 1954, 149-152. [Dept. Agric. Chem., Queen's Univ., Belfast.]

1996

- FRIEDMANN, B., NAKADA, H. I. and WEINHOUSE, S. A study of the oxidation of formic acid in the folic acid-deficient rat.

N.A. and B., April 1955

WEINHOUSE, S. and FRIEDMANN, B. A study of formate production in normal and folic acid-deficient rats. *J. Biol. Chem.*, 1954, **210**, 413-421; 423-433. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

The oxidation of ^{14}C -labelled sodium formate given intraperitoneally to fasting adult rats was studied with normal animals and animals deprived of folic acid, kept in a metabolism apparatus for 6 hr. after the injection. Rats deprived of folic acid had much less power to oxidise formate to CO_2 . Administration of folic acid restored the oxidation to normal. The defect was apparently in the metabolism and was not due to impairment in the absorption or excretion of formate. Studies were made *in vitro* with tissue homogenates and very low values were found in oxidation of formate by heart, kidney and liver from deprived rats; the catalase activity of liver too was low. The role of catalase in oxidation of formate is discussed with reference to the possible relation between folic acid and catalase activity.

The production of formate from glycine, choline, methionine or sarcosine labelled with ^{14}C was studied in normal rats and in rats deprived of folic acid. Tracer doses of the precursors were given with larger amounts of formate and the amounts of ^{14}C were measured in the urinary formate and the respiratory CO_2 during 6 hr. Rats deprived of folic acid produced more formate from the methyl groups of methionine, choline and sarcosine but less from the α -carbon of glycine than those given folic acid. Deprivation of folic acid caused a slight reduction in oxidation of methyl groups to CO_2 but strongly inhibited the oxidation of the α -carbon of glycine.

A. M. Copping.

1997

DOCTOR, V. M., COUCH, J. R. and TRUNNELL, J. B. Factors influencing conversion of folic acid to citrovorum factor by chick liver fractions. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 228-231. [Sect. Exp. Med., Univ. Texas, College Station.]

A study was made of the effect of homocysteine, cysteine, cystine, glutathione and ascorbic acid on the enzyme system in chick liver that converts folic acid to citrovorum factor. The enzyme was present mainly in the supernatant fraction obtained when a liver homogenate was centrifuged. It was precipitated by 40 per cent. ethanol. Homocysteine had a specific stimulatory effect which was not shared by the other sulphhydryl compounds tested. Optimum activity was obtained in the presence of serine, homocysteine and magnesium when dried acetone extract of liver was used. It is suggested that unidentified factors present in chick liver homogenates are required for the conversion of folic acid to citrovorum factor.—A. M. Copping.

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1998

LASCELLES, J. and WOODS, D. D. The synthesis of serine and *Leuconostoc citrovorum* factor by cell suspensions of *Streptococcus faecalis* R. *Biochem. J.*, 1954, **58**, 486-497. [Microbiol. Unit, Dept. Biochem., Univ. Oxford.]

Cells of *Streptococcus faecalis* R previously deprived of folic acid and vitamin B_6 synthesised serine on incubation in a buffered mixture of glycine, formate, glucose, pyridoxal and pteroylglutamic acid. Only about one-tenth of the amount of serine appeared if any one of the constituents of the mixture was omitted. Leucovorin and N^{10} -formylpteroylglutamic acid could replace folic acid. A substance required for growth of *Leuconostoc citrovorum* was synthesised at the same time as serine in the complete mixture; it could be formed also in the absence of glycine and pyridoxal. Synthesis of serine and the citrovorum factor was inhibited by N^{10} -methylptericoic acid in competition with folic acid. Serine was required for growth of *S. faecalis* R in a medium lacking folic acid and vitamin B_6 . The possible co-enzyme activities of folic acid or its derivatives in the synthesis of serine are discussed with reference to the findings.—A. M. Copping.

1999

BLAKLEY, R. L. The interconversion of serine and glycine: role of pteroylglutamic acid and other cofactors. *Biochem. J.*, 1954, **58**, 443-462. [Nat. Inst. Med. Res., Mill Hill, London; N.W.7.]

A study of the interconversion of glycine and serine was made with ^{14}C -labelled glycine and an enzyme prepared from pigeon liver. $2\text{-}^{14}\text{C}$ -Serine was formed from $2\text{-}^{14}\text{C}$ -glycine and L-serine. D-Serine did not react and no ^{14}C was found in the 3-C of serine. The labelled serine could be converted into glycine and formaldehyde. Pteroylglutamic acid was essential as a catalyst in the processes of interconversion; leucovorin had some catalytic effect but required simultaneous addition of yeast extract for a rapid reaction. Of other derivatives of pteroylglutamic acid studied, tetrahydropteroylglutamic acid was the most active catalyst. 4-Aminopteroylglutamic acid inhibited interconversion when pteroylglutamic acid was the catalyst, but not when the catalyst was leucovorin or tetrahydropteroylglutamic acid. The results are discussed and a scheme is suggested for the role of pteroylglutamic acid derivatives in metabolism of formate and transfer of C atoms.

A. M. Copping.

2000

GREENBERG, G. R. Symposium on basic and applied studies of newer B-complex factors.

Role of folic acid derivatives in purine biosynthesis. *Federation Proc.*, 1954, **13**, 745-759. [Dept. Biochem., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

2001

HAMILTON, L., PHILIPS, F. S., STERNBERG, S. S., CLARKE, D. A. and HITCHINGS, G. H. (with WHEELLOCK, B. and DEBLEUX, A.) Hematological effects of certain 2, 4-diaminopyrimidines, antagonists of folic acid metabolism. *Blood, J. Hematol.*, 1954, **9**, 1062-1081. [Div. Exp. Chemotherap., Sloan-Kettering Inst., New York.]

Three substituted diaminopyrimidines tested on rats, mice, cats and dogs in sub-lethal doses

produced signs of folic acid deficiency. Ileitis, colitis and diarrhoea occurred in all the animals and stomatitis in the dogs. The blood changes produced by the antagonists were granulocytopenia and reticulocytopenia, and there were severe alterations in the bone marrow which caused abnormalities in blood cell development. Doses above the LD₅₀ caused acute convulsions. In mice simultaneous administration of citrovorum factor with doses in excess of the LD₅₀ of diaminopyrimidines did not prevent immediate death but did prevent the delayed fatal effect in some, though not in all. The failure to protect completely was interpreted as evidence that there may be unrecognised factors in cells, that are concerned in the transformation of folic to folinic acid.

A. M. Copping.

VITAMIN B₁₂

2002

JAFFE, W. G. and GÓMEZ, O. L. Recientes adquisiciones sobre la vitamina B₁₂. [Recent discoveries about vitamin B₁₂.] *Arch. venezol. Nutricion*, 1954, **5**, 71-88. [Inst. Nac. Nutrición.] English and German summaries.

2003

CALET, C. and RERAT, A. Nouvelle technique du dosage microbiologique de la vitamine B-12 à l'aide d'*Escherichia coli*. [New technique for microbiological estimation of vitamin B₁₂ with *Bacterium coli*.] *Ann. Zootech.*, 1954, **3**, 247-270. [Lab. Biochim. Nutrit., C.N.R.S., Bellevue.]

A method of estimating vitamin B₁₂ with *Bacterium coli* 113-3 was developed with due attention to the nutritional requirements of the organism. The preliminary details of technique and basal medium were modified to give satisfactory and reproducible results. The results were obtained by measuring the degree of opacity in the tubes in comparison with a standard curve of response.

A. M. Copping.

2004

TIXIER, G. and NEUDÖRFFER, J. Sur le dosage de la vitamine B₁₂ dans les extraits de foie. [Estimation of vitamin B₁₂ in liver extracts.] *Bull. Soc. Chim. biol.*, 1954, **36**, 1173-1175. [Lab. Georges Tixier, 18 Rue Hamelin, Paris.]

A microbiological method depending on the development of opacity in cultures of *Lactobacillus leichmannii* or *Bacterium coli* was found more satisfactory than plate cultures for estimating vitamin B₁₂ in liver extracts.

A. M. Copping.

2005

GREGORY, M. E. The microbiological assay of "vitamin B₁₂" in the milk of different animal species. *Brit. J. Nutrition*, 1954, **8**, 340-347. [Nat. Inst. Res. Dairying, Univ. Reading.]

"Vitamin B₁₂", defined as the total activity for the test organisms, was estimated in cow's and goat's colostrum (1), and in human milk and milk of the cow, goat, ewe (1), sow (4) and rat with 3 different organisms, *Lactobacillus leichmannii*, *Bacterium coli* and *Ochromonas malhamensis*, the last according to Ford (Abst. 1825, Vol. 24) being specific for cyanocobalamin. Methods of extracting vitamin B₁₂ from the milk samples by cyanide with acid or buffer or by digestion with papain were investigated. All samples were steamed. The results with *O. malhamensis* were close to those with the other organisms, which is evidence that vitamin B₁₂ in milk occurs chiefly as cyanocobalamin. Average values for the acid-cyanide extract were in µg. per ml. for ewe 9.5, rat 9.1, cow 2.3, goat 0.9, woman 0.2 and sow 0.0. Cow's and goat's colostrum contained 3.7 and 6.5 µg. per ml. When all samples were ultrafiltered no activity was found in the filtrate, which suggested that vitamin B₁₂ occurred in a bound form. After digestion with papain and cyanide the values were for woman 0.3 and sow 1.7. Other samples did not change appreciably. Unheated cow's milk had no activity for *L. leichmannii* and recovery of added cyanocobalamin was erratic, suggesting the presence of substances inhibiting the growth of the organism.—A. Hepburn.

2006

BERMAN, D., YACOWITZ, H. and WEISER, H. H. Microbiological assay of vitamin B₁₂ and pseudovitamin B₁₂. *Poultry Sci.*, 1954, **33**, 1043. *Proc.* [Ohio State Univ., Columbus.]

N.A. and R., April 1955

2007

LAMBIN, S., GERMAN, A. and BRIGEAU, J. Activité vitaminique B₁₂ de préparations à base d'extraits de foie ou de protéines animales. Intérêt des diverses techniques de dosage. [Vitamin B₁₂ content of preparations based on liver extracts or animal proteins. Different methods of estimation.] *C.R. Soc. Biol.*, 1954, 148, 1017-1020.

Two methods of estimating vitamin B₁₂ were investigated with liver extracts, liver pastes, dried liver and *nuoc-mam* (Abst. 512, Vol. 25). The dilution method in liquid culture with a *Bacterium coli* mutant or *Lactobacillus leichmannii* was found more reliable than the cup-plate method with *Bact. coli* and the vitamin extracts diffusing on agar plates. In the dilution method the most suitable organism varied according to the nature of the product under investigation. *L. leichmannii* was particularly suitable for materials of low vitamin B₁₂ content.—A. M. Copping.

2008

DENTON, C. A., LILLIE, R. J. and SIZEMORE, J. R. Correlation of microbiological and chick assays for vitamin B₁₂. 10th World's Poultry Congr. Sect. Papers, Edinburgh, 1954, 152-154. [Bur. Animal Indust., U.S. Dept. Agric., Beltsville, Md.]

2009

HEATHCOTE, J. G. and DUFF, P. J. The analysis of analogues. A development of the general theory of partition and its application to the determination of cyanocobalamin and hydroxocobalamin in mixtures. *Analyst*, 1954, 79, 727-731. [Distillers Company (Biochemicals), Ltd., Speke, Liverpool.]

The partition coefficients between benzyl alcohol and water were estimated experimentally for mixed solutions of cyanocobalamin and hydroxocobalamin. The results were in good agreement with theoretical values and with the values for cyanocobalamin measured spectrophotometrically in the mixtures.—A. M. Copping.

2010

HEINRICH, H. C. and LAHANN, H. Physiologie, Pathologie und biochemischer Wirkungsmechanismus der B₁₂-Vitamine. 1. Physiologie der B₁₂-Vitamine. [Physiology, pathology and biochemical mode of action of the B₁₂ vitamins. 1. Physiology of the B₁₂ vitamins.] *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1954, 6, 126-200. [Physiol. Chem. Inst., Univ. Hamburg.]

A review.

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2011

VENKATARAMAN, P. R., DUBIN, A. and FRIEDEL, M. T. Influence of cortisone and vitamin B₁₂ on the growth and P³² uptake of adrenal and lymphoid tissue. *Metabolism*, 1954, 3, 502-505. [Hektoen Inst. Med. Res., Chicago, Ill.]

Weanling rats receiving a semi-purified diet with extracted soya bean meal as source of protein, after 2 weeks on the diet alone, were given vitamin B₁₂ or cortisone or both or no supplement. After another 2 weeks the animals were given intraperitoneal injections of 20 μ C. radio-active P and were killed 3 hr. later. Rats receiving cortisone and no vitamin B₁₂ showed retarded growth and atrophy of the adrenal and thymus glands, spleen and lymph nodes. If vitamin B₁₂ was given with cortisone the growth-inhibiting effects of the hormone were counteracted except for atrophy of the adrenal glands. Uptake of ³²P into the adrenal and thymus glands and spleen was inhibited by cortisone and was not restored to the same extent as growth when vitamin B₁₂ was given.

A. M. Copping.

2012

DRYDEN, L. P., HARTMAN, A. M. and CARY, C. A. Influence of vitamin B₁₂ upon vaginal patency in the rat. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 195-197. [Dairy Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

In young female rats from mothers which had received diets deficient in vitamin B₁₂ during lactation, there was delay in opening of the vagina if they themselves were fed from weaning on diets lacking vitamin B₁₂. If the maternal diet contained adequate vitamin B₁₂ the post-weaning diet of the young did not affect the onset of maturity. When casein was the source of protein in the diet the ages of maturity in the deprived and non-deprived were not affected by the source of carbohydrate. With soya bean protein maturity was earlier in the deprived rats with a mixture of lactose and dextrin than with maize meal or sucrose; the delay was greatest of all with soya bean protein and sucrose.—A. M. Copping.

2013

SCHWIGERT, B. S., SCHEID, H. E. and DOWNING, M. Liver changes in vitamin B₁₂ and riboflavin-deficient rats before and after partial hepatectomy. *Amer. J. Physiol.*, 1954, 178, 338-340. [Div. Biochem. Nutrit., Amer. Meat Inst. Found, Chicago, Ill.]

Weanling rats were given a diet of maize, soya bean oil meal and iodinated casein without vitamin B₁₂ or supplemented with 30 μ g. per kg., or a casein and sucrose diet without riboflavin or supplemented with 600 or 6000 μ g. per kg. After

4 weeks of the experimental diet about two-thirds of the liver was removed from some animals in every group, and weighed and analysed. The rats were killed 1 day or 4 days later and the remainder of the liver was taken for analysis. In the liver ribonucleic and deoxyribonucleic acids were estimated and cell counts were made as previously described (*Proc. Soc. Exp. Biol. Med.*, 1952, 79, 541).

Very few rats deprived of vitamin B₁₂ survived for 4 days after partial liver removal. Regeneration of liver tissue was less in rats deprived of vitamin B₁₂ than in the other groups. There was less ribonucleic and deoxyribonucleic acid in the liver of vitamin-B₁₂-deficient rats but not of those deprived of riboflavin. The findings are thought to provide further evidence for the specific role of vitamin B₁₂ in nucleic acid synthesis.

A. M. Copping.

2014

CHARKEY, L. W., KANO, A. K. and ANDERSON, J. A. Effects of fasting on free amino acid levels in chick blood as modified by vitamin B₁₂. *J. Biol. Chem.*, 1954, 210, 627-632. [Dept. Chem., Colorado Agric. and Mech. Coll., Fort Collins.]

Comparable groups of chicks were given a diet of soya bean meal and maize with or without a supplement of 50 µg. vitamin B₁₂ per kg. diet. After 2, 4 and 6 weeks chicks were killed before or after fasting for 48 hr., or 4 hr. after returning to feed. Blood samples were taken and the liver was removed. The amount of L-lysine, L-threonine, L-valine, L-leucine, and L-isoleucine was measured in the blood and all showed a clear increase during fasting when the birds were deprived of vitamin B₁₂, the increase being greatest for lysine and smallest for leucine. The age also of the chicks affected the amino-acid content of the blood, and the effect of fasting decreased with age. When vitamin B₁₂ was added to the diet the effect of fasting was less clearly seen and the vitamin appeared to regulate the amino-acid content of the blood. The content of vitamin B₁₂ in the liver was high in chicks receiving the vitamin, though the weight of the liver and total bodyweight were not affected.—A. M. Copping.

2015

RAMALINGASWAMI, V. and SRIRAMACHARI, S. The effect of vitamin B₁₂ on the toxicity of pyrimethamine (Daraprim) in the monkey. *Indian J. Malariol.*, 1953, 7, 305-306. [Nutrit. Res. Labs., Indian Council. Med. Res., Coonoor.]

Of 11 rhesus monkeys fed on a stock diet and given orally 10 mg. of the antimalarial drug pyrimethamine per kg. bodyweight daily, 5 were given in addition from 50 to 200 µg. vitamin B₁₂

by intramuscular injection. There was progressive loss of weight and granulocytopenia with death after from 12 to 20 days. The bone marrow showed arrest in the maturation of the myelocytes, and large numbers of abnormal giant myelocytes appeared, but there was no anaemia and no megaloblastic transformation of the marrow. Vitamin B₁₂ had no favourable effect on the condition and it is concluded that the effect of liver extract in alleviating the toxic effect of pyrimethamine (cf. *Abst.* 1641, Vol. 23) could not have been due to its content of vitamin B₁₂.—E. M. Hume.

2016

FORD, J. E., HOLDSWORTH, E. S. and KON, S. K. Biosynthesis of vitamin B₁₂-like compounds. *Biochem. J.*, 1954, 58, xxiv. [Nat. Inst. Res. Dairying, Univ. Reading.]

2017

FANTES, K. H. and O'CALLAGHAN, C. H. The biosynthesis of a new vitamin B₁₂ analogue. *Biochem. J.*, 1954, 58, xxi. [Glaxo Laboratories, Ltd., Sefton Park, Stoke Poges, Bucks.]

2018

MANNINO, N. and PIPTONE, V. Metabolismo vitaminico di *E. coli* in presenza di antibiotici diversi. [Vitamin metabolism of *Bacterium coli* in the presence of different antibiotics.] *Bol. Soc. ital. Biol. sper.*, 1954, 30, 308-311. [Ist. Clin. Med., Univ. Bari.]

A strain of *Bacterium coli* was exposed for 12 or 48 hr. to graded concentrations of aureomycin, chloramphenicol, penicillin, streptomycin or terramycin. The amount of growth was estimated turbidimetrically, and the amounts of vitamin B₁₂ and folic acid formed were estimated microbiologically. The amount of both substances produced in the presence of the antibiotics was less in relation to the amount of growth than would have been expected in their absence.—E. M. Hume.

2019

REGGE, D. V. and SREENIVASAN, A. The influence of folic acid and vitamin B₁₂ on nucleic acid metabolism in microorganisms. *J. Biol. Chem.*, 1954, 210, 373-380. [Dept. Chem. Technol., Univ. Bombay.]

The effect of folic acid and vitamin B₁₂ on nucleic acid synthesis in *Lactobacillus casei* (*Abst.* 5061, Vol. 20) was further investigated with other micro-organisms. In *Streptococcus faecalis* R, which requires folic acid for growth, the production of deoxypentose nucleic acid varied with the folic acid content of the medium. In *Lactobacillus leichmannii*, which requires vitamin B₁₂, production of pentose nucleic acid varied with the vitamin B₁₂ content of the medium. In media not containing

purines, folic acid and vitamin B₁₂ showed separate and joint effects on synthesis of nucleic acid by *L. casei*. With *L. casei* and *S. faecalis* R vitamin B₁₂ could replace folic acid only as a stimulant to nucleic acid synthesis. Purine degradation by resting cells of *L. casei* was inhibited to some extent in the presence of folic acid and vitamin B₁₂. *Lactobacillus arabinosus* and *Bacterium coli* do not require folic acid or vitamin B₁₂, and their addition to the medium did not affect nucleic acid synthesis.—A. M. Copping.

2020

JENKINS, K. J., BELL, J. M., O'NEIL, J. B. and SPINKS, J. W. T. The effects of antibiotics on the synthesis of vitamin B₁₂ in the chick. *Canad. J. Biochem. Physiol.*, 1954, **32**, 628-635. [Dept. Animal Husb., Univ. Saskatchewan, Saskatoon.]

A diet lacking vitamin B₁₂, with or without addition of radio-active cobalt as ⁶⁰CoCO₃, was given to chicks having penicillin, streptomycin, aureomycin, terramycin or no supplement. Co alone did not affect weight gains but gains were increased when Co and an antibiotic were given. Aureomycin and terramycin appeared superior to penicillin and streptomycin. The excretion of Co rose and that of vitamin B₁₂ fell in chicks receiving antibiotics. Estimation of Co and vitamin B₁₂ at all levels of the gastro-intestinal tract and in tissues showed that synthesis of vitamin B₁₂ began in the proventriculus and that the rate and site of synthesis were affected by the antibiotics. The amount of Co in the tissues was higher when no antibiotic was given. The vitamin B₁₂ content of all tissues, except the blood and gallbladder which showed high values, was little affected by administration of antibiotics. It is suggested that in chicks given no antibiotic the high values found in the blood and gallbladder were a sign of defective utilisation of the vitamin.—A. M. Copping.

2021

FERGUSON, T. M. and COUCH, J. R. The effect of vitamin B₁₂ on embryonic development of the chick. *Poultry Sci.*, 1954, **33**, 1054. *Proc. [Texas Agric. and Mech. Coll. System, College Station.]*

2022

MORIMOTO, H., ARIYOSHI, S. and HOSHII, H. Effect of arginine, glycine, methionine and vitamin B₁₂ on chick growth. *10th World's Poultry Congr. Sect. Papers*, Edinburgh, 1954, 1954, 142-144. [Nat. Inst. Agric. Sci., Chiba-shi, Japan.]

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2023

REID, B. L., GABAY, S. and COUCH, J. R. Effect of methionine, methionine hydroxy analogue and vitamin B₁₂ on the glutathione level in the chick. *Poultry Sci.*, 1954, **33**, 1090. *Proc. [Texas Agric. and Mech. Coll. System, College Station.]*

2024

MATTERSON, L. D., RYAN, F. A., KOZEFF, A. and POTTER, L. M. The effect of vitamin B₁₂ on broiler yield and finish. *Poultry Sci.*, 1954, **33**, 1069. *Proc. [Univ. Connecticut, Storrs.]*

2025

SHERWOOD, D. H. and SLOAN, H. J. Vitamin B₁₂ and choline in corn-soy rations for starting poults. *Poultry Sci.*, 1954, **33**, 1015-1021. [Dept. Poultry Husb., Univ. Minnesota, St. Paul.]

Day-old poults from turkey hens given a practical ration received for 4 weeks a basal all-vegetable diet low in choline, with or without supplements of vitamin B₁₂ alone or with nicotinic acid and choline or with methionine. The addition to the basal diet of 10 µg. vitamin B₁₂ per kg. increased the growth rate significantly, but efficiency of feed utilisation was not consistently improved. Supplements of vitamin B₁₂ with choline or methionine still further increased growth and efficiency of feed utilisation also. Mortality was excessive on the basal ration and much less when choline was added but only slightly less with vitamin B₁₂. Nicotinic acid had little effect on growth rate or mortality. There was some evidence that prolonged storage of the ration reduced the amount of available choline. When the basal diet was supplemented with choline, the severity of gizzard erosion and the size of the gizzard were less.

E. M. Cruickshank.

2026

WÖHLBIEH, W., ORTH, A., KUJUS, W. and HACKER, W. Schweinemast- und Kükenaufzuchtversuche mit Vitamin B₁₂-Präparaten. [Pig fattening and chick rearing with vitamin B₁₂ preparations.] *Arch. Tierernährung*, 1954, **4**, Beihefte, No. 4, 182-213. [Inst. Tierernährungslehre, Landw. Hochsch., Stuttgart, Hohenheim.]

The results of 6 experiments are summarised in Part 1; details of rations and weight gains are set out in Part 2. The series of tests began in 1950 and were concluded in 1953. The first was designed simply to study the behaviour of pigs and chicks reared without animal protein. The results showed that the inhibition of growth varied widely from one animal to another and great caution is required in interpreting results. Young animals behave differently from older ones.

The second experiment tested the effect of a syrupy extract of yeast, which contained per kg. 97 μ g. vitamin B₁₂, on the growth of pigs given a ration of cereals, cake meal and minerals with potatoes to appetite. The yeast extract improved growth but not to the same extent as fishmeal. The yeast extract dried with the extracted residue lost most of its effect. In the third experiment, with a similar ration, a small amount of fishmeal was given with the yeast extract but neither that combination nor the fishmeal itself gave good results in this test. In the next test, crystalline vitamin B₁₂ was added to the yeast extract which had been dried on starch. There was no effect of the extra supply.

Experiments 5 and 6 were with day-old chicks kept on a diet of maize meal, soya bean oil meal, minerals, cod liver oil and riboflavin until signs of deficiency appeared. Half were then given the yeast extract with added vitamin B₁₂ and the other half fishmeal. The yeast extract gave the best results. In the last experiment a hydrolysate of yeast with weak acid was compared with a new fungal mycelium rich in vitamin B₁₂, called here O-mycelium, a combination of the two, and crystalline vitamin B₁₂. The last 3 gave much better results than the hydrolysate alone. The combined product, hydrolysed yeast and the new mycelium, have been put on the market under the name Aprofa by Aschaffenburg Zellstoffwerke with a guaranteed vitamin B₁₂ content of 5 mg. per kg. In further tests Aprofa gave as good results as fishmeal.—I. Leitch.

2027

KLINE, E. A., KASTELIC, J., ASHTON, G. C., HOMEYER, P. G., QUINN, L. and CATRON, D. V. The effect on the growth performance of young pigs of adding cobalt, vitamin B₁₂ and antibiotics to semipurified rations. *J. Nutrition*, 1954, 53, 543-555. [Dept. Animal Husb., Iowa State Coll., Ames.]

A semi-purified diet deficient in vitamin B₁₂ and of low cobalt content was given to weanling pigs from sows that had had a maize and soya bean oil meal diet during lactation. Addition of vitamin B₁₂ to the diet significantly increased the rate of weight gain. Co alone did not increase weight gain and did not enhance the effect of vitamin B₁₂. There was no significant effect of Co or vitamin B₁₂ on feed intake or utilisation. If antibiotics, as a mixture of aureomycin, streptomycin, terramycin and penicillin, were added to the diet there was a general improvement in rate of weight gain and in feed utilisation, but the effects of added vitamin B₁₂ were no longer significant.

Microbiological studies of the faeces showed that the bacterial counts were higher in animals given vitamin B₁₂ or Co or both in addition to antibiotics.

The fungus counts were high in pigs given antibiotics and were lower when vitamin B₁₂ was given.—A. M. Copping.

2028

BUYSSE, F. and MARTIN, J. L'emploi d'une préparation à base de vitamine B₁₂, de pénicilline et de procaine dans les aliments composés pour porcs à l'engrais. [The use of a preparation based on vitamin B₁₂ and procaine penicillin in feeds for pig fattening.] *Rev. Agric.*, 1954, 7, pp. 22.

The effect of adding a mixture of vitamin B₁₂ and procaine penicillin to fattening rations containing animal and vegetable protein or vegetable protein alone was studied with 4 groups of 4 pigs during 14 weeks. With 100 mg. of the supplement per kg. ration, growth on a ration chiefly of vegetable products almost equalled that on an animal-protein ration but the feed consumed per unit increase was greater. The cost of the supplemented diet was 19.16 fr. per kg. weight increase in comparison with 16.55 fr. for the normal ration. In a second trial with 6 groups of 4 pigs for 10 weeks and supplements of procaine penicillin with or without vitamin B₁₂, diets with and without 8 per cent. fishmeal were used. No advantage was derived from the supplements with diets containing fishmeal, but with a diet entirely of vegetable products growth was notably improved. The cost of the ration thus supplemented was slightly greater than that of the normal ration. From the nutritional and economic standpoint the supplements did not appear highly efficient.

A. M. Copping.

2029

SCHEUNERT, A. and KRAACK, E. Schweinefütterungsversuch mit Klärschlammextrakt. [Pig feeding experiments with an extract of sewage sludge.] *Arch. Tierernährung*, 1954, 4, Beihefte, No. 4, 83-86. [Inst. Ernährungsforsch., Potsdam-Rehbrücke.]

In a ration containing no animal protein, addition of a sewage sludge extract providing 36 μ g. vitamin B₁₂ daily improved the growth of pigs by 20 per cent. during a test period of 100 days.

A. M. Copping.

2030

BENTLEY, O. G., MOINUDDIN, M., HERSHBERGER, T. V., KLOSTERMAN, E. W. and MOXON, A. L. The effect of trace minerals on growth performance and vitamin B₁₂ synthesis of steers. *J. Animal Sci.*, 1954, 13, 789-801. [Ohio Agric. Exp. Stat., Wooster.]

A mixture of trace elements including cobalt, manganese, zinc, iron and copper, or a supplement of alfalfa ash, produced a significant increase in the

average daily weight gains of steers given a ration of mature hay, ground maize, urea, cerelose, calcium, phosphorus, iodised salt and vitamin A. Co appeared to be the first essential trace element and others appeared individually beneficial. The apparent digestibility of the ration was not increased by the trace element mixture.

When Co was given, the amount of vitamin B₁₂ stored in the liver and excreted in the faeces was significantly increased.—A. M. Copping.

2031

SURE, B. Influence of processing on supplementary value of vitamin B₁₂ and amino acids to proteins in whole wheat. *J. Agric. Food Chem.*, 1954, **2**, 1111-1113. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

Young rats grew less well on shredded wheat manufactured from soft wheat than on the original grain. The biological value of the protein of the processed cereal was enhanced by addition of vitamin B₁₂ and amino-acids. The most efficient daily addition was 0.1 µg. vitamin B₁₂ with 0.4 per cent. L-lysine and 0.3 per cent. DL-threonine. The possibility of enriching processed cereals with amino-acids is suggested.—A. M. Copping.

2032

SCHIED, H. E. and SCHWEIGERT, B. S. Vitamin B₁₂ content of organ meats. *J. Nutrition*,

1954, **53**, 419-427. [Div. Biochem. Nutrit., Amer. Meat Inst. Found., Chicago, Ill.]

Vitamin B₁₂ was estimated with *Lactobacillus leichmannii* in liver, heart, kidney, brain, spleen, pancreas and lung tissue of the ox, lamb and pig and in liver from old cows and sows. Satisfactory extraction of the vitamin was obtained by autoclaving for 5 min. and by including thioglycollic acid as a protective agent in the culture medium. The liver and kidney of the ox were the richest sources of vitamin B₁₂, and those of other animals were next in value. Considerable residual vitamin B₁₂ activity was found in pancreas after treatment with alkali when *L. leichmannii* was the test organism, but very little if *Euglena gracilis* was used. The problems involved in the use of alkali treatment to show true vitamin B₁₂ potency are discussed.—A. M. Copping.

2033

SREENIVASAMURTHY, V., SWAMINATHAN, M. and SUBRAHMANYAN, V. Vitamin B₁₂ content of some animal foods. *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, **3**, 225.

Vitamin B₁₂ was estimated microbiologically in the edible portion of goat muscle and liver, sheep muscle, 5 genera of fish and hen's and duck's eggs. The method is described. All the samples tested except one genus of fish, *Macrones*, were fair sources of the vitamin. Goat liver and sheep muscle were good sources.—T. D. Bell.

See also Absts. 1907, 1921, 1942, 1971, 2302, 2700.

VITAMIN C (ASCORBIC ACID)

2034

SCHMALL, M., PIFER, C. W., WOLLISH, E. G., DUSCHINSKY, R. and GAINER, H. Colorimetric determination of ascorbic acid. New developments concerning the reaction with diazotized 4-methoxy-2-nitroaniline. *Anal. Chem.*, 1954, **26**, 1521-1522. [Hoffmann-La Roche, Inc., Nutley, N.J.]

The final product in the reaction between ascorbic acid and diazotised 4-methoxy-2-nitroaniline was identified as the blue disodium salt of oxalic acid 4-methoxy-2-nitrophenylhydrazide. In the procedure *n*-butanol was substituted for ethanol or isopropanol (see Abst. 1852, Vol. 24).

A. Hepburn.

2035

OWEN, J. A., IGGO, B. and HORN, D. B. Use of *p*-chloromercuribenzoic acid in the determination of ascorbic acid in the presence of sulphydryl compounds. *Nature*, 1954, **174**, 701. [Dept. Clin. Chem., Univ. Edinburgh.]

The method is put forward as an improvement on that of Emmerie (Abst. 232, Vol. 4), interfering

sulphydryl groups being removed by precipitation with *p*-chloromercuribenzoic acid instead of mercuric acetate.—A. Hepburn.

2036

MEZINCESCU, M. D., MIHĂILESCU, C. and DUMITRESCU-OPREAN, Z. Dozarea vitaminei C in produsele vegetale. [Estimation of vitamin C in plant products.] *Rev. Igien. Microbiol. Epidemiol.*, 1954, **2**, 47-59. [Sect. Igien. Aliment., Inst. Igien., Bucharest.] French and Russian summaries.

A method is described.

2037

HUGHES, R. E. The use of homocysteine in the estimation of dehydroascorbic acid. *Biochem. J.*, 1954, **58**, xix. [Dunn Nutrit. Lab., Univ. Cambridge.]

2038

HEIMANN, W. and REIFF, F. Zur Synthese von Iso-vitamin C (d-Arabo-ascorbin-säure) aus Saccharose. [The synthesis of isovitamin C

(d-araboascorbic acid) from sucrose.] *Pharm. Zentralhalle*, 1954, 93, 97-99. [Inst. Lebensmittelchem., Tech. Hochsch., Karlsruhe.]

2039

MARX, T. Zum Nachweis einer an Eiweiss gebundenen L-Ascorbinsäure in frischem Pflanzenmaterial. [Demonstration of a compound of L-ascorbic acid with protein in fresh plant material.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, 99, 261-264. [Inst. Landwirtschaft. Chem., Bundesanst. Landwirtschaft., Berlin-Dahlem.]

2040

LLOYD, B. B. and PARRY, H. V. The reduction of L-ascorbone by human erythrocytes. *J. Physiol.*, 1954, 126, 54P-55P. [Lab. Physiol., Univ. Oxford.]

2041

KESTON, A. S. and CARSIOTIS, M. The action of ascorbic acid and oxygen on some adrenal steroids. *Arch. Biochem. Biophys.*, 1954, 52, 282-283. [Dept. Chem., Coll. Med., Univ. New York.]

Certain adrenal steroids incubated with a mixture of ascorbic acid, FeSO_4 and ethylenediaminetetra-acetic acid in the presence of oxygen were apparently hydroxylated.—A. Hepburn.

2042

NATH, M. C. and CHAKRABARTI, C. H. Biosynthesis of ascorbic acid and prevention of glycogen depletion in liver and muscle. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 851-854. [Dept. Biochem., Univ. Nagpur, India.]

The intramuscular injection of Na acetoacetate into rats weighing from 100 to 150 g. and given a normal diet increased the concentration of ascorbic acid, estimated by indophenol titration, in the plasma. With a daily injection of 600 mg. per kg. bodyweight the biosynthesis of ascorbic acid was depressed, glycogen in the liver and muscle was depleted and blood sugar rose. In rabbits, 60 mg. per kg. bodyweight caused a slight but temporary increase in plasma ascorbic acid; greater doses had a depressing action. β -Hydroxybutyrate had no effect on the plasma value for ascorbic acid in rats but depressed it in rabbits.

A. Hepburn.

2043

SCHWARTZ, M. A., DE SALEGUI, M. and WILLIAMS, J. N. (Jr.) Effect of dietary aminopterin and sulphasuxidine on biosynthesis of ascorbic acid in the rat. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 858-862. [Dept. Biochem., Univ. Wisconsin, Madison.]

The destruction of ascorbic acid during incubation with liver homogenates from rats fed on a complete diet including vitamin B_{12} was slightly less when the diet included 4 mg. aminopterin per kg. than when it did not. Aminopterin decreased the concentration of ascorbic acid in the liver (see Abst. 3471, Vol. 21, and for a similar effect with sulphasuxidine Abst. 1717, Vol. 23), adrenal glands and kidneys, and the total amount of ascorbic acid in the spleen. Aminopterin therefore did not cause an abnormally great breakdown of ascorbic acid or promote its translocation from the liver to other organs. Since aminopterin also did not increase the urinary excretion of ascorbic acid (Abst. 434, Vol. 23), the decrease in the rat liver was attributed to inhibition of biosynthesis. Experiments with guineapigs receiving adequate ascorbic acid supported the theory, since aminopterin and sulphasuxidine did not depress the amount of ascorbic acid in the liver. Sulphasuxidine is poorly absorbed through the intestinal wall and is a bacterial inhibitor like aminopterin. It was thought possible that the 2 substances depressed liver ascorbic acid by the inhibition of intestinal micro-organisms which produce some necessary compounds of the system for synthesis of ascorbic acid.—A. Hepburn.

2044

ERSHOFF, B. H. Protective effects of alfalfa in immature mice fed toxic doses of glucoascorbic acid. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 134-136. [Dept. Biochem. Nutrit., Univ. S. California, Los Angeles.]

Immature mice fed on a diet containing all the known vitamins and 4 per cent. glucoascorbic acid lost weight and had diarrhoea, an unthrifty appearance, irritation and swelling of the anal region, and alopecia. Dried alfalfa as 10 per cent. of the diet completely cured the mice but alfalfa ash, more of some of the same vitamins, casein or cottonseed oil had no effect. Purified cellulose as 12 per cent. of the diet effected a cure also, but the weight increase was significantly less than with dried alfalfa.—A. Hepburn.

2045

DEB, C. and BANERJEE, S. Haematological studies in normal and scorbutic guinea-pigs. *Indian J. Med. Res.*, 1953, 41, 27-32. [Dept. Physiol., Presidency Coll., Calcutta.]

Blood samples were taken from guineapigs fed for 22 days on a scorbutogenic diet with or without a supplement of ascorbic acid. Red blood corpuscles, cell volume and Hb decreased and the number of reticulocytes increased in the scorbutic guineapigs. The mean corpuscular Hb, mean

corpuseular volume and mean corpuseular Hb concentration showed that the anaemia was of normochromic, normocytic type. Leucopenia, due mainly to a decrease in neutrophils, was found also.

Both scorbutic and normal animals were in positive Fe balance.—A. Hepburn.

2046

CIMA, V. Comportamento della concentrazione dell'acido ascorbico nell'acqua e nel plasma del coniglio in seguito a carico idrico. [Concentration of ascorbic acid in the aqueous humour and plasma of rabbits after administration of water.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 106-108. [Ist. Fisiol., Univ. Milan.]

Administration of water to rabbits was not followed by any consistent change in the concentration of ascorbic acid in the plasma, estimated by the method of Roe and Kuether (Abst. 261, Vol. 13), but was followed by a small decrease, ranging from 8 to 16 per cent., in the concentration in the aqueous humour. Values, in mg. per cent., ranged for the aqueous humour from 17 to 35, and for the plasma from 2 to 8.

E. M. Hume.

2047

SCHMIDT, H. Untersuchungen zur Bestimmung des Ovulationstermines mit dem Vitamin C-Test bei Haustieren. [Estimation of the time of ovulation by the vitamin C test in domestic animals.] *Ztschr. Tierzücht. Züchtungsbiol.*, 1954, **63**, 303-328. [Inst. Tierzücht., Tech. Univ. Berlin, Charlottenburg.]

The method is based on the clinical findings that after a daily test dose women retain vitamin C with a maximum 15 days before menstruation (Pillay [no reference]) or at 2 different points in the cycle (Rusca, *Diss.*, Berne, 1947), of which one is thought to correspond with ovulation. Parallel experiments were made with 10 cows, 2 ewes, 2 goats and 2 sows; the cattle and sows were given 0.5 mg. ascorbic acid per kg. liveweight and the ewes 1 mg. per kg. by intramuscular injection daily in the early morning. Four hr. later, urine was collected. In comparison with control values, excretion of vitamin C rose at once and remained high and fairly steady except for a sharp dip about or just after the termination of heat in the ruminants, and one or more equally sharp dips in the sows in which oestrus persisted for a few days.—I. Leitch.

2048

RABINOWICZ, M. and RATSIMAMANGA, R. Contribution à l'étude du sort des divers corticostéroïdes au cours de l'évolution du scorbut expérimental. [Fate of different corticosteroids during the development of experimental scurvy.] *C.R. Soc. Biol.*, 1954, **148**, 971-973.

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[Lab. Biol. Méd., Fac. Méd., C.N.R.S., Hautes-Études, Paris.]

In guinea pigs fed on a scorbutogenic diet, the water-soluble corticosteroids in the adrenal glands decreased progressively with the content of ascorbic acid for about the first 28 days while the deficiency was acute. In animals which survived into a chronic phase the content of corticosteroids rose again, while the adrenal glands hypertrophied. Paper chromatography showed that the corticosteroids present in scurvy differed qualitatively from those in the normal adrenal gland.

D. Duncan.

2049

CLAYTON, B. E., MILLS, I. H. and PRUNTY, F. T. G. Further studies on adrenocortical function in ascorbic acid deficiency. *J. Endocrinol.*, 1954, **11**, vi-vii. [Dept. Chem. Pathol., St. Thomas's Hosp. Med. Sch., London, S.E.1.]

2050

FORBES, J. C. and DUNCAN, G. M. Effect of intraperitoneal administration of alcohol on the adrenal levels of cholesterol and ascorbic acid in rats and guinea pigs. Effect of vitamin C intake on the adrenal response of rats and guinea pigs to alcohol administration. *Quart. J. Studies Alcohol.*, 1953, **14**, 19-21; 22-27. [Biochem. Dept., Med. Coll. Virginia, Richmond.]

Adult rats were injected intraperitoneally with 3 g. ethanol per kg. bodyweight as a 10 per cent. solution in 5 per cent. glucose or in 0.85 per cent. saline. From 4 to 5 hr. later the animals were killed and ascorbic acid was estimated in one adrenal gland by the method of Roe and Kuether (Abst. 261, Vol. 13), and cholesterol by the method of Outhouse and Forbes (Title 2308, Vol. 10) in the other. In rats given glucose or saline without alcohol, the values for ascorbic acid and cholesterol were higher with saline than with glucose. All values for rats given alcohol were lower than for rats not given it. The results were confirmed with guinea pigs.

Male guinea pigs weighing from 200 to 280 g., maintained on a stock diet, were given by stomach tube a 50 per cent. solution of 95 per cent. ethanol, supplying between 5 and 7 g. absolute alcohol per kg. bodyweight. Some animals, both given and not given alcohol, were injected intraperitoneally with 50 mg. Na ascorbate just before the administration of alcohol. Most of the animals were killed 24 hr. later, but in some the procedure was repeated several times. The adrenal glands were analysed as described above. The single injection of Na ascorbate did not prevent the fall in ascorbic acid or cholesterol content of the adrenal glands, but the repeated injections promoted the return of both values to normal.

In further experiments with rats and guineapigs, intraperitoneal injections of 50 or 75 mg. Na ascorbate per 100 g. bodyweight were given daily for 3 days before administration of alcohol, but failed to prevent the fall in adrenal ascorbic acid and cholesterol ensuing from administration of alcohol.—E. M. Hume.

2051

BERGERON, G. A., BOURBEAU, G. and LAMARRE, C. J. Effets de l'acide ascorbique, de la cortisone et de la surrénalectomie sur l'hypertension expérimentale à la DCA. [Effect of ascorbic acid, cortisone and adrenalectomy on experimental hypertension caused by DCA.] *Rev. canad. Biol.*, 1954, 13, 106-114. [Dept. Physiol., Laval Univ., Quebec.] English summary.

In 74 male rats weighing about 88 g., from which the adrenal glands had been removed, hypertension was induced by removal of one kidney. The rats were fed on Purina cubes with NaCl solution to drink. Three groups were formed of which 2 received for 14 days a daily injection of 2.5 mg. deoxycorticosterone acetate (Ciba), one with and one without addition of 4 doses of 40 mg. Na ascorbate daily, and the third received no further treatment. Arterial blood pressure was measured under ether anaesthesia. In the group not given deoxycorticosterone acetate there was a small increase of blood pressure. In the 2 groups given it there was a considerable rise in blood pressure which was not significantly less when ascorbic acid also was given. The blood pressure was still high a week after withdrawal of deoxycorticosterone acetate. The weight curve showed that ascorbic acid did not mitigate the oedema caused by deoxycorticosterone acetate. It thus appeared that ascorbic acid did not exercise its known effect to counteract the effect of deoxycorticosterone acetate unless the adrenal glands were intact.

In another experiment with 5 groups of 15 or 16 intact rats, cortisone was given to 4 groups, alone, or with ascorbic acid, or with deoxycorticosterone acetate, or with both. One group received deoxycorticosterone acetate only. There was much mortality from intercurrent diseases, which was not less with ascorbic acid. Blood pressure rose with cortisone or deoxycorticosterone acetate or both, and ascorbic acid had no counteracting effect. On withdrawal of cortisone after 14 days, blood pressure began to drop but was maintained on withdrawal of deoxycorticosterone acetate.

E. M. Hume.

2052

MILKOVIĆ, S. Influence of vitamin C on the extra-adrenal effect of ACTH. *Arch. internat. Physiol.*, 1954, 62, 309-312. [Dept. Pharmacol., Med. Fac., Univ. Zagreb.]

Male rats were castrated and had their adrenal glands removed; some of them received injections of adrenocorticotrophic hormone with and some without ascorbic acid. The thymus and preputial glands were weighed after 7 days and compared with those from a group of normal rats. Adrenalectomised rats and those receiving hormone had significantly greater thymus weights. When ascorbic acid was given with the hormone there was no increase in the thymus weight, the effect of the hormone being inhibited. Adrenalectomy alone or with the hormone did not affect the weight of the preputial glands, but the hormone with ascorbic acid produced a significant increase.

A. Hepburn.

2053

MARRUBINI, G. and GUANZIROLI, B. Azione degli estrogeni sul contenuto in acido ascorbico dei surreni del ratto ipofisectomizzato. [Action of oestrogens on the ascorbic acid content of the adrenal glands of hypophysectomised rats.] *Arch. Fisiol.*, 1954, 54, 1-5. [Ist. Fisiol. Gen., Univ. Milan.]

The pituitary glands were removed from 2 groups of 10 rats weighing about 100 g. Twenty-four hr. later, the left adrenal gland was removed from each animal, and 0.1 or 0.3 mg. oestradiol benzoate was injected intraperitoneally in the 2 groups, respectively. The second adrenal gland was removed 1½ hr. later, and ascorbic acid was estimated in both glands by the method of Roe and Knether (Absts. 261, Vol. 13; 1225, Vol. 14). Two other groups of 10 intact rats received the same treatment.

The mean content of ascorbic acid in the adrenal glands was not affected by the injection of oestrogen in the rats without pituitary glands, but in intact rats the mean value, in µg. per mg., was reduced from 4.005 to 3.422 and from 3.356 to 2.325, with the smaller and the larger dose, respectively.

E. M. Hume.

2054

KATSH, S., KATSH, G. F. and OSHER, P. Adrenal, pituitary and urinary ascorbic acid levels in rats subjected to hypothermic environment. *Amer. J. Physiol.*, 1954, 178, 457-461. [Kerekhoff Labs. Biol., California Inst. Technol., Pasadena.]

Adult male rats fed on a diet deficient in vitamin C were maintained at room temperature as controls or in the cold (2° to 4° C.). In the rats subjected to cold the weight of the adrenal glands and their total content of ascorbic acid increased, the latter by 60 and 20 per cent. of the values for the controls after 10 and 28 days, respectively. The average concentration of ascorbic acid in the adrenal glands fell below the values for the controls after 10 days. Bodyweight first fell, but then rose to approach the weight of the controls after 12 days.

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The increase in total ascorbic acid was believed to be the response to the cold stress with consequent greater activity and hypertrophy of the adrenal glands.

The ascorbic acid content of the pituitary, which was less in the cold than at room temperature, rose to about normal after 10 days, and then became still greater after 28 days. Concentration of vitamin C in the urine decreased in the cold but the volume of urine increased so that the amounts excreted in 24 hr. changed little.—A. Hepburn.

2055

HASSAN, H. H. and MCCOLLUM, J. P. **Factors affecting the content of ascorbic acid in tomatoes.** *Illinois Agric. Exp. Stat. Bull.* No. 573, April 1954, pp. 24. [Urbana, Ill.]

Tomatoes exposed to direct sunlight contained significantly more ascorbic acid than those shaded. The effect of sunshine was evidently cumulative, as the maximum content of ascorbic acid was not attained if the tomatoes had been shaded for part of the time during development. By selecting tomatoes according to the extent of light exposure, the sampling error could be greatly reduced and more accurate comparisons could be made of tomatoes exposed to direct sunlight. The difference amounted to from 2 to 3 mg. ascorbic acid per 100 g. fresh fruit from samples of 10 fruits. Two varieties of exposed tomatoes had a peak in the content of ascorbic acid about the middle of the season, and also a greater seasonal variation than shaded ones. Varieties of tomato may vary in time of maturity, so shaded fruits should be used for comparison at different times during the season.

The uppermost tomatoes from greenhouse plants contained most ascorbic acid. Thinning to 2 tomatoes per truss caused an increase in the ascorbic acid content.—A. Hepburn.

2056

FRATONI, A. and SPADONI, M. A. Contributo allo studio dell'influenza della concimazione sul contenuto in acido ascorbico dei pomodori. [Effect of fertilisers on the ascorbic acid content of tomatoes.] *Quad. Nutrizione*, 1953, 13, 52-60. [Ist. Naz. Nutrizione C.N.R., Rome.]

Groups of 6 plants of *Lycopersicon esculentum* var. *pyriformis* were transferred from ordinary soil to pots of the same soil to which were added on 11 July superphosphates or Ca nitrate or both or neither. Fruit ripened in August, and was gathered as soon as the colour was wholly red. Ascorbic acid was estimated by indophenol titration with use of metaphosphoric acid for extraction in the first 2 fruits on each plant, and the

whole crop from each plant was weighed. The results were analysed statistically. None of the fertilisers had any influence on the concentration of ascorbic acid in the fruits. The total amount in individual fruits was somewhat increased by superphosphates and decreased by nitrates; the two together tended to counteract one another.

E. M. Hume.

2057

MURPHY, E. F. **Vitamin C content of Maine rutabagas.** *Maine Agric. Exp. Stat. Bull.* No. 508, January 1953, pp. 16. [Orono, Maine.]

The ascorbic acid content of 10 varieties of fresh rutabaga ranged from 40.8 to 55.9 mg. per 100 g. during one season. Differences within the same varieties during the same season were from 4.8 to 11.2 mg. and the averages for 2 varieties over 3 successive crop years were 37.8, 47.6 and 39.1 mg. per 100 g. Application of commercial fertiliser, farm manure, borax or lime did not influence the ascorbic acid content. Small rutabagas contained more ascorbic acid than large ones.

Loss of ascorbic acid was negligible on storage at 32°, 34° and 40° F. and in some cases the amount increased but no account was taken of possible loss of weight. Quality was superior at the 2 lower temperatures. Cooking in small amounts of initially boiling water caused a loss of less than 30 per cent. ascorbic acid, but more than 50 per cent. was lost with long cooking started in cold water.—A. Hepburn.

2058

CHEKIN, V. YA. Vitaminonositeli tundry. [Vitamin carriers of the tundra.] *Dokl. Akad. Nauk S.S.S.R.*, 1954, 96, 383-385.

The ascorbic acid values for numerous varieties of vegetables grown in the Soviet Arctic regions are tabulated, and the values for a number of indigenous species of plants are given for comparison. Values were highest before flowering. The possibility of utilising Arctic species as sources of ascorbic acid is discussed.—D. W. Taylor.

2059

EGOROV, A. D. Vika krasivaya—tzennoe vitaminnoe rastenie. [*Vicia amoena*, Fisch—a valuable source of vitamins.] *Prirada*, 1954, No. 6, 118. [Yakut Filial, Acad. Sci. U.S.S.R.]

The vetch is widely distributed throughout Yakutiya. It contains, until the flowering period, ascorbic acid up to 2.5 per cent. of the dry matter of the leaves. Not only the leaves but also the flowers, fruit, stems and seeds are rich in vitamin C. Its value lies also in its being a fodder plant resistant to drought and frost.—H. Scherbatoff.

2060

PETUELY, F. and LYNAU, V. Ein einfacher, voll-synthetischer Optimalnährboden für den *Lactobacillus bifidus*. (Über die Bedeutung der Ascorbinsäure für das Wachstum des *Lactobacillus bifidus*.) [Simple, completely synthetic, optimum nutrient medium for *Lactobacillus bifidus*. (Significance of ascorbic acid for the growth of *Lactobacillus bifidus*.)] *Biochem. Ztschr.*, 1954, 326, 62-78. [Universitätsplatz 2, Graz.]

The synthetic nutrient medium previously devised for growing *Lactobacillus bifidus* (*Biochem. Ztschr.*, 1952, 322, 463) was further developed and improved. The solution finally adopted which at pH 6.4 gave optimum growth for all the strains investigated, obtained from the stools of breast-fed infants, was a fully synthetic medium, containing ammonium sulphate or acetate as the only source of N. Substances shown to be essential were cystine, Ca pantothenate, some salts, and phosphate, which was supplied as primary K

phosphate. Optimum growth was obtained with the addition of from 1 to 2.5 per cent. ascorbic acid, which acted as a buffer, but could not be replaced by phosphate or acetate buffer. The mechanism of its growth-promoting action presumably lay in the maintenance of a definite oxidation-reduction potential. Biotin was necessary only if the ascorbic acid content was 0.5 per cent. or less, and it could generally be replaced by Tween 80. With 1 per cent. ascorbic acid or more, biotin or Tween 80 was not essential for optimum growth. With 2 per cent. agar the same formula could be used as a solid nutrient medium. The composition of the complete nutrient solution at pH 6.4 was, per 100 ml., lactose 3.5 g., ammonium sulphate or acetate 0.2 g., cystine 0.02 g., K_2HPO_4 0.25 g., $MgSO_4 \cdot 7H_2O$ 12.5 mg., $FeSO_4 \cdot 7H_2O$ 0.6 mg., $MnSO_4 \cdot 2H_2O$ 0.4 mg., NaCl 0.6 mg., Ca pantothenate 20 μ g., L-ascorbic acid 2 g., and at times biotin 0.2 μ g. or Tween 80 0.1 g.

M. B. Richards.

See also Absts. 1736, 1792-94, 1970, 2372.

OTHER VITAMINS

2061

BICKEL, E. and DIECKHOFF, J. Der Einfluss des Rutin auf die gefäßabdichtende Wirkung des "Dextran Dessau". [Influence of rutin on the action of Dextran Dessau in strengthening vascular resistance.] *Ztschr. ges. inn. Med.*, 1954, 9, 510-512. [Kinderklin., Martin Luther Univ., Halle-Wittenberg.]

With isolated preparations from frogs and guinea pigs, the permeability of the vascular tissues to a solution of Dextran Dessau was less than with Ringer's solution but greater than with 2 other plasma substitutes, Macrodex and Periston. Addition of rutin as Rutabion to the Dextran solution reduced the permeability to Dextran.

E. M. Hume.

2062

KEYSSLER, H., PARHOFER, R. and SCHEDEL, F. Kreislaufwirkung von Vitamin P. [An effect of vitamin P on the circulation.] *Münch. med. Wochenschr.*, 1954, 96, 1070-1071. [Chirurg. Klin., Univ. Munich.]

In 14 healthy adult dogs intravenous injection of from 150 to 300 mg. rutin caused an immediate fall in blood pressure lasting for up to 8 min. A second injection had much less effect, and an interval of about half an hour had to elapse before the full effect could be obtained again.

E. M. Hume.

2063

MOSES, C. The effect of phosphorylated hesperidin on experimental atherosclerosis. *Amer. Heart J.*, 1954, 48, 264-265. [Addison H. Gibson Lab., Sch. Med., Univ. Pittsburgh, Pa.]

Phosphorylated hesperidin has an effect antagonistic to hyaluronidase.

Male rabbits were maintained on a diet of Purina rabbit chow on which 5 g. cholesterol dissolved in ether was poured 3 times a week. Groups of from 8 to 16 were given intraperitoneally per kg. bodyweight 40 mg. phosphorylated hesperidin five times a week for 4 weeks, or 50 mg. three times a week for 4 weeks, or 100 mg. three times a week for 8 weeks, or sterile saline three times a week for 4 or 8 weeks. Weight gain was irregular, being adversely affected by hesperidin, and development of atherosclerosis was directly related to weight gain. The groups given hesperidin had less atherosclerosis than one of the groups given saline which increased considerably in weight, but had about the same degree as the other group given saline, which increased less in weight. No protective action of hesperidin was thus demonstrated.

E. M. Hume.

2064

CHANG, PEH-I. and FRAENKEL, G. Histopathology of vitamin B_7 (carnitine) deficiency in larvae of meal worm, *Tenebrio molitor* L. *Physiol. Zool.*, 1954, 27, 259-267. [Dept. Entomol., Univ. Illinois, Urbana.]

Histological changes were studied in larvae of *Tenebrio molitor*, L. having a purified diet without vitamin B_7 , and in starved larvae. In late stages of deprivation the cytoplasm of the oenocytes became disorganised, but no such effect was seen in starved larvae. Deprived larvae lost fat more rapidly than starved larvae. Changes occurred also in the malpighian tubes, blood and cuticle of

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larvae having no vitamin B₁₂, and severe necrosis developed in the mid-intestines; crystals of uric acid, found normally only in the excreta or malpighian tubes, occurred in the intestine.

A. M. Copping.

2065

ARONS, I., FREEMAN, J., SOKOLOFF, B. and EDDY, W. H. Bio-flavonoids in radiation injury.

2. Contact radiation in experimental cancer. ARONS, I., FREEMAN, J. and WEINTRAUB, S. 3. Clinical studies. *Brit. J. Radiol.*, 1954, 27, 642-644; 696-698. [Dept. Radiation Therapy, Harlem City Hosp., New York.]

2. Studies were made on rats with transplanted Crocker carcinoma or sarcoma 39 tumors treated by a single contact radiation of 10,000 or 15,000 r. The mortality rate was 80 to 88 per cent. unless

flavonoids from citrus fruits were given to the animals. A total of 280 mg. flavonoids given during 21 days before exposure reduced mortality to 66 per cent. The same dose given after exposure reduced mortality to 42 per cent. and if flavonoids were given for 7 days before and 21 days after exposure mortality was only 28 per cent.

3. In 403 patients with malignant disease who received 600 mg. citrus vitamin P daily for 6 to 7 days before and daily during exposure to X-ray treatment the degree of erythema was much less than that in 617 comparable patients who received no flavonoids before exposure. Studies on 20 patients with cancer of the breast showed a marked improvement in tolerance of radiation therapy in 10 who received flavonoids.—A. M. Copping.

4. PHYSIOLOGY OF NUTRITION

ENZYMES

2066

DE FILIPPI, F., GIUSSANI, A. A. and RIVELIS, L. Assay of the tryptic activity of the feces of the newborn infant, at term or premature. *Pediatrics*, 1954, 14, 114-116. [Hosp. Clin., Buenos Aires.] Spanish summary.

The tryptic activity of faeces of 30 newborn children, 4 of whom were premature, was measured. In 28 no trypsin was detected on the first day of life, but by the fourth day specimens from all infants were positive. Since duodenal contents in the foetus are known to possess activity it is concluded that its absence from faeces is the result of intestinal stagnation, and that in suspected meconium ileus the estimation has no diagnostic value.

D. Harvey.

2067

SEIGE, K. Zur biologischen Wertigkeit der Kohlenhydrate. 1. Über enzymatischen Abbau von Weizenmehl durch menschliche Fermente. [Biological value of carbohydrates. 1. Enzymic breakdown of wheat flour by human enzymes.] 2. Vergleichender enzymatischer Abbau verschiedener Mehle durch menschliche Fermente. [2. Comparative enzymic breakdown of different flours by human enzymes.] *Deutsch. Ztschr. Verdauungs- u. Stoffwechsellehr.*, 1954, 14, 180-187; 224-233. [Med. Klin., Univ. Leipzig.]

1. Finely ground wheat flour of known composition was boiled with water for 5 min. under reflux, cooled to 38° C. and mixed with human fasting duodenal juice, and starch breakdown products with free aldehyde groups were estimated at intervals by the Hagedorn Jensen method. By

varying the proportions it was possible to obtain a linear relation between the percentage of the starch broken down and the time elapsed, which could serve as a standard for comparison.

2. Similar experiments were made with rye, oats, barley, rice, maize and potatoes. Breakdown of wheat starch was significantly slower and that of potato starch significantly faster than for the other cereals, which did not differ significantly among themselves.

In a discussion of the possible clinical applications, it is suggested that wheat starch might suit patients with labile blood sugar and potato starch those deficient in duodenal enzymes; but for definite information experiments *in vivo* are essential.—W. M. Deans.

2068

MELCHIOR, J. B. and SLIWINSKI, R. A. Proteolytic inhibitors in serum. 1. Effect of food intake and of hypophysectomy. *Cancer Res.*, 1954, 14, 677-681. [Dept. Biochem., Grad. Sch., Loyola Univ., Chicago, Ill.]

The inhibitory effect of serum was studied *in vitro* with solutions of crystalline trypsin and chymotrypsin digesting casein. Chymotrypsin was more easily estimated.

When rats were fasted until they lost a third of their initial bodyweight the inhibitory effect of their serum was not changed. After pituitary removal the effect was significantly reduced, and this was reversed when the rats received injections of pituitary homogenate. Growth hormone increased the inhibitory effect of serum when it was injected, but not when it was added to the protein-digesting system *in vitro*.—D. Duncan.

2069

SIRCUS, W. Studies of uropepsinogen excretion in gastrointestinal disorders. *Quart. J. Med.*, 1954, **23**, 291-306. [Royal Infirmary, Sheffield.]

With a substrate made from dried human plasma, the excretion of uropepsinogen was measured in 256 subjects, 61 normal controls and the others with gastro-intestinal disorders.

The mean output of uropepsinogen was abnormally high in patients with duodenal ulcer and those with haematemesis in whom the existence of a duodenal ulcer was subsequently disclosed. Output was abnormally low in Fe-deficiency anaemia and pernicious anaemia. Mean output was normal in patients with gastric ulcer and in dyspepsia not due to disease in the digestive tract. No uropepsinogen was excreted by patients who had undergone total gastrectomy or by most of those who had undergone partial gastrectomy. Patients who had carcinoma of the stomach excreted less uropepsinogen than normal subjects, but this was not of diagnostic value.

The measurement of uropepsinogen is thought to be of value in clinical investigation and in research on the digestive processes.—F. C. Aitken.

2070

VIJAYARAGHAVAN, P. K. and NARASINGA RAO, B. S. The influence of duck egg white (DEW) ovomucoid on the liberation of essential amino acids from different proteins by trypsin *in vitro*. *Indian J. Med. Res.*, 1954, **42**, 373-379. [Nutrit. Res. Labs., Indian Coun. Med. Res., Coonoor, S. India.]

Solutions of casein, wheat gluten, Bengal gram globulin, coagulated hen egg white and autoclaved duck egg white in phosphate buffer were digested with trypsin, and the effect of duck ovomucoid on the release of total amino-N and essential amino-acids was estimated after 24 and 120 hr.

The release of total amino-N was significantly inhibited and was least from casein and wheat gluten. The release of amino-acids, in particular histidine, lysine and threonine, was also inhibited with every protein, most with Bengal gram globulin and least with casein.

The antitryptic activity of the ovomucoids from duck and hen on casein was about the same, but after 24 hr. the activity of hen ovomucoid was much less than that of duck ovomucoid and after 120 hr. it had disappeared.

The growth-depressing action of duck ovomucoid was attributed to a possible block in the supply of essential amino-acids for formation of tissue protein.—A. Hepburn.

2071

STARK, G. and SIEBERT, G. Kathepsinaktivität in Placenten verschiedener Altersstufen. [Cath-

epsin activity in placentas of different ages.] *Arch. Gynäkol.*, 1954-55, **185**, 50-59. [Frauenklinik, Univ. Mainz.]

Cathepsin activity was estimated in placentas at intervals during pregnancy. For statistical purposes the results were arranged in 3 groups: months 2 to 6, 24 placentas; months 7 to 10, 28; and a group of 6 beyond term. The values for cathepsin activity, expressed as μg . tyrosine per mg. N per hr., were 112, 61 and 19, respectively. There was thus a definite fall of activity in the later months of pregnancy, the differences being statistically significant. The significance of the enzyme in the placenta for growth is discussed.

M. B. Richards.

2072

LACOBELLIS, M., MUNTWYLER, E. and GRIFFIN, G. E. Enzyme concentration changes in the kidneys of protein- and/or potassium-deficient rats. *Amer. J. Physiol.*, 1954, **178**, 477-482. [Dept. Biochem., Coll. Med., State Univ. New York, Brooklyn.]

Young adult rats received diets low in K or protein or both, as described in Absts. 3842, Vol. 20 and 831, Vol. 24.

The kidneys increased in weight on the low-K diet and decreased with low protein or low K and protein. Kidney N per g. fresh tissue remained constant except on the low-protein diet. Changes in D-amino-acid oxidase and arginase were related to the changes in total kidney N. Changes in glutaminase and carbonic anhydrase were not great; their increases on the low-K diet and falls on the low-K, low-N diet were directly related to changes in ammonia excretion and urinary total acidity.

No explanation is offered.—D. Duncan.

2073

VAN REEN, R. The influence of excessive dietary molybdenum on rat liver enzymes. *Arch. Biochem. Biophys.*, 1954, **53**, 77-84. [McCullum Pratt Inst., Johns Hopkins Univ., Baltimore, Md.]

Young rats received a purified diet containing 400 to 1200 p.p.m. Mo for 4 or 5 weeks. Enzyme activity in the liver was then studied.

No significant effect of Mo was found on cytochrome oxidase, catalase, isocitric dehydrogenase or diphosphopyridine nucleotidase, but alkaline phosphatase was as much as 9 times the control value in rats given 1200 p.p.m. Mo. Hb was not greatly affected. Inorganic P in liver homogenates was not affected by Mo. No inhibitor or activator of alkaline phosphatase was found, and it was believed that there was a higher concentration of the enzyme in rats given Mo. Growth and

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food intake were depressed by Mo, but the effect on alkaline phosphatase was shown by paired feeding to be real.—D. Duncan.

2074

MUUS, J. The amino acid composition of human salivary amylase. *J. Amer. Chem. Soc.*, 1954, **76**, 5163-5165. [Dept. Physiol., Mount Holyoke Coll., S. Hadley, Mass.]

2075

CHAKRABARTY, M. L. and SEN, S. K. Distribution of serum phosphatases in health and diseases. *Indian J. Med. Res.*, 1953, **41**, 235-252. [Dept. Physiol., Med. Coll., Calcutta.]

2076

AVERY, J. K. Alkaline and acid phosphatases in the developing teeth. *J. Dent. Res.*, 1954, **33**, 646. *Proc.* [Sch. Med. Dent., Univ. Rochester, N.Y.]

2077

ROLLINSON, D. H. L. A study of the distribution of acid and alkaline phosphatase in the genital tract of the Zebu bull (*Bos indicus*). *J. Agric. Sci.*, 1954, **45**, 173-178. [Animal Health Res. Centre, Entebbe, Uganda.]

2078

TURA, J. and DICKIE, N. The role of alkaline phosphatase in intestinal absorption. 2. The effects of various carbohydrates on levels of the enzyme in intestinal mucosa. *Canad. J. Biochem. Physiol.*, 1954, **32**, 621-624. [Dept. Biochem., Univ. Alberta, Edmonton.]

See also Abst. 565, Vol. 24.

Adult rats after being fed on stock diet were fasted for 5 days. Groups of from 5 to 7 then received 5 g. cellulose or 3.5 g. cellulose mixed with 1.5 g. digestible carbohydrate. They were killed 6 hr. later for estimation of intestinal alkaline phosphatase.

Glucose, galactose, fructose and mannose significantly increased the amount of phosphatase; cellulose, sucrose, arabinose and xylose did not. The results support the view that alkaline phos-

phatase may participate in the absorption of some sugars.—D. Duncan.

2079

WEBER, G. and CANTERO, A. Glucose-6-phosphatase studies in fasting. *Science*, 1954, **120**, 851-852. [Montreal Cancer Inst., Res. Labs., Notre Dame Hosp., Montreal, Que.]

The glucose-6-phosphatase activity in liver from mice increased by 60 per cent. after fasting for 72 hr. A similar increase was found in rats after fasting for 48 hr., when liver glycogen had decreased by 95 per cent. The increase in activity of glucose-6-phosphatase in contrast to other liver enzymes was considered a physiological adaption to fasting, during which the glycogen stores of the liver were depleted.—A. Hepburn.

2080

JEFFERSON, M. The cholinesterase activity of cerebrospinal fluid. *Clin. Sci.*, 1954, **13**, 599-605. [Dept. Neurol., Queen Elizabeth Hosp., Birmingham.]

2081

MONDY, N. I., STRENGTH, D. R., GRAY, L. F. and DANIEL, L. J. Effect of age of rat on choline oxidation *in vitro*. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 129-131. [Dept. Biochem. Nutrit., Cornell Univ., Ithaca, N.Y.]

Diphosphopyridine nucleotide (DPN), choline dehydrogenase and betaine aldehyde dehydrogenase were estimated manometrically in livers from rats aged 2 days, 1, 2, 3, 5, 7, 9 and 13 weeks and 11 months. DPN and choline dehydrogenase at 2 days were 21.9 and 25.6 per cent. of the adult values. Increases to 94.8 and 85.0 per cent. were obtained after 9 and 13 weeks. Betaine aldehyde dehydrogenase was 90.7 per cent. at 2 days. The low rate of choline oxidation in liver from young rats was probably due to lack of choline apodehydrogenase.—A. Hepburn.

2082

CONCHIE, J. β -Glucosidase from rumen liquor. Preparation, assay and kinetics of action. *Biochem. J.*, 1954, **58**, 552-560. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

DIGESTION AND ABSORPTION

2083

ÁNGYÁN, A. J. and LISSÁK, K. Relationship between unconditioned and conditioned reflex-excitabilities of salivary reflexes, as influenced by previous feeding and insulin treatment. *Acta physiol. hung.*, 1954, **6**, 289-299. [Inst.

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Physiol., Med. Univ., Pécs.] Russian summary.

2084

HARTLES, R. L. Some recent advances in the study of carbohydrate degradation in the mouth.

2069

SIRCUS, W. Studies of uropepsinogen excretion in gastrointestinal disorders. *Quart. J. Med.*, 1954, 23, 291-306. [Royal Infirmary, Sheffield.]

With a substrate made from dried human plasma, the excretion of uropepsinogen was measured in 256 subjects, 61 normal controls and the others with gastro-intestinal disorders.

The mean output of uropepsinogen was abnormally high in patients with duodenal ulcer and those with haematemesis in whom the existence of a duodenal ulcer was subsequently disclosed. Output was abnormally low in Fe-deficiency anaemia and pernicious anaemia. Mean output was normal in patients with gastric ulcer and in dyspepsia not due to disease in the digestive tract. No uropepsinogen was excreted by patients who had undergone total gastrectomy or by most of those who had undergone partial gastrectomy. Patients who had carcinoma of the stomach excreted less uropepsinogen than normal subjects, but this was not of diagnostic value.

The measurement of uropepsinogen is thought to be of value in clinical investigation and in research on the digestive processes.—F. C. Aitken.

2070

VIJAYARAGHAVAN, P. K. and NARASINGA RAO, B. S. The influence of duck egg white (DEW) ovomucoid on the liberation of essential amino acids from different proteins by trypsin *in vitro*. *Indian J. Med. Res.*, 1954, 42, 373-379. [Nutrit. Res. Labs., Indian Council Med. Res., Coonoor, S. India.]

Solutions of casein, wheat gluten, Bengal gram globulin, coagulated hen egg white and autoclaved duck egg white in phosphate buffer were digested with trypsin, and the effect of duck ovomucoid on the release of total amino-N and essential amino-acids was estimated after 24 and 120 hr.

The release of total amino-N was significantly inhibited and was least from casein and wheat gluten. The release of amino-acids, in particular histidine, lysine and threonine, was also inhibited with every protein, most with Bengal gram globulin and least with casein.

The antitryptic activity of the ovomucoids from duck and hen on casein was about the same, but after 24 hr. the activity of hen ovomucoid was much less than that of duck ovomucoid and after 120 hr. it had disappeared.

The growth-depressing action of duck ovomucoid was attributed to a possible block in the supply of essential amino-acids for formation of tissue protein.—A. Hepburn.

2071

STARK, G. and SIEBERT, G. Kathepsinaktivität in Placenten verschiedener Altersstufen. [*Cath-*

epsin activity in placentas of different ages.] *Arch. Gynäkol.*, 1954-55, 185, 50-59. [Frauenklinik, Univ. Mainz.]

Cathepsin activity was estimated in placentas at intervals during pregnancy. For statistical purposes the results were arranged in 3 groups: months 2 to 6, 24 placentas; months 7 to 10, 28; and a group of 6 beyond term. The values for cathepsin activity, expressed as μ g. tyrosine per mg. N per hr., were 112, 61 and 19, respectively. There was thus a definite fall of activity in the later months of pregnancy, the differences being statistically significant. The significance of the enzyme in the placenta for growth is discussed.

M. B. Richards.

2072

IACOBELLIS, M., MUNTWYLER, E. and GRIFFIN, G. E. Enzyme concentration changes in the kidneys of protein- and/or potassium-deficient rats. *Amer. J. Physiol.*, 1954, 178, 477-482. [Dept. Biochem., Coll. Med., State Univ. New York, Brooklyn.]

Young adult rats received diets low in K or protein or both, as described in Absts. 3842, Vol. 20 and 831, Vol. 24.

The kidneys increased in weight on the low-K diet and decreased with low protein or low K and protein. Kidney N per g. fresh tissue remained constant except on the low-protein diet. Changes in p-amino-acid oxidase and arginase were related to the changes in total kidney N. Changes in glutaminase and carbonic anhydrase were not great; their increases on the low-K diet and falls on the low-K, low-N diet were directly related to changes in ammonia excretion and urinary total acidity.

No explanation is offered.—D. Duncan.

2073

VAN REEN, R. The influence of excessive dietary molybdenum on rat liver enzymes. *Arch. Biochem. Biophys.*, 1954, 53, 77-84. [McCollum Pratt Inst., Johns Hopkins Univ., Baltimore, Md.]

Young rats received a purified diet containing 400 to 1200 p.p.m. Mo for 4 or 5 weeks. Enzyme activity in the liver was then studied.

No significant effect of Mo was found on cytochrome oxidase, catalase, isocitric dehydrogenase or diphosphopyridine nucleotidase, but alkaline phosphatase was as much as 9 times the control value in rats given 1200 p.p.m. Mo. Hb was not greatly affected. Inorganic P in liver homogenates was not affected by Mo. No inhibitor or activator of alkaline phosphatase was found, and it was believed that there was a higher concentration of the enzyme in rats given Mo. Growth and

food intake were depressed by Mo, but the effect on alkaline phosphatase was shown by paired feeding to be real.—D. Duncan.

2074

MUUS, J. The amino acid composition of human salivary amylase. *J. Amer. Chem. Soc.*, 1954, **76**, 5163-5165. [Dept. Physiol., Mount Holyoke Coll., S. Hadley, Mass.]

2075

CHAKRABARTY, M. L. and SEN, S. K. Distribution of serum phosphatases in health and diseases. *Indian J. Med. Res.*, 1953, **41**, 235-252. [Dept. Physiol., Med. Coll., Calcutta.]

2076

EVERY, J. K. Alkaline and acid phosphatases in the developing teeth. *J. Dent. Res.*, 1954, **33**, 646. *Proc.* [Sch. Med. Dent., Univ. Rochester, N.Y.]

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DIGESTION AND ABSORPTION

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2084

HARTLES, R. L. Some recent advances in the study of carbohydrate degradation in the mouth.

Proc. Roy. Soc. Med., 1954, **47**, 645-652 (with discussion 652). [Dept. Dent. Biochem., Sch. Dent. Surg., Univ. Liverpool.]

2085

LUDWIG, T. G. and BIBBY, B. G. **Acid formation in the mouth after the ingestion of different carbohydrate foods.** *J. Dent. Res.*, 1954, **33**, 671. *Proc.* [Eastman Dent. Dispensary, Rochester, N.Y.]

2086

PATHAK, J. D., PAI, M. L. and GANDHI, A. M. **Gastric response, digestion and evacuation time of some milk preparations.** *Indian J. Med. Res.*, 1953, **41**, 17-25. [Dept. Physiol., Med. Coll., Baroda.]

The subjects were healthy adult students. The preparations, given by stomach tube, were: boiled milk, with or without sugar, ice-cream, unsweetened condensed milk; curds, non-sour; chhas (curds with added water and salt); maska (non-sour curds from which water is expressed); shrikhand (maska mixed with sugar); mava (evaporated milk); basundi (sweetened evaporated milk); dudhpak (sweetened evaporated milk, cooked with a small amount of rice); cheese.

Protein digestion began in about 15 min. after administration of the foods. Boiled milk, with or without sugar, and ice-cream evoked less secretion of acid than the other preparations and left the stomach more rapidly.—F. C. Aitken.

2087

HUNT, J. N. **The inhibitory action of sucrose on gastric digestive activity in patients with peptic ulcer.** *Guy's Hosp. Rep.*, 1954, **103**, 161-173. [Dept. Physiol.]

A method for the simultaneous assessment of gastric emptying and secretion is described and the computation of parietal cell secretion is shown. Non-parietal secretions were obtained by difference between total and parietal components of gastric secretion. Responses to test meals of 1750 ml. water alone or containing 35 to 100 g. sucrose per litre, with phenol red, were studied in 5 normal men, 5 men with duodenal ulcer and 3 men with gastric ulcer. In all 3 groups volume of gastric contents at 30 min. rose with increasing concentration of sucrose in the test meal. Four of 5 patients with duodenal ulcer, 2 of 5 normal subjects and none of the 3 gastric ulcer patients showed a decreased secretion of the acid component when the concentration of sucrose in the meal was raised to 100 g. per litre. Between the normal subjects there was little variation in non-parietal secretion, and this component was not affected by alteration in the concentration of sucrose in the test meal. Between subjects with peptic ulcer there was considerable

variation in non-parietal secretion and this component was influenced by sucrose intake.

F. C. Aitken.

2088

KURODA, Y. and GIMBEL, N. S. **Selective disappearance of stereoisomers of amino acids from the human small intestine.** *J. Appl. Physiol.*, 1954, **7**, 148-150. [Dept. Surg., Coll. Med., Wayne Univ., Detroit, Mich.]

The DL-forms of alanine, valine, methionine, histidine, lysine, threonine, isoleucine and tryptophan were separately introduced in to an isolated segment, like a Thiry Vella loop, of terminal ileum of a man who had twice undergone ileostomy. After 30 min. the segment was washed out, the amount of N that had disappeared was estimated, the optical rotation of the residue was found and the L:D ratio of the absorbed amino-acid was calculated. These ratios varied in different experiments from 1.5 to 8.6.—C. Warner.

2089

McCORKLE, H. J. and HARPER, H. A. **The problem of nutrition following complete gastrectomy.** *Ann. Surg.*, 1954, **140**, 467-473 (with discussion 473-474). [Div. Surg., Univ. California Sch. Med., San Francisco.]

Results are summarised of nutrition studies of 120 dogs after total gastrectomy. Normal dogs and dogs after partial gastrectomy were controls. "Alimentation time" after total gastrectomy decreased to less than half that of normal controls. Absorption of amino-acids was quicker but efficiency of absorption was less than in controls. Most animals remained in positive N balance after total gastrectomy. Absorption of glucose was quicker, but there was a more rapid fall in blood sugar levels in the experimental animals. Rate of fat absorption was somewhat increased. Supplements of HCl, intrinsic factor, vitamin B₁₂ and an antibiotic were given to prevent diarrhoea and anaemia. There was little diarrhoea, but microcytic hypochromic anaemia occurred. It is suggested that larger amounts of vitamin B₁₂ might have controlled the anaemia.

Weight loss was least in dogs with oesophago-duodenostomy and greatest in those with colon transplants. Nutrition was better maintained in dogs trained to eat little and often.

The implications for management of human subjects are indicated.—F. C. Aitken.

2090

OTTO, W. **Über die Verdauung des Sumpfbibers (*Myocastor coypus*). [Digestion in the nutria (*Myocastor coypus*).]** *Arch. Tierernährung*, 1954, **4**, No. 4, Beihefte, 119-150. [Anst. Vitaminforsch., Potsdam, Rehbrücke.]

N.A. and R., April 1955

Eighteen nutrias were studied in captivity. Their diet in summer consisted largely of green plants, especially *Galinsoga parviflora*, *Oenothera biennis* and clover. They also liked potatoes cooked in their skins, carrots or turnips and branches to gnaw, windfalls and maize stalks. In winter they ate carrots, turnips, potatoes and bread. They preferred roots to green plants and liked to gnaw wood. Nearly all food was taken to the pond and washed before being eaten.

Faeces were deposited in the water. Coprophagy was not seen for certain, and no faecal remains were found in the stomach.

The anatomy of the digestive tract is described. There is a large stomach, with well-defined cardiac, fundic and pyloric regions but no non-secretory portion like that in the rat. Digestion was studied and also the movements of the stomach and the bacterial flora of the tract. The digesta tend to have a high water content.—D. Duncan.

2091

HEINZ, E. and ÖBRINK, K. J. Acid formation and acidity control in the stomach. *Physiol. Rev.*, 1954, 34, 643-673. [Dept. Biochem. Nutrit., Tufts Med. Sch., Boston, Mass.]

2092

OWEN, E. C. Reviews of the progress of dairy science. Section A. Physiology of dairy cattle. 2. Physiology and biochemistry of rumination. *J. Dairy Res.*, 1954, 21, 408-450.

2093

BRUNAUD, M. Données actuelles sur la physiologie et la pharmacodynamie des estomacs des ruminants. [Present views on the physiology and pharmacodynamics of the ruminant stomach.] *Rev. Méd. vet., Toulouse*, 1954, 105, 535-580. [Lab. Physiol., École Nat. Vét., Toulouse.]

2094

LE BARS, H., LEBRUMENT, J., NITESCU, R. and SIMONNET, H. Recherches sur la motricité du rumen chez les petits ruminants. [Investigation of the motility of the rumen in small ruminants.] 4. Actions de l'injection intraveineuse d'acides gras à courte chaîne. [4. Effect of injecting short-chain fatty acids intravenously.]

LE BARS, H., LEBRUMENT, J. and SIMONNET, H. 5. Oscillations de l'amplitude des contractions dans les conditions normales. [5. Oscillations in the amplitude of the contractions in normal conditions.] *Bull. Acad. vét. France*, 1954, 27, 53-67; 69-73. [Lab. Physiol., École Nat. Vét., Alfort.]

For parts 1 to 3 see Abst. 4602, Vol. 24.

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4. The Na salts of the fatty acids tested were injected into the jugular vein of sheep with a rumen fistula, as 20 ml. of an aqueous solution containing from 0.5 to 10 cg. per kg. bodyweight.

Na acetate in a dose of 10 cg. per kg. bodyweight caused an immediate decrease in the amplitude of rumen contractions, which lasted for from 6 to 8 min.; the rhythm then became normal again, but from 40 to 65 min. after the injection the amplitude was again decreased and the rate was slowed for 2 or 3 hr.

Injection of 10 cg. per kg. bodyweight of Na propionate or Na butyrate also had an inhibitory effect which was complete at first for some minutes, and then pursued a varying course.

Less than 10 cg. of any of the substances produced much smaller effects.

5. Graphs are shown of the rumen contractions during rumination and of the behaviour of the rumen and reticulum during sleep. The results are discussed with those of others, and it is suggested that there is an analogy between the functioning of the respiratory centre and that of the centre controlling the motility of the rumen and reticulum.—E. M. Hume.

2095

BROOKS, C. C., GARNER, G. B., MUHRER, M. E. and PFANDER, W. H. Effect of some steroid compounds on ovine rumen function. *Science*, 1954, 120, 455-456. [Dept. Animal Husb., Univ. Missouri, Columbia.]

The quantity of cellulose digested in an artificial rumen by mixed micro-organisms of the sheep rumen was tested with and without addition of stilboestrol.

Addition of 10 µg. or more stilboestrol to the artificial rumen [the volume of which is not given] increased cellulose fermentation by 8 to 14 per cent. Oestrone and cholesterol were also effective.

Administration of 10 or 20 mg. stilboestrol daily to sheep increased the coefficient of digestibility of cellulose by 6 to 7 per cent., but pathological signs of overdosage appeared.—A. T. Phillipson.

2096

SMYTH, D. H. and TAYLOR, C. B. Transport of water and other substances through the intestinal wall. *J. Physiol.*, 1954, 126, 42P. [Dept. Physiol., Univ. Sheffield.]

2097

HELLER, H. Intestinal absorption of glucose in protein-deficient and in starving rats. *Brit. J. Nutrition*, 1954, 8, 370-379. [Dept. Pharmacol., Univ. Bristol.]

Groups of rats received a control diet with 18 per cent. casein; a low-casein, high-carbohydrate diet with 0.5 per cent. casein; a vegetable

low-protein diet with 81.5 per cent. turnip; or a wet filter-paper diet with 0.8 per cent. casein. After a test dose of glucose by stomach tube, the amount of glucose remaining in the stomach after 42 min. was more in the protein-deficient rats than in the controls, and the amount of glucose absorbed from the intestine was less. Rats starved for 48 to 96 hr. showed a normal or increased gastric emptying time and the relative amount absorbed from the intestine was decreased. Glucose tolerance curves in the protein-deficient rats and those starved for 48 hr. were normal; rats starved 96 hr. showed an exaggerated hyperglycaemic response. There was no histologically demonstrable abnormality in the small intestine.—C. Warner.

2098

MATTHEWS, D. M. and SMYTH, D. H. **The intestinal absorption of amino-acid enantiomorphs.** *J. Physiol.*, 1954, **126**, 96–100. [Dept. Physiol., Univ. Sheffield.]

The DL-form of alanine, phenylalanine or leucine was injected into the lumen of an isolated loop of the intestine of a cat and the D- and L-amino-acids were estimated separately at intervals in the vein draining that part of the intestine. The L:D ratios of the absorbed amino-acids were roughly 5, 2 and 3, respectively. When the temperature of the gut was lowered, the L:D ratio for alanine tended to approach unity; similar results were obtained *in vitro*.—C. Warner.

2099

BERGSTROM, S., BORGSTROM, B. and CARLSTEN, A. **On the mechanism of intestinal fat absorption in the cat.** *Acta physiol. scand.*, 1954, **32**, 94–98. [Dept. Physiol. Chem., Univ. Lund.]

Maize oil with stearic acid- $1^{14}C$, maize oil transesterified with labelled stearic acid or hydrolysed maize oil with labelled stearic acid was given to unanaesthetised cats with their main intestinal lymphatics cannulated. Lymph was then collected for from 10 to 17 hr.; lymph lipids were fractionated and the fatty acids of phospholipids

and glycerides were isolated for estimation of their radio-activity.

The results, which amplify those previously obtained with anaesthetised cats (Abst. 5408, Vol. 20), showed that there was no difference in the route of absorption of labelled stearic acid whether it was in combination as glyceride or dissolved in free fatty acids. The distribution of the stearic acid among lymph glycerides and phospholipids showed that extensive hydrolysis and randomisation had occurred.—G. A. Garton.

2100

GLOVER, J. and GREEN, C. **The distribution of cholesterol and 7-dehydrocholesterol in the intestinal mucosae of the guinea pig.** *Biochem. J.*, 1954, **58**, xvii–xix. [Dept. Biochem., Univ. Liverpool.]

2101

NEWSHOLME, G. A. and FRENCH, J. M. **Absorption of $^{24}NaCl$ from the small intestine in the sprue syndrome.** *Clin. Sci.*, 1954, **13**, 607–614. [Dept. Med., Univ. Birmingham.]

In 8 normal subjects radio-activity was detected in the hand within $2\frac{1}{2}$ min. after $^{24}NaCl$ was injected into the duodenum. The count increased rapidly thereafter. In 6 out of 8 patients with tropical sprue and 6 out of 7 with idiopathic steatorrhoea there was a delay in the initial hand count and a slower than normal rise thereafter. The exceptions were the least severely affected. Two patients with tropical sprue tested before and after clinical recovery showed return to normal counting rates after recovery. The results suggested a delay in absorption of $NaCl$ from the small intestine in idiopathic steatorrhoea and tropical sprue.

F. C. Aitken.

2102

LIKINS, R. C. and ZIPKIN, I. **In vivo absorption of fluorides from the gastrointestinal tract.** *J. Dent. Res.*, 1954, **33**, 711. *Proc.* [Nat. Inst. Dent. Res., Bethesda, Md.]

See also Absts. 2079, 2215, 2272, 2490.

COMPOSITION OF BODY FLUIDS AND TISSUES

BLOOD

2103

HADLEY, G. G. and CHINNOCK, R. F. **A study of hemograms in premature infants.** *J. Pediat.*, 1954, **45**, 413–418. [Dept. Pathol., Coll. Med. Evangelists, Los Angeles, Calif.]

In all, 643 samples of blood were obtained from 117 premature infants during the first year of life. Measurements of Hb, red cell count and packed cell volume and estimates of mean corpuscular Hb, mean corpuscular volume and mean corpuscular

Hb concentration are plotted against age in weeks. Average white cell count and percentage of lymphocytes are tabulated for different weeks of life. Most of the blood counts were made in the first 15 to 20 weeks.

The data show that the early anaemia of prematurity is normochromic, not hypochromic.

F. C. Aitken.

2104

PASSARO, G. and IMPERIALI, M. T. **Il volume del sangue nel bambino normale determinato a**

N.A. and R., April 1955

mezzo del polivinilpirrolidone. [The blood volume of the normal infant estimated by means of polyvinylpyrrolidone.] *Arch. ital. Pediat. Puertcoll.*, 1954, 16, 429-444. [Int. Clin. Paediat., Univ. Rome.] French, English and German summaries.

The literature on estimation of the blood volume in infants is reviewed.

The subjects of this study were 20 infants aged from 12 days to 12 months and 42 children of from 13 months to 12 years. They received by intravenous injection a 25 per cent. solution of polyvinylpyrrolidone, 1 ml. per 5 kg. bodyweight, and 2 ml. blood was taken 4 min. later for estimation of haematocrit and of the marker in the plasma.

The blood volume rose steadily with age in the infants from 251 ml. in the youngest to 717.4 in a boy of 12 months. The volume per kg. bodyweight ranged from 68.4 to 84.4 ml., without relation to age, with a mean of 77.7 ml. per kg., 75.8 in boys and 79 in girls. Plasma volume rose like blood volume, from 173 ml. in the youngest infant to 480.7 in the oldest. The volume per kg. ranged from 47 to 58, mean 52.6 ml., 53.9 ml. in boys and 51.5 in girls.

The steady increase in blood volume continued in the older children, reaching 2955 ml. in a boy of 12 years. The value per kg. bodyweight ranged from 72.6 to 93.1 ml., mean 79.4, and was the same in both sexes. The highest plasma volume was 1980 ml.; the values per kg. bodyweight were from 49.3 to 62.4, mean 54 ml.

D. Duncan.

2105

ŠEVKOVIĆ, N. and MILOSAVLJEVIĆ, S. Uticaj rada na krvnu sliku konja. [Influence of work on the blood picture of the horse.] *Acta vet., Belgrade*, 1954, 4, No. 3, 53-58. [Inst. Ishranu, Vet. Fak., Belgrade.] German summary.

The blood picture was studied in 15 geldings and 4 mares of the Pešter hill breed. Seven were packhorses carrying loads and the others carted hay for a 10-hr. day. It was summer and the maximum temperature was 29.8° C. The horses were fed on good hay and pasture and were from 4 to 15 years old and in good condition.

The mean values before and after work were: Hb (Sahli) 57 and 62.5 per cent., red cell count 4.8 and 5.3 millions and white cell count 8.75 and 9.78 thousand. The proportions of white cells were not significantly altered. The differences due to the 2 types of work were not significant.

D. Duncan.

2106

HAFEZ, E. S. E. and ANWAR, A. Normal haematological values in the buffalo. *Nature*, 1954, 174, 611-612. [Fac. Agric., Univ. Cairo.]

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2107

HOITINK, A. W. J. H. Haematologische onderzoeken bij zebus. [Haematological studies of zebu cattle.] *Tijdschr. Diergeneesk.*, 1954, 79, 812-821. [Amsterdam.] English, French and German summaries.

2108

WEHMEYER, P. On the influence of age on plasma protein concentration, blood cell volume, and sedimentation rate in the ox. *Acta physiol. scand.*, 1954, 32, 69-74. [State Serum Inst., Copenhagen.]

2109

MEHROTRA, P. N., MULLICK, D. N. and KEHAR, N. D. Seasonal variations in the blood composition of sheep. *J. Animal Sci.*, 1954, 13, 1026. *Proc.* [Indian Vet. Res. Inst.]

2110

VAN DEN BERGHE, L. and BLITSTEIN, I. Études hématologiques chez des singes. [Haematological study of some monkeys.] 1. Composition cytologique du sang. [1. Cytological composition of the blood.]

VAN OYE, E. and CHARDOME, M. 2. Note sur le sang et la moelle osseuse chez le jeune gorille. [2. Note on the blood and bone marrow of the young gorilla.] *Ann. Soc. belg. Méd. trop.*, 1953, 33, 709-729; 737-746.

1. Values obtained by others for Hb, red cells and differential counts are tabulated. Similar data for 30 *Macaca mulatta*, 21 *Cercopithecus* spp., 10 *Papio jubileus*, 2 *Papio sphinx*, 10 *Cercocebus* spp., 8 chimpanzees and 2 orang-outangs are analysed statistically and tabulated, and are compared graphically for the different genera. For all elements except the thrombocytes it is considered that the results were so similar that they could be pooled for all the genera.

2. A similar investigation was made of 10 freshly caught young gorillas (*Gorilla beringei*, Matschie) of ages up to 3½ years. The results are compared with those for human children, which they closely resemble.—E. M. Hume.

2111

KRAMÁR, J., WILHELMJ, C. M., MEYERS, V. W., MILANI, D. P., GUNDERSON, D. E., SHUPUT, D., RACHER, E. M. and MAHONEY, P. S. (with GREEN, D. P. and NELSON, C.) Stress of fasting and realimentation as reflected in the capillary resistance and eosinophile count. *Amer. J. Physiol.*, 1954, 178, 486-492. [Dept. Paediat., Sch. Med., Creighton Univ., Omaha, Nebr.]

Capillary resistance and eosinophil counts were studied in 20 dogs which were starved, with water

only, for 39 to 67 days and then re-fed on different diets. During control periods on kennel diet the mean capillary resistance was 24 cm. Hg, means for individual animals 17 to 49. The mean eosinophil count was 156 per c.mm., range 47 to 416. There was no relation between the values. During fasting, capillary resistance increased and circulating eosinophils fell, the latter by 70 per cent. Re-feeding on high carbohydrate diets was not accompanied by restoration of these values to normal; high-protein diets rapidly reduced capillary resistance to normal, and eosinophils often rose above their control levels in an initial increase.

In 36 rats starved for 4 to 9 days capillary resistance rose and eosinophil counts fell. During re-feeding, whatever the diet, capillary resistance usually fell sharply to below normal for 7 to 20 days before returning to normal, and eosinophil counts changed inversely.

The specific and individual variations in response are discussed.—D. Duncan.

2112

DUSTIN, J. P., SCHAPIRA, G., DREYFUS, J. C. and HESTERMANS-MEDARD, O. La composition en acides aminés de l'hémoglobine foetale humaine. [Amino-acid content of human foetal haemoglobin.] *C.R. Soc. Biol.*, 1954, **148**, 1207—1210. [Lab. Biochim. Méd., Brussels.]

The amino-acids of adult and foetal haemoglobins were separated by chromatography on Dowex 50. The concentrations of nearly all the amino-acids showed slight differences between the 2 forms, but the most striking was isoleucine. This was confirmed when it was separated from leucine by paper chromatography. The isoleucine content of foetal Hb was 1.04 and 1.11 per cent. in 2 samples, that of adult Hb 0.12 per cent.

D. Duncan.

2113

PARISE, F. M. and BRAMIE, D. D. The relationship of prenatal hemoglobin to the hemoglobin of the newborn infant. *Amer. J. Obstet. Gynecol.*, 1954, **68**, 589-592 (with discussion 593). *Proc.* [Dept. Obstet., Orange Mem. Hosp., Orlando, Fla.]

2114

HAWKINS, W. W., SPECK, E. and LEONARD, V. G. Variation of the hemoglobin level with age and sex. *Blood, J. Hematol.*, 1954, **9**, 999-1007. [Maritime Reg. Lab., Nat. Res. Council, Canada, Halifax, N.S.] Interlingua summary.

The Hb values of 1308 male subjects aged 6 to 98 years and of 1424 female subjects aged 6 to 94 years were surveyed in Halifax, Nova Scotia, during the winter and spring of 1952-53. Among boys and girls aged 6 to 14 years the values increased

from about 13 to about 14 g. per 100 ml. of blood; there was no significant difference between the sexes and the average was 13.5 g. Among girls aged 14 to 20 years the Hb values decreased slightly, reaching 13 g. per 100 ml.; among boys of the same age the values increased to about 15 g.; in both sexes the values attained at 20 years of age remained throughout the third decade of life and were, respectively, the lowest and the highest shown by female and male subjects of any age. In men between 20 and 60 years of age the Hb values were 14.5 to 15 g. per 100 ml.; after 50 years of age they fell progressively to reach on the average 12.4 in men aged 80 to 90 years. In women aged 20 years and upwards the average Hb values remained near 13 g. per 100 ml.

G. F. Garten.

2115

WADSWORTH, G. R. Haemoglobin levels of normal men and women living in a tropical climate. *Brit. Med. J.*, 1954, **ii**, 910-911. [Dept. Physiol., Univ. Malaya, Singapore.]

Hb values of 337 healthy men and 116 healthy women in Singapore, where the temperature ranges from 23° to 32° C. (73.4° to 89.6° F.) during the year, were measured. In both sexes there were Europeans who had been in Singapore for at least 6 months and Chinese and other Asiatics who had lived all their lives in the tropics. The method of Hb estimation is described in detail.

Hb in men ranged from 15.87 to 16.60, average 16.12 g. per 100 ml. blood, and in women from 13.80 to 14.07, average 13.88, with no significant difference between the races.

It is concluded that during a long sojourn in a hot climate Hb values adjust themselves to normal after a temporary fall. Lower Hb values found in natives of tropical areas by other workers were probably due to other environmental influences such as nutrition.—T. D. Bell.

2116

PUGH, L. G. C. Haemoglobin levels on the British Himalayan Expeditions to Cho Oyu in 1952 and Everest in 1953. *J. Physiol.*, 1954, **126**, 38P-39P. [Div. Human Physiol., Med. Res. Council.]

2117

HARTMAN, R. H., MATRONE, G. and WISE, G. H. Effect of supplemental Mn in the diet of lambs on Hb concentration. *J. Animal Sci.*, 1954, **13**, 987. *Proc.* [N. Carolina Agric. Exp. Stat.]

2118

KALDOR, I. Studies on intermediary iron metabolism. 4. Haemoglobin value, serum iron and iron binding capacity in normal and

castrated rats. *Austral. J. Exp. Biol. Med. Sci.*, 1954, 32, 437-440. [N.S.W. Red Cross Soc. Blood Transfusion Serv.]

(See also Absts. 3914, 4735, Vol. 23.)

Experiments were made on about 200 rats, half of them castrated at 6 to 10 weeks of age. Animals were killed for the tests in 3 batches 2, 5 and 7 months after castration. The Hb values showed no consistent sex difference, and no consistent change with age or castration. The serum Fe values in all 3 batches were about 50 per cent. higher for normal females than normal males, the values declining with age in both these groups. Castration reduced the serum Fe values in females, but caused little change in males. In neither sex after castration was there a significant decline with age. In spite of the low serum Fe values in males the total Fe-binding capacity values of both normal and castrated male groups were slightly higher than those of the corresponding female groups. No significant variation of total Fe-binding capacity was observed in either male or female rats.—M. B. Richards.

2119

HOLEMANS, K. and MARTIN, H. Étude des protéines sériques chez les indigènes du Kwango. [Study of the serum proteins in natives of the Kwango.] *Ann. Soc. belg. Méd. trop.*, 1953, 33, 675-679. [Lab. Hôp. Feshi, Belgian Congo.] Flemish summary.

Total proteins, albumin and globulin were estimated by a micro-Kjeldahl method in the blood of 10 infants up to 1 year old, 25 children from 1 to 5 years, 24 from 5 to 15 years, 62 adults from villages and 25 adults who were soldiers or hospital orderlies.

The mean value for total serum proteins increased from birth to maturity, when it was higher than the normal for white races. Unlike those in the white races, after 17 years of age the mean albumin value declined with advancing age and the mean globulin value rose. The values for soldiers and hospital orderlies showed the same effect but not quite so clearly. The albumin:globulin ratio was so low that it would be regarded as pathological for white races.

The low serum albumin value is taken as evidence of protein undernutrition.—E. M. Hume.

2120

WEHMEYER, P. Concentration of plasma proteins in the ox. 2. Variation in composition of the blood in the individual animals. *Nord. Vet.-Med.*, 1954, 6, 818-824. [Statens Seruminst., Copenhagen.] German and Danish summaries.

For part 1 see Abst. 623, Vol. 25.

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Blood samples from 8 healthy cows showed individual differences in serum protein composition in the course of a day, a month and a year. The variation in globulin concentration was the greater and was independent of variation in the albumin concentration. Serum protein concentration varied independently of cell volume. An increase in cell volume usually coincided with a fall in sedimentation rate and *vice versa*, so the variation in concentration of serum proteins was considered unlikely to be associated with hydration or dehydration.

A. Hepburn.

2121

GAISINSKAYA, O. M., L'VOVA, V. V. and USPENSKAYA, V. D. Elektroforeticheskoe izuchenie belkov syvorotki krovi sobaki. [Electrophoretic study of serum proteins of dog's blood.] *Biokhimiya*, 1954, 19, 319-331. [Inst. Biol. Med. Khim., Akad. Med. Nauk SSSR, Moscow.]

2122

DELOIRME, M. L. Étude du volume et des protéines du plasma au cours des hépatites d'origine diététique chez le rat. [Study of plasma volume and plasma proteins during hepatitis of dietary origin in the rat.] *Arch. Sci. physiol.*, 1954, 8, 287-303. [Bichat Hôp., 170 Boulevard Ney, Paris.]

A method is described for estimating plasma volume in small animals.

In 2 series of 7 and 6 normal rats the plasma volume was from 3.5 to 4.5, mean 3.9 per cent. of bodyweight. In the second group, which were on controlled diet, the plasma volume was related to the weight of the brain, giving a mean value of 870 per cent. of brain weight \pm 5.7. In rats kept on a diet with 7 per cent. protein for 200 days and showing extensive liver lesions the plasma volume relative to brain weight was 15 to 44 per cent. below normal, but no relation was found between the fall in plasma volume and the extent of liver damage.

The total plasma protein in normal rats was estimated at 61.6 per cent. of the brain weight, with deviations from - 8 to + 5 per cent. Electrophoresis gave, per cent., albumin 37.5 and α -, β - and γ -globulins 22.1, 15.4 and 25, respectively. In protein-depleted rats the total protein was not diminished in those with the lowest plasma volumes but in 5 out of 8 the total protein was 22.8 to 43.7 per cent. below normal. Albumin or α -globulin or both were low, β -globulin was normal and γ -globulin increased to 42 per cent. The net result was a lower ratio of albumin plus α -globulin to β - plus γ -globulin. For absolute values there was a more important fall in total protein, albumin and α -globulin.—D. Duncan.

2123

- ARBOUYS, S., FINE, J. and EYQUEM, A. Contribution à l'étude électrophorétique du serum des rongeurs. [Electrophoretic study of the serum of rodents.] *Ann. Inst. Pasteur*, 1954, **87**, 169-174. [Lab. Hématol.]
Meriones grandis, mouse and rat.

2124

- ROBOZ, E., HESS, W. C., FORSTER, F. M. and TEMPLE, D. M. Serum lipid studies in multiple sclerosis. *Arch. Neurol. Psychiat.*, Chicago, 1954, **72**, 154-159. [Dept. Biol. Chem., Sch. Med., Georgetown Univ., Washington, D.C.]
 The lipid content of serum of 12 patients with multiple sclerosis and of 8 normal subjects was studied by staining the lipids absorbed on filter paper strips and estimating the density of the stained area with a photo-electric densitometer. No significant difference was found. Some observations were made by paper electrophoresis on the distribution of lipoproteins in the sera. The electrophoretic patterns obtained showed greater variability in multiple sclerosis, but the significance of this is not certain.—G. A. Garton.

2125

- GLAZIER, F. W., TAMPLIN, A. R., STRISOWER, B., DELALLA, O. F., GOFMAN, J. W., DAWBER, T. R. and PHILLIPS, E. Human serum lipoprotein concentrations. *J. Gerontol.*, 1954, **9**, 395-403. [Donner Lab., Div. Med. Phys., Dept. Phys., Univ. California, Berkeley.]
 Serum lipoproteins from 3573 subjects were separated by the ultracentrifuge into classes S_f 0-12, 12-20, 20-100 and 100-400. The slowing effect of concentration was taken into account. All 4 classes of serum lipoprotein continued to rise into the seventh decade of life in women; in men they reached a peak in the fifth or sixth decade and then decreased. From the third decade the mean levels of S_f 0-12 and S_f 12-20 in men were significantly higher than in women up to the sixth and fifth decades, respectively, when they became equal. In the seventh decade both mean levels were higher in women. For S_f 20-100 and S_f 100-400 the difference between the sexes after the first decade was maintained up to the sixth decade. The S_f 0-12 lipoprotein levels were significantly higher in the fasting than in the non-fasting state; the opposite was true for S_f 100-400 lipoproteins.
 A. Hepburn.

2126

- RUBIN, L. and ALADJEM, F. Serum lipoprotein changes during fasting in man. *Amer. J. Physiol.*, 1954, **178**, 263-266. [Donner Lab., Div. Med. Phys., Univ. California, Berkeley.]

Blood samples were taken daily from 6 volunteers fasting for 4 or 5 days and the serum lipoproteins were separated by ultracentrifuge into 2 main fractions of low and high density. A significant rise in the low-density serum lipoprotein was found in 5 subjects. The other had been on a low-lipid diet for 2 years before the experiment. A change to normal diet restored the level of serum lipoprotein within 24 hr. High-density serum lipoproteins were not significantly affected during fasting.—A. Hepburn.

2127

- ALADJEM, F. and RUBIN, L. Serum lipoprotein changes during fasting in rabbits. *Amer. J. Physiol.*, 1954, **178**, 267-268. [Donner Lab., Div. Med. Phys., Univ. California, Berkeley.]
 Samples of serum lipoprotein from 16 rabbits were divided into 4 low-density fractions of S_f 0-12, 12-20, 20-100 and 100-400. High-density lipoproteins were negligible. The concentration of each lipoprotein fraction increased significantly after fasting for 3 days. At 7 days, S_f 12-20 and 20-100 lipoproteins were unchanged, S_f 0-12 had further increased and S_f 100-400 had returned to the pre-fasting level.—A. Hepburn.

2128

- WEIMER, H. E., REDLICH-MOSHIN, J., SALKIN, D. and BOAK, R. A. Distribution of glycoproteins in normal human plasma. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 102-105. [Dept. Infect. Dis., Sch. Med., Univ. California, Los Angeles.]

2129

- TRAVIA, L., SPADONI, M. A., FRATONI, A. and VALORA, N. Sulle variazioni di alcuni esterî fosforici del sangue nel diabete umano. [Variation in some phosphate esters in the blood of diabetic patients.] *Quad. Nutrizione*, 1952, **12**, 499-504. [Ist. Clin. Med. Gen.]

2130

- MAN, E. B., BONDY, P. K., WEEKS, E. A. and PETERS, J. P. Normal range of serum butanol-extractable iodine of human adults. *Yale J. Biol. Med.*, 1954, **27**, 90-96. [Dept. Int. Med., Sch. Med., Yale Univ.]

2131

- MEAD, J. J., EWELL, J. W., ROGERS, O. F. and MAN, E. B. Serum butanol-extractable iodines of male university students. *Yale J. Biol. Med.*, 1954, **27**, 97-100. [Dept. Univ. Health, Yale Univ.]

2132

- BROWN, H. B. and PAGE, I. H. The effect of oral iodide on serum butanol-insoluble protein
 N.A. and R., April 1955

bound iodine in various species. *Circulation*, 1954, 10, 714-720. [Res. Div., Cleveland Clin. Found, Ohio.] Spanish summary.

When iodides were administered to rabbits, dogs, rats and 9 hypertensive human patients, a substance called butanol-insoluble protein-bound iodine developed in the serum. It appeared a few days after iodide treatment was started and disappeared 4 to 8 weeks after treatment stopped. In all animals receiving no extra iodide, serum protein-bound I was completely soluble in butanol in acid solution, and consisted largely of alkali-insoluble I resembling thyroxine. The concentration of this fraction in serum was not increased by iodide. Most of the increase in protein-bound I in animals given iodide was butanol-insoluble. The daily dose of iodide by mouth required to produce measurable concentrations of butanol-insoluble protein-bound I in serum was 0.4 mg. I per kg. bodyweight for rabbits, less than 3 mg. for dogs, 8 mg. for rats and 7 to 13 mg. for man. Hypothyroidism reduced the iodide requirement to one-tenth of that needed to produce comparable amounts of butanol-insoluble protein-bound I in euthyroid animals. Hypothyroid rabbits given as little as 0.1 mg. iodide per kg. bodyweight had detectable amounts of serum butanol-insoluble protein-bound I. Similarly in dogs, but 4 times as much was required by hypothyroid rats. The maximum concentrations attainable appeared in rabbits at an iodide dose of 16 mg. per kg. bodyweight daily, at more than 20 mg. in rats, at from 35 to 40 mg. in man and at 63 to 94 mg. in dogs. One human patient had 21.5 μ g. per 100 ml. serum after 3 weeks on 14 to 24 mg. iodide per kg. bodyweight. The attainable concentration varied considerably with individuals.

The function of butanol-insoluble protein-bound I is unknown as yet. Its concentration in blood is related to the amount of ingested iodide and is one measure of the organism's response to I. Such a measure is important because of an apparent association of this substance with serum cholesterol changes in rabbits fed on cholesterol, in which large amounts of iodide retard and small amounts enhance the development of high blood cholesterol.

B. W. Simpson.

2133

SERPA SANABRIA, L. M. and DE VENANZI, F. Fósforo inorgánico del suero en pacientes cancerosos. [Inorganic phosphorus of serum in patients with cancer.] *Acta científ. venezol.*, 1953, 4, 213-215. [Centro Invest. Cáncer, Caracas.]

Although the occurrence of high serum P was demonstrated in cancerous animals some years ago, little importance seems to have been attached to the occurrence of high serum P in patients with cancer. In 77 normal subjects the mean value for

inorganic P was 3.65 mg. per 100 ml. serum, in 42 patients with diseases of non-neoplastic nature 3.76, and in 82 with cancer 4.32, a difference of high statistical significance. In 76.8 per cent. of the cancer patients the concentrations were above 4.0 mg. per 100 ml. serum, compared with 22.1 and 31.1 per cent. in the first 2 groups; 30 per cent. of the patients with neoplasms had concentrations between 4.5 and 5.0 mg.

It is suggested that serum inorganic P should be estimated in patients suspected of malignant neoplasms.—M. B. Richards.

2134

REDA, H. and SALEM, H. A study of calcium in the blood serum of Egyptian buffaloes and native and crossbred cattle. *Amer. J. Vet. Res.*, 1954, 15, 561-563. [Fac. Agric., Univ. Cairo.]

The average amount of Ca in 100 ml. serum from Egyptian buffaloes, Egyptian cattle and crossbred Shorthorns was 10, 9.2 and 8.5 mg., respectively. Values were higher in males than in females. Serum Ca rose during pregnancy to a peak a week before parturition, fell below normal after parturition and then returned to normal.—A. Hepburn.

2135

DE BELLIS, L. La potassiemia durante l'età senile. [Blood potassium in old age.] *Bol. Soc. Ital. Biol. sper.*, 1954, 30, 370-372. [Clin. Ostet. Ginecol., Univ. Catania.]

Potassium was estimated by the method of Kramer and Tisdall, modified, in the plasma and cells of 40 women aged from 50 to 85, and of 20 young women. The mean values, in mg. K per cent., for plasma and cells, were for the young women 20.79 and 410.74, and for the old women 22.45 and 438.65. The differences were not significant.—E. M. Hume.

2136

McSHERRY, B. J. and GRINER, I. The pH values, carbon dioxide content, and the levels of sodium, potassium, calcium, chloride, and inorganic phosphorus in the blood serum of normal cattle. *Amer. J. Vet. Res.*, 1954, 15, 509-510. [Ontario Vet. Coll., Guelph.]

2137

EVANS, J. V. Electrolyte concentrations in red blood cells of British breeds of sheep. *Nature*, 1954, 174, 931-932. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Of 93 Scottish Blackface sheep examined with the same plasma level of K and Na, 47 had a mean concentration in the red blood cells of 36 m. equiv. and 46 a mean of 13 m. equiv. K per litre. The 1:1 ratio of the high- and low-K types (HK

and LK) was not found in 43 Cheviot sheep, 7 being HK and 36 LK. Widdas (Title 636, Vol. 25) found 8 HK and 14 LK in 22 pregnant Welsh ewes. In the 3 breeds mentioned there seem to be 2 types with varying distribution. Merino sheep (Denton *et al.*, *Acta med. scand.*, 1951, 140, Suppl. 261) appear to be mostly LK, and LK, HK and intermediate types have been found in Lebanese fat-tailed sheep (Abst. 487, Vol. 7).—A. Hepburn.

2138

CRASS, G. and RIGDON, R. H. **Histologic study of the bone marrow in normal white Pekin ducks.** *Arch. Pathol.*, 1954, 58, 159-167. [Lab. Exp. Pathol., Univ. Texas Sch. Med., Galveston.]
See also Absts. 1613, 1972, 2014, 2045, 2272, 2329, 2381, 2495, 2630, 2721, 2724, 2799.

LYMPH, CEREBROSPINAL FLUID, ETC.

2139

SIMMONDS, W. J. **The effect of fluid, electrolyte and food intake on thoracic duct lymph flow in unanaesthetized rats.** *Austral. J. Exp. Biol. Med. Sci.*, 1954, 32, 285-299. [Kanematsu Mem. Inst. Pathol., Sydney Hosp.]

Cannulae were inserted into the thoracic lymph ducts of adult rats, which also had gastrotomy tubes in the cardiac region of the stomach. Lymph collection was possible for from 1 to 4 days after operation.

When 0.9 per cent. NaCl solution was dripped into the stomach at about 20 ml. per kg. per hr. for 8 hr., more lymph and less urine were produced than when distilled water replaced the saline; the water diuresis decreased the lymph flow. With both fluids protein output rose as the lymph flow increased.

A single dose of 16 to 20 ml. water per kg. body-weight produced much the same increase in lymph flow as did saline, but the peak was reached and passed earlier and the lymph protein was more diluted after water.

A hypotonic solution of 0.5 g. serum albumin in water resembled water in its effect on lymph flow, but hypertonic glucose solution resembled saline. Large doses of olive oil or oleic acid produced a prolonged increase in lymph flow independently of the volume of fluid given, but smaller doses of fat as full-cream milk had little effect.—D. Duncan.

2140

KORNER, P. I., MORRIS, B. and COURTICE, F. C. **An analysis of factors affecting lymph flow and protein composition during gastric absorption of food and fluids, and during intravenous infusion.** *Austral. J. Exp. Biol. Med. Sci.*, 1954, 32, 301-320. [Kanematsu Mem. Inst. Pathol., Sydney Hosp.]

Experiments were made on 58 cats anaesthetised with Nembutal; catheters were inserted into the thoracic lymph duct, femoral artery and lower inferior vena cava.

Intravenous infusion of Ringer Locke solution increased venous pressure and lymph flow. Plasma protein concentration fell relatively less than lymph protein concentration, but the two were related and the latter was independent of the rate of lymph flow. The albumin:globulin ratio in lymph did not change. Experiments with T 1824 showed that large infusions of Ringer Locke solution greatly increased the rate of protein exchange between plasma and lymph. The percentage loss of protein labelled with T 1824 from the plasma in 5 hr. was about twice that of total protein; this is ascribed to mobilisation of new unlabelled protein into the circulation. About 25 to 30 per cent. of the dye lost from the plasma was recovered in the lymph.

In 43 cats operated on 3 to 4 hr. after being fed the spontaneous lymph flow was about 33 per cent. greater than in 23 cats starved, but allowed water, for 24 hr. The protein content of the lymph was directly related to plasma protein concentration and inversely to rate of lymph flow in starved cats, but was independent of flow in fed cats.

In 4 cats given Ringer Locke solution by stomach tube at 40 ml. per kg. per hr. the lymph flow increased from the third hour and continued to rise for 2 hr. after the infusion ceased. When water was thus given to 3 cats the lymph flow reached a peak in the second and third hours, falling abruptly when infusion ceased. During water absorption lymph protein varied inversely with flow, but during saline absorption lymph protein varied directly with plasma protein as well as inversely with flow.

All protein fractions in plasma were present also in lymph. When water was given by mouth there was intravascular haemolysis and free Hb appeared in the lymph 1 to 2 hr. later.—D. Duncan.

2141

ROTHSCHILD (Lord) and BARNES, H. **Constituents of bull seminal plasma.** *J. Exp. Biol.*, 1954, 31, 561-572. [Dept. Zool., Univ. Cambridge.]
Seminal plasma was prepared from semen samples collected from 10 bulls of different breeds and ages.

The mean value of Δ from 40 samples was -0.528 and the range from -0.50 to -0.58 , with one value of -0.71 . Some of the semen diluents in common use have too high and others too low an osmotic pressure. The average concentrations and ranges of several constituents, in mg. per 100 ml., were: Na 258.2, 152 to 370; K 171.6, 50 to 387; Ca 37.3, 24 to 60; Mg 8.4, 0.1 to 18; Fe 2.1, 1 to 4; chloride 174.8, 100 to 293;

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citric acid 620.2, 357 to 818; fructose 459.7, 26 to 872; total N 876.9, 441 to 1169; and total P 56.9, 16 to 91. Correlations between these constituents are tabulated. Na and K were negatively correlated, $r = -0.86$ and $P < 0.001$. Ca, chloride, fructose, citrate and total N were also closely correlated.

Results for Na and K obtained with the flame photometer were less reliable than those of chemical analysis.—D. Duncan.

See also Abst. 1684.

TISSUES

2142

KEYS, A. and FIDANZA, F. Composizione del corpo umano e nutrizione. [Composition of the human body and diet.] *Quad. Nutrizione*, 1953, 13, 93-119. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

A review.

2143

GLEGG, R. E., EIDINGER, D. and LEBLOND, C. P. Presence of carbohydrates distinct from acid mucopolysaccharides in connective tissue. *Science*, 1954, 120, 839-840. [Dept. Anat., McGill Univ., Montreal.]

Connective tissue from cattle lung, Achilles tendon, skin, ligamentum nuchae, tracheal cartilage and bone matrix was extracted with NaOH. The neutralised extracts were fractionally precipitated with alcohol to yield fractions 1, containing acid mucopolysaccharide, and 2. Both fractions and washed lens capsule were analysed by paper chromatography for monosaccharides after hydrolysis for 2 days at 100° C.

Fraction 1 contained glucuronic acid, unlike fraction 2, which contained galactose, mannose and fucose and, in some preparations, glucose. The high N content of 10 to 15 per cent. in fraction 2 suggested the association of protein with the extracts.

The periodic acid Schiff technique for detection of carbohydrates, containing free 1:2-glycol (and α -amino-alcohol) groups stained lens capsule sections intensely, cartilage and bone matrix moderately, collagenous fibres in the derma weakly, and tendon fibres not at all. Application of a commercial sample of "pectinase" to sections of derma and tendon produced an intense stain in the collagenous fibres. The elastic fibres of ligamentum nuchae did not stain even when previously treated with pectinase, which changed the stain of the interstitial material from weak to intense. Since fraction 2 reacted intensely in the periodic acid Schiff spot test and fraction 1 did not, the staining of fraction 2 was attributed to the carbohydrate moiety.—A. Hepburn.

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2144

DE GROOT, C. A. and VLASBLOM, A. The fat content of the carcass of ACTH-treated normal rats. *Acta physiol. pharmacol. neerl.*, 1954, 3, 325-330. [Dept. Pharmacol., Univ. Leyden.]

2145

CIZEK, L. J. Total water content of laboratory animals with special reference to volume of fluid within the lumen of the gastrointestinal tract. *Amer. J. Physiol.*, 1954, 179, 104-110. [Dept. Physiol., Coll. Phys. Surg., Columbia Univ., New York.]

Observations were made on rabbits, guinea-pigs, rats and dogs, a few on mice and hamsters and one goat. With manipulations made as rapidly as possible the animals were killed, their intestines were emptied and carcass weight was measured as liveweight minus that of intestinal contents. In all specimens, contents and carcasses, moisture was estimated by drying to constant weight at 100° C. For the first 3 species data are tabulated which refer to normal feeding, deprivation of food for up to 28, 5 or 7 days and of both food and water for 7, 5 or 5 days, respectively.

During normal feeding water in the lumen of rabbit's intestine is about 15 per cent. of total body water; the lowest percentage, 7.6, was in females after 7 days without food or water. For guinea-pigs a sex difference was found in those feeding normally, 20 per cent. in males, 16.9 per cent. in females; in those without food or water it was 10.3 and 11.3 per cent. after 5 days. In rats normally fed it was 6.7 per cent. in both sexes and 1.5 and 2.4 per cent. in males and females after 5 days without food or water. For dogs 2 hr. after eating the percentages were 9.7 and 6.4 and, after 48 hr. without food but with water, 1.4 and 1.3 per cent., for males and females.

For mice and hamsters feeding normally corresponding values were 8.7 and 11.3 for males and 11.5 and 12.5 per cent. for females. In the one male goat 16.3 per cent. of the total body water was in the lumen of the intestine.

The pitfalls that these data may provide in the estimation of extracellular fluid by the use of substances such as inulin and sucrose, which do not enter the gut, are discussed.—D. Harvey.

2146

GROLLMAN, A. (with CAMPBELL, C., MIMS, J. and RECTOR, F.) The water and electrolyte content of the tissues in hypertension. *Circulation Res.*, 1954, 2, 541-543. [Dept. Exp. Med., Southwestern Med. Sch. Univ. Texas, Dallas.]

Adult rats with high blood pressure produced by a choline-deficient diet given for 10 days after weaning had no apparent loss of parenchymal

renal tissue and less damage in the parenchyma than in hypertension produced by other methods. Water, Na, K, Mg and chloride estimated in brain, gut, heart, liver, skeletal muscle and skin were similar to those of the controls. A second group of hypertensive rats treated with a renal extract to reduce blood pressure gave similar results. The changes in water and electrolyte content in the tissues found by previous workers (Abst. 2063, Vol. 20) were considered to be due to renal disturbances and not to high blood pressure.

A. Hepburn.

2147

FOX, C. L., LASKER, S. E., WINFIELD, J. M. and MERSHEIMER, W. L. Albumin, potassium, sodium, and chloride redistribution and erythrocyte loss after surgical trauma and extensive burns. *Ann. Surg.*, 1954, **140**, 524-532 (with discussion 533-534). [Dept. Surg., New York Med. Coll.]

2148

HARKNESS, M. L. R. and HARKNESS, R. D. The relation of collagen content of the liver to body weight in the rat. *J. Physiol.*, 1954, **125**, 447-452. [Dept. Physiol., University Coll., Gower Street, London, W.C.1.]

Rats, 42 male and 7 female, under 1 year old and weighing 25 to 400 g., which had been allowed a stock diet to appetite until death, were killed and the collagen content of the right lobes of the liver was estimated. The relation of liver weight to bodyweight was the same in males and females; linear relations were found between both weight and collagen content of the liver and bodyweight and could be expressed as

$$w(g.) = 0.0203 W(g.)^{0.91}$$

$$c(mg.) = 0.0124 W(g.)^{1.09}$$

where w and c are weight and collagen content of the liver and W is bodyweight. Thus, liver weight increases less rapidly and liver collagen more rapidly than bodyweight.—G. F. Garton.

2149

WALKER, A. R. P. and ARVIDSSON, U. B. Studies on human bone from South African Bantu subjects. 1. Chemical composition of ribs from subjects habituated to a diet low in calcium.

HIGGINSON, J. 2. Histopathological changes in the ribs of South African Bantu infants. *Metabolism*, 1954, **3**, 386-391; 392-399. [Human Biochem. Unit, S. African Inst. Med. Res., Johannesburg.]

1. Ash, Ca and P were estimated in dry, defatted and occasionally demarrowed fifth ribs from 44 Bantu infants, 13 children and 12 adults; ribs from 18 European infants and 22 adults were

analysed for comparison. No significant difference was found between the percentage composition of either infant or adult ribs from the two races. All the data were in close agreement with those reported for white subjects both in South Africa and in western countries. It is concluded that although the Bantu diet is low in Ca and vitamin D and high in phytate P and has an adverse Ca:P ratio this does not prevent the formation of bone with a normal mineral composition under local conditions, including plentiful sunlight. In some infants, mainly breast fed, who were dying of rickets, the low mineral content of the bone was believed to be due to vitamin D deficiency and insufficient exposure to the sunlight available.

2. The costochondral junction of the fifth rib of 80 Bantu infants who died from kwashiorkor, gastro-enteritis, tuberculosis or respiratory or other disease was examined histologically. Thirteen ribs from European infants and ribs from a few Bantu adolescents and adults were also studied. Details and diagrams are given of the findings. Growth depression was the most frequent lesion observed, and it was most marked in subjects with kwashiorkor. Histological evidence of rickets was found in 20 infants. It is suggested that osteoporosis among these infants is probably due to growth depression rather than to rickets.

G. F. Garton.

2150

CURZON, G. Longitudinal distribution of organic components of bone. *Nature*, 1954, **174**, 646-647. [Inst. Orthopaedics, Brockley Hill, Stanmore, Middlesex.]

In the femur of a goat aged 18 months the galactose, glycogen, hydroxyproline and tyrosine contents were lowest in the shaft and highest at the epiphyses. Galactose and glycogen, especially the former, were highest in the epiphyseal plate. Hydroxyproline, a measure of collagen content, was not higher in the epiphyseal plate than in the other end sections of the bone.—D. Duncan.

2151

GRIFFITH, G. C., BUTT, E. M. and WALKER, J. The inorganic element content of certain human tissues. *Ann. Int. Med.*, 1954, **41**, 501-509. [Dept. Cardiol., Sch. Med., Univ. S. California, Los Angeles.]

Estimations of Cu, Fe, Pb, Mn, Zn and Hg in liver, kidney, heart, brain, lung and spleen were made by chemical and spectrophotometric methods on material obtained at 910 post-mortem examinations. The data are tabulated, with standard deviations, for ages under 3 months, 3 months to 1 year and thereafter for decades of age to the ninth.

In particular Hg content is considered in relation to the effect on the kidney of therapeutic administration of its compounds. It is concluded from the data for 45 patients so treated for congestive heart failure that a trace of Hg may be found in tissues at all ages and that, in the absence of anuria due to low blood Na, small or even massive doses are not injurious to the kidney.—D. Harvey.

2152

BATTISTONE, G. and BURNETT, G. W. **The amino acid content of human enamel.** *J. Dent. Res.*, 1954, **33**, 646-647. *Proc.* [Dept. Dent. Res., Army Med. Serv. Grad. Sch., Washington, D.C.]

2153

BRUDEVOLD, F., GARDNER, D. E. and SMITH, F. A. **Distribution in depth of fluoride in human enamel.** *J. Dent. Res.*, 1954, **33**, 650. *Proc.* [Eastman Dent. Dispensary, Rochester, N.Y.]

2154

POSNER, A. S. and DUYCKAERTS, G. **Infra-red study of the carbonate in bone, teeth and francolite.** *Experientia*, 1954, **10**, 424-425. [Inst. Exp. Therap., Univ. Liège.] French summary.

2155

HART, P. C. **An investigation into the content of trace elements in cow livers.** *Netherlands J. Agric. Sci.*, 1954, **2**, 298-302. [Inst. Animal Husb. Res. T.N.O., Utrecht.]

Copper, zinc, manganese, molybdenum and cobalt were estimated in the livers of 62 cows. Half of the animals had been treated for 5 weeks with Vevoron, an antithyroid preparation containing methylthiouracil, for fattening. On a low-protein diet the Vevoron had increased slaughter weight and the weight of the livers.

The contents in $\mu\text{g. per g. dry liver}$ of Cu, Zn, Mn, Mo and Co in control animals were 116, 144, 10.9, 4.98 and 0.37. In experimental animals they were 120, 125, 8.4, 4.24 and 0.34. Zn, Mn and Mo were significantly decreased by Vevoron. Cu and Co were not significantly affected.

In animals with infections except fascioliosis of the liver, and those with fascioliosis of the liver only, the only difference in content of trace elements in the livers was in Cu, which was higher in the healthy animals.—T. D. Bell.

2156

VAN ESCH, G. J. and HART, P. C. **Onderzoek naar het kopergehalte van runderlevers. [Copper content of cow livers.]** *Landbouwk.*

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Tijdschr., 1953, **65**, no. 12, pp. 12. [Inst. Veeleeltkundig Onderzoek T.N.O., Utrecht.] English summary.

See above abstract.

2157

VAN ESCH, G. J. and HART, P. C. **Onderzoek naar het molybdeengehalte van runderlevers. [Molybdenum content of cattle livers.]** *Landbouwk. Tijdschr.*, 1953, **65**, 195-202. [Inst. Veeleeltkundig Onderzoek T.N.O., Utrecht.] English summary.

See above abstract.

2158

WASHBURN, R. G., GILMORE, L. O. and FECHHEIMER, N. S. **The mineral content of cattle hair.** *J. Animal Sci.*, 1954, **13**, 964. *Proc.* [Ohio Agric. Exp. Stat.]

2159

RYŚ, R. **Zawartość cystyny w wełnach owiec hodowanych na obszarze Polski. [Cystine content of the wool of sheep bred in Poland.]** *Rocz. Nauk. rol.* [B], 1954, **68**, 67-86. [Lab. Centralne, Pracownia Biochem.] Russian and English summaries.

The average cystine content of the wool was the same in the inner and outer layers of the fleece of Zackel sheep bred in Poland and in different areas of Merino fleeces. The cystine content was higher in breeds developed for good fleeces, and was directly proportional to the quality of the wool. It is suggested that the cystine content might be used as an additional method for grading wool.—T. D. Bell.

2160

BURLEY, R. W. **Sulphydryl groups in wool.** *Nature*, 1954, **174**, 1019-1020. [Nat. Chem. Res. Lab., S. African Council. Sci. Indust. Res., Pretoria.]

This is a modification of the method of Scott and Fleisch (*Science*, 1954, **119**, 70) for estimation of sulphydryl groups with 1-(4-chloromercurenylphenylazo)-naphthol-2. A sample of 50 mg. wool of known moisture content is shaken with a formamide solution of the reagent containing 4 mg. per 100 ml. The wool fibres swell in the formamide, allowing the reagent to penetrate. The concentration of sulphydryl groups was estimated after 4 days when the rate of reaction had reached a small but finite value, by measuring the decrease in colour intensity of the reagent.

Typical South African merino wool contained on the average 7 micromoles of sulphydryl groups per g. dry wool. Wool from sheep deficient in Cu contained more sulphydryl groups, and the relative mechanical weakness of this wool can be explained by a lower formation of cystine linkages.

A. Hepburn.

16

2161

BURNETT, G. W. and LOBENE, R. R. Spectrochemical analysis of enamel and dentin from Syrian hamsters. *J. Dent. Res.*, 1954, **33**,

651. *Proc.* [Dept. Dent. Res., Army Med. Serv. Grad. Sch., Washington, D.C.]
See also Abst. 1613.

DUCTLESS GLANDS AND HORMONES

2162

LONG, C. N. H. The hormones and metabolism. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 9*, 1954, 106-119. [Sch. Med., Yale Univ., New Haven, Conn.]

2163

NERENBERG, S. T. Beta granules of islets of Langerhans of rat: a study of their development under normal and abnormal conditions. *Arch. Pathol.*, 1954, **58**, 236-240. [Dept. Pathol., Univ. Minnesota, Minneapolis.]

Sections of pancreas were studied from foetal rats from the seventh to the twenty-first day of gestation and from young rats from birth to 3 weeks old. The pancreases were stained with a modified Gomori chrome alum haematoxylin method for demonstrating alpha and beta granules in the islets of Langerhans.

Beta granules were first seen on the twentieth day of gestation, and beta cells were well filled with granules in the newborn rats, but no alpha granules appeared until the fourth day of life. Administration of insulin to the mothers throughout pregnancy did not affect the development of beta granules in the foetus, nor did starvation in the newborn. In young from alloxan-diabetic mothers there was no beta granulation until 24 hr. after birth, but in one killed at birth alpha cells were strikingly prominent. The results with cortisone were not conclusive, but there appeared to be no significant effect on the beta granules.

D. Duncan.

2164

ORTIZ DE LANDÁZURI, E., ESCOBAR DEL REY, F., MORA LARA, R. J., SÁNCHEZ AGESTA, A., RODRÍGUEZ MORENO, F. and MORATA GARCÍA, F. Exploración de los procesos hipoparatiroides. [Hypoparathyroid conditions.] *Rev. clín. española*, 1954, **55**, 5-19. [Clín. Med., Univ. Granada.] English, German and French summaries.

After a classification of types of hypoparathyroidism, the functional tests, both classic and modern, applied in studying the condition are discussed. A detailed study, based on these tests, is reported for 2 patients, one with genuine hypoparathyroidism, in whom the Ellsworth Howard test with parathyroid hormone was positive, and the other with pseudohypoparathyroidism which gave a negative result with this test. It is

concluded that the parathyroid hormone diminishes tubular reabsorption in genuine, but not in false hypoparathyroidism. In the former the hormone causes a rise in blood Ca and a fall in blood P; without hormone the phosphate level rises first, and later the Ca level falls. This points to a primary effect on P metabolism and a secondary effect on that of Ca. Vitamin D₂ acts above all on blood Ca, probably as a result of improved Ca uptake from the intestinal lumen. Administration of a protein diet with vitamin D₂ and CaCl₂ improves the humoral and clinical picture in hypoparathyroidism. The Ellsworth Howard test is considered effective, provided certain precautions outlined in the paper are observed.—M. B. Richards.

2165

BRENNER, O., BLACK, A. B. and GADDIE, R. Estimation of the rate of thyroid hormone secretion in man. *Clin. Sci.*, 1954, **13**, 441-451. [United Birmingham Hosps.]

Of 12 patients selected, 6 had thyrotoxicosis, 2 had myxoedema, 3 had normal thyroids and 1 had a high B.M.R. but no clinical evidence of thyrotoxicosis. Daily collections of faeces and 24-hr. specimens of urine were made during the 2 weeks of the experiment. Each patient was given 5 to 10 mC. of ¹³¹I as Na¹³¹I by mouth. One hr. later and then every 24 hr., 30 ml. blood was taken and 4 or 5 ml. serum was used for estimation of protein-bound iodine radio-activity. The radio-activity of faeces and urine was also studied. Details are given of the method of calculating the daily secretion of thyroxine from the data obtained; the validity of the method is discussed, and possible sources of error. In the 3 euthyroid patients the daily secretion of thyroxine estimated by this method was 163 to 274 µg. In the 2 myxoedematous patients it was 10.5 and 17.8 µg. In the 6 thyrotoxic patients it was 247 to 2603 µg. and in the single patient with the high B.M.R., 1396 µg.—B. W. Simpson.

2166

PITT-RIVERS, R. Metabolic effects of compounds structurally related to thyroxine *in vivo*: thyronine derivatives. *J. Clin. Endocrinol.*, 1954, **14**, 1444-1449. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

A short review.

2167

EDWARDS, D. A. W., ROWLANDS, E. N. and TROTTER, W. R. **The mechanism of the goitrogenic action of *p*-aminosalicylic acid.** *Lancet*, 1954, 267, 1051-1052. [Dept. Clin. Res., University Coll. Hosp. Med. Sch., London.]

Previous investigators have noted that among patients receiving treatment with *p*-aminosalicylic acid (PAS) a few developed mild goitre with myxoedema. The mechanism of the effect was studied.

PAS did not reduce the concentration of iodides by thyroid or by saliva, but inhibited formation of thyroid hormone. In 4 patients who had previously received large therapeutic doses of ^{131}I and whose blood levels of ^{131}I remained steady, the concentration of ^{131}I in the saliva was not altered by administration of PAS, nor was the concentration of iodides in the thyroid. Two patients with toxic goitre were given 5 g. sodium PAS by mouth and, 1 hr. later, an oral dose of ^{131}I . The radio-active count over the thyroid rose and levelled off in about 1 hr., and 200 mg. KClO_3 was then given to discharge any iodides not organically bound. The proportion of ^{131}I discharged, expressed as a percentage, was a measure of the effectiveness of PAS in blocking hormone formation. In one patient 30 per cent. only was discharged, indicating a slight block, but in the other 95 per cent. was discharged, indicating almost complete block.

This mild form of goitre induced by PAS could be effectively treated with thyroid or thyroxine preparations, but not with iodides. As half of a single dose of PAS is excreted by the kidneys in 3 hr. the goitrogenic complication is slight and easily overcome.—B. W. Simpson.

2168

SINGH, O. N., HENNEMAN, H. A. and REINEKE, E. P. **The relationship of thyroid activity to lactation, growth, and sex in sheep.** *J. Animal Sci.*, 1954, 13, 1031. *Proc.* [Michigan State Coll.]

2169

ZIMMERMAN, L. M., SHUBIK, P., BASERGA, R., RITCHIE, A. C. and JACQUES, L. **Experimental production of thyroid tumors by alternating hyperplasia and involution.** *J. Clin. Endocrinol.*, 1954, 14, 1367-1373. [Dept. Surg., Chicago Med. Sch., Ill.]

Young adult rats were alternately given propylthiouracil to produce hyperplasia and KI to produce involution of the thyroid. The former was administered as 0.1 per cent. and the latter as 0.01 per cent. in the drinking water. Two control groups were kept continuously on propyl-

thiouracil and KI, respectively. After a year all the rats were killed.

Tumours in the thyroids of the experimental rats were more numerous than in the control group on propylthiouracil. The thyroids of rats which had undergone alternate hyperplasia and involution showed localised areas of hyperinvolution. Three types of neoplastic change were seen. The first consisted of cords of cells and of small elongated acini containing little or no colloid. The cells were tall and columnar. No capsule had formed. The second was a type of benign adenoma consisting of closely packed cells with abundant granular cytoplasm, but again no capsule. The third type was found once only, a large cyst almost entirely replacing the thyroid lobe and filled with papillary projections.

Although the production of nodular goitre was not achieved, such an alternation of activity and rest was more effective in the production of neoplasms than sustained stimulation.

B. W. Simpson.

2170

HIGHLEY, D. R., PARKER, H. E. and ANDREWS, F. N. **Quantitative interrelationships between the effects of iodine and thiouracil on thyroid function.** *J. Nutrition*, 1954, 54, 249-256. [Dept. Biochem., Purdue Agric. Exp. Stat., W. Lafayette, Ind.]

Weanling male rats were divided into 16 groups of 10 and fed on diets containing 20, 100, 400 and 1600 μg . iodine per kg. for 6 weeks. During the 5th and 6th weeks 3 diets at each I level were supplemented with thiouracil, 0.005, 0.025 and 0.10 per cent. The greatest effect of the thiouracil was exerted when the I level was near the minimum required to prevent thyroid enlargement in the normal rat. High dietary I decreased, but did not prevent, the goitrogenic effect on thyroid weight and I content. Growth rate was not affected by the I intake when the thiouracil level was 0.005 per cent. or less. The growth-reducing effect of 0.025 per cent. thiouracil was counteracted by 400 μg . I per kg., but the growth-reducing effect of 0.1 per cent. thiouracil was not neutralised by 1600 μg . per kg. The addition of thiouracil to the diet increased thyroid size at all levels of I intake, but more at 100 and 400 than at 20 or 1600 μg . I per kg. The thyroid weight was proportional at the lower I intakes to the log log of the dose of thiouracil, but at 400 and 1600 μg . per kg. it was proportional to the log of the dose of thiouracil. When thiouracil was continuously in the diet for 6 weeks adrenal enlargement occurred at the 2 lower levels of I intake.—B. W. Simpson.

2171

KRÜSKEMPER, H. L. and KLEINSORG, H. **Zur anti-thyreoidalen Wirkung von Kaliumperchlorat.**

[Antithyroid action of potassium perchlorate.] *Arch. exp. Pathol. Pharmacol.*, 1954, **223**, 469-480. [Med. Klin., Univ. Göttingen.]

Experiments were made on intact rats and rats from which the pituitary was removed. $KClO_4$, 100 or 250 mg. per kg. bodyweight daily, had no effect on weight gain, muscle, blood or liver. Thyroid weight rose to more than twice normal in 28 days, and returned spontaneously to approximately normal when $KClO_4$ was stopped. Thyroxine counteracted this effect and it did not occur when the pituitary had been removed. $KClO_4$ had no direct effect *in vitro* on respiration of liver but the respiration of liver removed after treatment was reduced. The effects of thyroxine on tissue metabolism *in vitro* and on bodyweight were not counteracted by $KClO_4$. No toxic effect was seen and the adrenals showed no reaction.

The effect on metabolism and thyroid weight of 250 mg. per kg. daily for 14 days was similar to that of 100 mg. methylthiouracil.—I. Leitch.

2172

MELLEN, W. J. and WALLER, E. F. Antibiotics and thyroid size in growing chickens. *Poultry Sci.*, 1954, **33**, 1036-1037. [Dept. Animal and Poultry Indust., Univ. Delaware, Newark.]

Duplicate groups of day-old chicks were given a normal ration with: (1) no supplement, (2) 75 g. aureomycin per ton, (3) 100 g. bacitracin per ton, and (4) 100 g. furazolidone per ton. All chicks were injected intraperitoneally at 3½ weeks of age with the agent of chronic respiratory disease and spray-vaccinated with Newcastle disease vaccine at 5 weeks and 5 weeks of age. At 8 weeks of age the thyroids in groups 2, 3 and 4 were considerably larger than in the controls, but the increase in liveweight due to the antibiotics accounted for some of this greater thyroid size.—M. J. Head.

See also Absts. 1690, 1769, 1852, 1981, 2218, 2306, 2327, 2414.

2173

DELOIRME, M. L. and CAROIT, M. Étude de la diurèse et recherche d'un principe anti-diurétique au cours des hépatites provoquées par le régime hypoprotéidique chez le rat. [Study of diuresis and research on an anti-diuretic principle during hepatitis induced by low-protein diet in the rat.] *Arch. Sci. physiol.*, 1954, **8**, 329-347. [Bichat Hôp., 170 Boulevard Ney, Paris.]

Rats of initial weight 100 g. fed for 6 months on a diet providing 7 per cent. protein excreted less urine than controls on normal diet. At the twenty-sixth week the mean daily output was 10 ml. in the former and 77 ml. in the latter. The Na output was between 6 and 24 m. equiv. per litre in protein-deficient and 130 m. equiv. per litre in normal rats. Neither the differences in the diet nor those in growth appeared to account for these findings, and no renal lesion was found.

When normal rats received by stomach tube a water load of 5 per cent. of their bodyweight the resulting diuresis was inhibited by intraperitoneal injection of urine from protein-deficient rats or from 6 patients with hepatitis, but not by urine from normal rats or men.

The urine from protein-deficient rats and that from 14 patients (and possibly from 2 more) out of 21 with hepatitis had an oxytocic effect on guinea-pig uterus *in vitro*, which was not found in urine of normal rats or men. In the human subjects the presence of this substance was correlated with a low output of urine.

The results support the hypothesis that the antidiuretic substance is the posterior pituitary hormone.—D. Duncan.

2174

GIACALONE, O. Influenza di estratti acquosi di testicolo e di ovaio sui limiti di resistenza alla iposalimentazione e sulla perdita percentuale giornaliera del peso corporeo. [Influence of aqueous testicular and ovarian extracts on the limits of resistance to underfeeding and on the daily percentage loss of weight.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 49-51. [Ist. Fisiol., Univ. Palermo.]

Three groups of 5 adult rats were fed on a diet of, per cent., wheat starch 75, casein 10, butter 10, salts 5, with vitamins and fresh liver extract. The intake was restricted to 0.215 to 0.222 Cal. per g. bodyweight daily. On alternate days, a subcutaneous injection was given to one group of whole extract of testis equivalent to 30 cg. of the organ, to another group of whole extract of ovary equivalent to 5 cg. of the organ, and to the third group of saline. The rats given saline and those given ovarian extract died in a mean time of 54.4 and 53.6 days, both groups having lost a mean amount of 0.89 g. daily. The corresponding values for the rats given testicular extract were 49.0 and 1.0.—E. M. Hume.

See also Absts. 1969, 1981, 2011, 2041, 2049-54, 2318, 2712, 2726.

ENERGY EXCHANGE AND SPECIFIC DYNAMIC ACTION

2175

KULIN, L. Die Berechnung des Kalorienbedarfes beim atrophischen Säugling. (Unter besonderer Berücksichtigung der Erfahrungen im Klimamilieu.) [Calculating the calorie requirement of the atrophic infant. With special reference to findings in the constant-temperature room.] *Ann. paediat.*, 1954, **183**, 162-188. [Kinderklin., Univ. Debrecen.] English and French summaries.

Observations were made on 70 atrophic infants. Their energy requirements were higher than those of normal infants when calculated from age and body mass, but showed great variation. When these infants were nursed in a controlled environment their requirements became much more stable, and 91 per cent. of them required 120 to 150 Cal. per kg. daily. It is necessary to supply from 10 to 30 per cent. more than the intake calculated from age and body mass. The ideal environment was found to be 28° to 30° C. and R.H. 55 to 70 per cent., so that much energy was not required for maintenance of body temperature.—D. Duncan.

2176

SUZUKI, S., NAGAMINE, S., KAWADA, S., KUGA, T., YAMAKAWA, K., OSHIMA, S., HATTORI, B. and MIURA, S. [Studies on feeding standard of the National Safety Force. 5. On basal metabolism of the National Safety Force personnel at Camp Obihiro, Hokkaido.] *Jap. Safety Forces Med. J.*, 1954, **1**, No. 6, 19-29. [Div. Physiol., Nat. Inst. Nutrit.] In Japanese: English summary.

For earlier papers see Abst. 713, Vol. 25.

Data on basal metabolism, body measurements and how the time of 182 infantry personnel was spent are presented in tables in Japanese.

Body measurements, especially weight and chest girth, were superior to those of the average Japanese.

Average basal metabolic energy was 44.2 Cal. per hr. per sq. m. body surface, as compared to 42.5 Cal. found in 20 infantry personnel of Camp Nerima, Tokyo. (From summary.)—T. D. Bell.

2177

HATTORI, B. *et al.* [Studies on feeding standard of the National Safety Force. 6. On basal metabolism of the infantry personnel at Camp Kanoya, Kyushu.] *Jap. Safety Forces Med. J.*, 1954, **1**, No. 7, 11-22. [Ground Self-Defence Force Med. Sch.] In Japanese: English summary.

The mean basal metabolic rate for 236 subjects was 43.4 Cal. per hr. per sq. m. body surface,

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slightly lower than that for 182 subjects at Hokkaido, where the climate is colder. (From summary.)—D. Duncan.

2178

KENYON, F., KELLY, H. J. and MACY, I. G. Basal metabolism of girls in the Great Lakes region. Need for continuous promotion of iodized salt. *J. Amer. Dietetic Assoc.*, 1954, **30**, 987-990. [Michigan Dept. Health, Detroit.]

The subjects were 67 apparently healthy Michigan girls aged from 5 to 18 years who were reared in the Great Lakes region during a goitre control programme. The Benedict Roth closed circuit apparatus was used for a total of 710 measurements of B.M.R. Twenty-five to 30 per cent. of the girls had basal metabolic rates within the range of 0 to -5 per cent. This tendency towards low rates emphasises the need for continuous propaganda for the use of iodised salt in goitre areas.—F. C. Aitken.

2179

VIVANCO, F. and RAMOS, F. Correlacion entre el M.B. y el iodo proteico del suero en normales y enfermos de tiroides. [Correlation between B.M.R. and protein-bound iodine in the serum of normal subjects and those with thyroid disorders.] *Rev. clín. española*, 1954, **54**, 208-210. [Inst. Invest. Méd., Madrid.] English, German and French summaries.

2180

ARDY, C. and PONTREMOLI, S. Su alcuni aspetti del ricambio respiratorio dopo carico endovenoso di grassi. [Respiratory exchange after fat is given intravenously.] *Quad. Nutrizione*, 1953, **13**, 152-165. [Ist. Fisiol., Univ. Genoa.] The evidence in the literature on the possible conversion of fat to carbohydrate in the body is considered to be incomplete.

Basal metabolism was studied with Haldane's open circuit apparatus in 7 dogs weighing between 3.1 and 6.2 kg., starved for 12 hr. and in thermal neutrality. Changes in weight, oxygen consumption, CO₂ and water output and R.Q. were estimated for 10 hr. The experiments were later repeated when the dogs had received, after fasting for 12 hr., an intravenous infusion of an emulsion of 9 g. coconut oil per kg. bodyweight; and on another occasion when they received in the same way 6.99 g. glucose per kg. bodyweight in 15 per cent. solution. The fat and glucose provided the same amount of carbon.

In the second 5 hr. of experiments in which the dogs received fat emulsion there was a considerable

reduction in the mean hourly loss of bodyweight : after glucose the weight loss was similar to that of fasted dogs. This decreased weight loss after fat was accompanied by a low R.Q. of 0.63 ± 0.13 , compared with the fasting R.Q. of 0.79 ± 0.06 and one of 1.03 ± 0.15 in the second 5 hr. after glucose. Output of water was similar in all experiments.

The results are considered to support the theory that fats can be converted to carbohydrate in the body.—D. Dumeau.

2181

LIQUORI, G. Il dispendio energetico nel lavoro dei salinieri. Studio nelle saline di S. Gilla (Cagliari). [Energy expenditure by workers in salt mines. Study in the salt mine of S. Gilla, Cagliari.] *Quad. Nutrizione*, 1953, **13**, 120-142. [Ist. Fisiol., Univ. Cagliari.]

Energy expenditure was computed for the working day from analysis in a Haldane Margaria apparatus of expired air collected in a Simonson bag. Basal metabolism was taken from Boothby and Sandiford's modification of Du Bois's tables after deduction of 10 per cent. to fit Italian values. The work is described. For 11 *attolatori* (gatherers) the mean age was 42, weight 57 kg., height 160 cm. and surface area 1.59 sq. m.; standing at rest their R.Q. was 0.88, oxygen consumption per min. 207 c.c., equivalent to 1.03 Cal.; at work R.Q. was 0.93, and oxygen consumption 935 c.c., or 4.28 Cal. Similar data are given for 20 *carrucianti* (loaders) and a total of 20 *caricatori* (barrowmen) in 2 groups on different tasks. With comparable allowances for rest in the canteen, cycling 20 km. (B.M. + 240 Cal. per hr.), domestic activities (B.M. + 65 per cent.) and sleep (B.M. + 10 per cent.), the daily expenditures of the groups are computed to be [without decimal points] 3272, 3889, 3210 and 3546 Cal. The work of loading, at the rate of 7.09 Cal. per kg. bodyweight per hr., is "very heavy", demanding frequent rest pauses.

I. Leitch.

2182

HETTINGER, T. and WIRTHS, W. Arbeitsphysiologische Untersuchungen über Korbform und Trageart beim Kartoffellegen. [Physiology of work : shape of basket and mode of carrying it in potato planting.] *Arbeitsphysiologie*, 1954, **15**, 364-372. [Max Planck Inst. Arbeitsphysiol., Dortmund.]

Baskets of oval or kidney shape, carried by handles or suspended in front of the body by a strap over the back, were used in respiration tests in the field, on the energy expended in planting potatoes and filling the baskets from a sack. In all tests the energy expenditure for planting was on the average 4.3 Cal. per min., and for filling a basket 3 to 4 Cal. The planting of a hectare required about 7400 work Cal. The subjective

feeling of strain and the increase of pulse frequency in the work of potato planting were much greater with baskets with handles than with those carried on a strap.—M. B. Richards.

2183

BARČIĆ, I. Prilog poznavanju utroška energije u poljoprivrednim radovima. 1. Potrošnja energije pri jesenjem oranju. [Energy exchange in agricultural tasks. 1. Energy output in autumn ploughing.] *Zborn. Rad., Srpsku Akad. Nauka*, 1954, **28** (Inst. Nutrit., No. 2), pp. 10. [Inst. Nutrit., Serb. Acad. Sci.] German summary.

Measurements were made with the Dortmund gas meter and the Haldane apparatus of the energy exchange of men ploughing generally flat land. There were 9 subjects whose basal metabolism ranged from 56.1 to 80.2 Cal. per hr. The averages for data from 13 estimations were : bodyweight 68.8 kg., R.Q. 0.79, energy exchange during work 319.4 Cal., and at rest 68.1 Cal. per hr., at an average speed of ploughing of 46.3 m. per minute. For a ploughman working for 8 hr. the daily energy requirement is estimated to be about 4100 Cal. (From summary).—D. Harvey.

2184

WYNDHAM, C. H., STRYDOM, N. B., MORRISON, J. F., DU TOIT, F. D. and KRAAN, J. G. A new method of acclimatization to heat. *Arbeitsphysiologie*, 1954, **15**, 373-382. [Lab. Appl. Physiol., Transvaal and Orange Free State Chamber of Mines, Johannesburg.]

In a new method of acclimatization of labourers to the hot humid conditions experienced in deep mines, the men are exposed to full production rates in mild heat for 6 days, followed by 6 days at full production rates in very severe heat. In a test of the method on 205 labourers not one developed heat stroke. The men are productive from the start, and the method offers considerable economical, physiological and psychological advantages over the present procedure, lasting 18 to 28 days, where work is restricted during the initial stages of acclimatization.—M. B. Richards.

2185

BENEZRA R., M.V. A new index for measuring the adaptability of cattle to tropical conditions. *J. Animal Sci.*, 1954, **13**, 1015. *Proc.* [Central Univ., Venezuela.]

2186

PATCHELL, M. R. Direct effects of climate on cattle. 3. The diurnal trend in body temperature, respiration rate and pulse rate. *N.Z. J. Sci. Technol.*, 1954, **36**, 93-102. [Dairy Res. Inst. (N.Z.), Palmerston North.]

2187

- QUAZI, F. R. and SHRODE, R. R. Variation in rectal temperature, pulse rate and respiratory rate of cattle as related to variation in four environmental variables. *J. Animal Sci.*, 1954, 13, 1028-1029. *Proc. [Agric. and Mech. Coll. Texas.]*

2188

- THOMPSON, H. J. Environmental physiology and shelter engineering with special reference to domestic animals. 24. Effect of temperature upon heat exchanges in dairy barns.

- BRODY, S., RAGSDALE, A. C., THOMPSON, H. J. and WORSTELL, D. M. 25. The effect of wind on milk production, feed and water consumption and body weight in dairy cattle.

- THOMPSON, H. J., YECK, R. G., WORSTELL, D. M. and BRODY, S. 26. The effect of wind on evaporative cooling and surface temperature in dairy cattle.

- KIBLER, H. H. and BRODY, S. 27. Influence of wind on heat exchange and body temperature regulation in Jersey, Holstein, Brown Swiss, and Brahman cattle. *Missouri Agric. Exp. Stat. Res. Bull.* Nos. 542, 545, 548 and 552, 1954. [Columbia, Mo.]

2189

- KROG, H. and MONSON, M. Notes on the metabolism of a mountain goat. *Amer. J. Physiol.*, 1954, 178, 515-516. [Arctic Health Res. Centre, Pub. Health Serv., Anchorage, Alaska.]

A male mountain goat, *Oreamnos americanus*, aged $1\frac{1}{2}$ years, was captured in Alaska. Its oxygen consumption was fairly constant at environmental temperatures from 20° to -20° C., with a mean of 0.26 ml. oxygen per g. per hr. At -30° C. oxygen consumption rose by about 23 per cent., and at -50° C. by 130 per cent. The metabolic rate corresponds with the general formula $H=KW^2$, showing no modification for the cold environment of Alaska.—D. Duncan.

2190

- GELINEO, S. La température d'adaptation, la concentration de l'hémoglobine et la production de chaleur chez le chien. [Adaptation temperature, haemoglobin concentration and heat production in the dog.] *C.R. Soc. Biol.*, 1954, 148, 1114-1116. [Inst. Physiol., Fac. Sci., Univ. Belgrade.]

Three dogs aged 3 or 4 years received a diet of meat, bread, maize meal and milk. Oxygen consumption was measured in a closed circuit after they had fasted for 17 to 20 hr. The dogs spent $2\frac{1}{2}$ to 3 months at temperatures between -4° and $+5^{\circ}$ C., then 1 spent a month and the others 2

months at 25° C. and finally 2 spent another month at between 5° and 10° C.

These dogs adapted themselves by chemical thermoregulation. The basal metabolism at 25° C. and oxygen consumption at 3° C. were compared at the beginning and end of the period spent at 25° C. In dog "Noir" the B.M.R. fell from the first to the second estimation by 19 per cent. and heat production at 3° C. fell by 30 per cent. In dog "Djoka" the falls were 22 and 35 per cent., and in "Blanc" 28 and 38 per cent. Hb concentrations are tabulated: the mean value was 14.0 g. per 100 ml. after the low temperature period and 12.7 after the high.

The results are contrasted with those obtained by Irving (Title 3687, Vol. 21) in Eskimo dogs, which modified their heat loss rather than heat production.—D. Duncan.

2191

- WYNDHAM, C. Heat transfer in dogs. *Amer. J. Med. Sci.*, 1954, 228, 364. *Proc. [Dept. Physiol., Med. Sch., Univ. Pennsylvania.]*

2192

- CHÉNIER, L. P. Effet du froid et des régimes alimentaires sur les échanges respiratoires du rat blanc. [Effect of cold and of diet on the respiratory exchange of the white rat.] *Laval méd.*, 1954, 19, 381-420. [Dept. Physiol. Nutrit., Inst. Physiol., Laval Univ., Québec.]

Respiratory quotient and oxygen consumption were measured in rats under 24 different sets of conditions of food and temperature. The results were considered compatible with the assumption that animals exposed to cold burn preferably fat, and that the process of adaptation to cold is characterised by preferential utilisation of fats and by accelerated conversion of sugar to fat. (See Absts. 716, 717, Vol. 25.)—E. M. Hume.

2193

- COTTLE, W. and CARLSON, L. D. Adaptive changes in rats exposed to cold. Caloric exchange. *Amer. J. Physiol.*, 1954, 178, 305-308. [Dept. Physiol. Biophys., Sch. Med., Univ. Washington, Seattle.]

Rats were fed on Purina chow and kept in a cold room at $5 \pm 1^{\circ}$ C.; controls were kept at $25 \pm 2^{\circ}$ C.

Young rats placed in the cold room maintained their rate of growth for about a week and then began to lag behind controls. Rats from the control group placed in the cold room after 28 days at 25° C. lost weight for about a week, and after this became and remained comparable in weight to other animals in the cold. All rats increased their food intake during their first week in the cold. Rats brought from 5° to 25° C.

immediately began to eat less, and their weight changed little.

Heat production of rats in the cold room rose abruptly during the first 5 days and continued to rise for 2 or 3 weeks; after about 5 weeks it began to decline. Cold-acclimatised rats equalled others in heat production at 25° C., but at 15° and 5° C. the former produced more heat.—D. Duncan.

2194

ROBINSON, K. W. Heat tolerances of Australian monotremes and marsupials. *Austral. J. Biol. Sci.*, 1954, 7, 348–360. [Dept. Physiol., Univ. Queensland, Brisbane.]

The species studied were platypus, echidna, bandicoot, possum (*Trichosurus caninus*), cuscus, koala, wallaby and wallaroo, and the animals were young, healthy adults. They were exposed for 7 hr. twice weekly to combinations of dry-bulb temperatures from 86° to 108.5° F. with absolute humidities between 15 and 40 mm. vapour pressure. Rectal temperature, pulse and respiratory rates, evaporative weight loss and behaviour were recorded.

The monotremes were but poorly able to regulate body temperature at air temperatures above 90.5° F., and the echidna was less tolerant of heat than the platypus. Rising humidity at 90.5° F. was relatively well tolerated by the monotremes. The animals higher in the evolutionary scale were better able to withstand the higher temperatures. Marsupials panted, monotremes did not.

The platypus became drowsy and inactive as its body temperature rose; the only method by which it can prevent overheating is by cutting down heat production. The marsupials, besides panting, lick themselves to procure evaporation. Sweating appears to be more efficient in the more

tolerant species, which approach eutherian mammals in ability to regulate temperature.

D. Duncan.

2195

MELLEN, W. J. and HILL, F. W. Studies of the avian respiratory quotient. *Poultry Sci.*, 1954, 33, 1071–1072. *Proc.* [Cornell Univ., Ithaca, N.Y.]

2196

HUTCHINSON, J. C. D. Evaporative cooling in fowls. *J. Agric. Sci.*, 1954, 45, 48–59. [Agric. Res. Comm. Poultry Res. Centre, King's Bldgs., Edinburgh.]

It is concluded that atmospheric humidity hinders evaporative cooling less in fowls than in men. The maximum cooling obtained was much less than in men and somewhat less than in dogs; evaporation per unit surface area was somewhat less than in the cow, but similar in relation to metabolic requirements. Some discrepancies between rectal temperature and evaporative loss are discussed.—D. Duncan.

2197

ROMIJN, C. Development of heat regulation in the chick. 10th World's Poultry Congr. Sect. Papers, Edinburgh 1954, 181–184. [Lab. Vet. Physiol., State Univ., Utrecht.]

2198

NÖCKER, J. Energiestoffwechsel und Ernährung bei körperlicher Leistung. [Energy exchange and diet in bodily work.] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselkr.*, 1954, 14, 59–69; 145–158. [Med. Klin., Univ. Leipzig.]

See also Absta. 1693, 1973.

CARBOHYDRATES

2199

IRVING, E. M. and WANG, I. The effect of the previous diet on glucose tolerance tests. *Glasgow Med. J.*, 1954, 35, 275–278. [Dept. Metabol. Dis., Victoria Infirmary, Glasgow.]

The subjects, 7 men and 5 women from 19 to 25 years old, were healthy and of normal weight, except 1 who was 20 per cent. over ideal weight. Their normal diets provided from 150 to 420 g. carbohydrate daily. Oral glucose tolerance tests were made after 4 days on controlled diets providing 100 and 300 g. carbohydrate daily.

There was no significant effect of diet on fasting blood sugar levels or the shape of the curves except that in 3 subjects on the low intake curves were obtained in which the peak was above 180

mg. per 100 ml. It was concluded that it is unnecessary to give extra carbohydrate before tests.

D. Duncan.

2200

RAJCHAUDHURI, B. and GHOSH, S. C. The study on the nature of intravenous glucose tolerance test in marasmic babies. *Calcutta Med. J.*, 1954, 51, 87–90. [Dept. Paediat., Med. Coll. Hosp., Calcutta.]

2201

McCULLAGH, E. P., FAWELL, W. N. and LANE, F. J. Significance of hyperglycemia without glycosuria: a ten to twenty-eight year study. *J. Amer. Med. Assoc.*, 1954, 156, 925–929. [Cleveland Clin. Found., Ohio.]

N.A. and R., April 1955

Of 200 subjects with high blood sugar without glucose in the urine, 29 per cent. were later classed as having diabetes and 11 per cent. as suspected diabetes, compared with 10 and 7 per cent. in a control group of 200 subjects with normal blood sugar at first examination. Comparison of subjects over 50 years of age with high and normal blood sugar and of obese subjects in both groups showed for each classification a higher incidence of diabetes in subjects with high blood sugar.—F. C. Aitken.

2202

HENNEMAN, D. H., ALTSCHULE, M. D. and GONCZ, R. M. **Carbohydrate metabolism in brain disease. 2. Glucose metabolism in schizophrenic, manic-depressive, and involutional psychoses.** *Arch. Int. Med.*, 1954, **94**, 402-416. [Lab. Clin. Physiol., McLean Hosp., Waverley, Mass.]

In psychotic patients the fasting blood concentrations of pyruvic, citric and α -ketoglutaric acids and of inorganic phosphate were normal. One-third of the patients showed significant elevations of true blood glucose and lactic acid concentrations. After ingestion of 100 g. glucose the psychotic patients showed a delay in the return of the glucose concentration to the fasting value, an excessive and prolonged rise in whole blood lactic acid (seen almost exclusively in patients with psychosis of recent onset), an increased and prolonged accumulation of pyruvic acid, and an increased and prolonged fall in serum inorganic phosphate. Plasma citric acid and α -ketoglutaric acid showed a rise instead of the fall characteristic of most normal subjects. The results after intravenous infusion of dextrose varied with the rate of infusion. The biochemical abnormalities found in psychotic patients after administration of glucose are similar to those in patients with organic brain disease.

M. B. Richards.

2203

RUNYAN, J. W. and KANTOR, N. **The response of serum inorganic phosphorus and potassium to oral glucose in normal individuals and in patients with mild diabetes.** *J. Lab. Clin. Med.*, 1954, **44**, 400-402. [Thorndike Mem. Lab., Boston City Hosp., Mass.]

The administration of 100 g. glucose by mouth to 37 mildly diabetic and 20 normal subjects reduced serum K and P in each group by similar amounts and hence was of no value as a diagnostic test for diabetes mellitus.—A. Hepburn.

2204

DE VENANZI, F. and ROCHE, M. **Fósforo inorgánico del suero y metabolismo glucídico. [Inorganic phosphorus of serum and carbohydrate meta-**

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bolism.] *Acta cientif. venezol.*, 1953, **4**, 192-208. [Inst. Invest. Méd., Caracas.]

A review.

2205

ALTHAUSEN, T. L. and UYEYAMA, K. **A new test of pancreatic function based on starch tolerance.** *Ann. Int. Med.*, 1954, **41**, 563-575. [Dept. Med., Sch. Med., Univ. California, San Francisco.]

2206

ALBANESE, A. A., ARNOLD, W. H., HAYS, D. R., BELMONT, A., ORTO, L. and DI LALLO, R. **Protein-sparing action of intravenously administered carbohydrate solutions.** *Metabolism*, 1954, **3**, 523-529. [Nutrit. Res. Lab., St. Luke's Hosp., New York.]

The patients who were given the solutions ranged from 13 to 80 years of age and were malnourished, in acute or convalescent phases of disease. The sugars and their concentrations were: invert sugar 10 per cent., or glucose or fructose, 5 or 10 per cent., and the amounts were between 0.5 and 3 litres daily. In 5 days the diet supplied 70 g. protein and 2000 Cal., with 14, 40 and 46 per cent. from protein, carbohydrate and fat, respectively.

The findings on protein-sparing action as measured by changes in excretion of N were difficult to evaluate. At 50 and 100 g. levels fructose solutions induced greater retention than did an invert sugar solution with a comparable amount of fructose. With 150 g. fructose in 5 per cent. fructose or in 10 per cent. invert sugar solutions, sparing of N was good, but as 10 per cent. solution its action was poor. Solutions of invert sugar, 10 per cent., or of fructose, 5 per cent. are those of choice; the final decision will rest on relative costs and availabilities.—D. Harvey.

2207

BEAL, J. M. and SMITH, J. L. (with FELTS, J.) **The metabolism of fructose in man.** *Surgery*, 1954, **36**, 243-255. [Surg. Serv., Veterans Admin. Centre, Los Angeles, Calif.]

In man intravenous injection of fructose commonly results in elevation of blood glucose as well as of blood fructose. In 8 experiments injection of fructose was followed by a mean rise in blood lactic acid from 8.3 to 38.4 mg. per 100 ml.; after glucose the level rose only to 10.8 mg. per 100 ml. CO_2 combining power of the blood fell. Serum inorganic P fell by about 2.7 mg. per 100 ml. after fructose and 1.5 mg. after glucose, and the effect on Mg was similar; Na, K and Cl levels were unchanged.

The amounts of sugars appearing in the urine after fructose administration need more study,

as reports are conflicting. Losses of P and N were greater after fructose than after glucose. In 3 patients glucose given into the portal vein was better retained than fructose, and losses of Na and K were greater with the latter. The higher electrolyte loss may seriously reduce the value of fructose for parenteral feeding.—D. Duncan.

2208

WALTON, J. N. and LATNER, A. L. **Ribosuria in muscular dystrophy.** *Arch. Neurol. Psychiat., Chicago*, 1954, **72**, 362-364. [Dept. Med., King's Coll., Univ. Durham.]

The test for *D*-ribose in the urine, suggested by Orr and Minot (*Arch. Neurol. Psychiat.*, 1952, **67**, 483) as diagnostic of muscular dystrophy, was made on 94 patients. Of 89 with muscle disorders of several types only 12 excreted ribose, which was excreted also by 2 patients with muscular atrophy caused by motor neurone disease.

It is concluded that the test has no value in the diagnosis of muscle disorders.—D. Duncan.

2209

TOUSTER, O., HUTCHESON, R. M. and REYNOLDS, V. H. **The formation of L-xylulose in mammals and its utilization by liver preparations.** *J. Amer. Chem. Soc.*, 1954, **76**, 5005-5006. [Dept. Biochem., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

The urine of normal guineapigs and of 3 normal human subjects contained no xylulose. The urine of a fourth subject contained this pentose, as did the urine of all 4 and of guineapigs after ingestion of *D*-glucuronolactone. Guineapig liver slices and homogenates utilised L-xylulose as rapidly as fructose.

It is suggested that xylulose is a normal metabolite which is poorly utilised in pentosuria, in which disorder it is excreted.—D. Duncan.

2210

APPEL, W., HANSEN, K. J. and ALSLEV, J. Untersuchungen über den Wirkungsbereich des Glukagons. [Studies of the range of activity of glucagon.] *Ztschr. ges. exp. Med.*, 1954, **124**, 345-354. [Med. Klin., Univ. Kiel.]

Blood sugar and cholesterol esters, lipid P, lactic and pyruvic acids, and amino-N in the serum were estimated in groups of about 10 subjects free from metabolic or liver disorder at intervals after they were given 2.5, 5.0, 10 or 20 μ g. per kg. bodyweight of a preparation of glucagon almost free of insulin and with about one-fifth of the activity of the crystalline substance.

Blood sugar rose rapidly to a peak after 15 min.; the most effective amount of glucagon was 2.5 μ g. per kg. bodyweight. In magnitude the effect of glucagon was similar to that of insulin, but it

did not last so long. Glucagon did not alter the arterio-venous difference in blood sugar. Lactic and pyruvic acids rose slightly but not significantly after 10 and 20 μ g. glucagon per kg. bodyweight. In contrast to insulin, glucagon did not affect blood amino-N or blood lipids.

The conclusions are that maintenance of normal blood sugar values depends on both glucagon and insulin; that glucagon, unlike other hormones antagonistic to insulin, has no effect on peripheral sugar utilisation; that it probably does not favour the formation of sugar from fat; and that it is unlikely to be responsible for the raised blood sugar in diabetes. It is regarded, not as an antagonist of insulin, but as a synergist which releases sugar from the liver.—W. M. Deans.

2211

FONTENOT, J. P., GALLUP, W. D. and NELSON, A. B. **Further studies of the influence of added carbohydrate (cerelose) on the nitrogen metabolism of steers.** *J. Animal Sci.*, 1954, **13**, 982-983. *Proc.* [Oklahoma Agric. Exp. Stat.]

2212

LEFFEL, E. C. and SHAW, J. C. **Blood glucose and acetone bodies, liver glycogen and fat of normal, fasted and ketotic cows.** *J. Animal Sci.*, 1954, **13**, 992-993. *Proc.* [Univ. Maryland.]

2213

FOURNIER, P. **Aperçus nouveaux sur la physiologie des glucides, deduits de leur activité différente vis-à-vis de l'utilisation du calcium.** [New views on the physiology of carbohydrates deduced from their different activities in utilisation of calcium.] *C.R. Acad. Sci.*, 1954, **239**, 718-720.

The effects of sugars upon the retention of Ca were compared by the method described earlier (Abst. 745, Vol. 25) with groups of 6 young rats each weighing about 50 g.

Sucrose 12 per cent., glucose 20 per cent. and maltose 15 per cent. gave about the same utilisation of dietary Ca as the control diet with 85.5 per cent. starch. Lactose, *D*- and *L*-xylose and *D*- and *L*-arabinose each doubled the coefficient of Ca utilisation.

It is suggested that carbohydrates are divisible into 2 groups with different functions in the animal body. Starch, glucose, fructose, maltose and sucrose are "energetic" carbohydrates; but lactose, galactose, xylose and arabinose are considered to be structural carbohydrates, influencing bone formation. It is pointed out that many of the latter also form structural carbohydrates in plants in the forms of xylans, cellulans, hemicelluloses and pectic substances.—D. Duncan.

2214

DREINBACH, L. and NASSET, E. S. Absorption of carbohydrate and protein as affected by feeding cornstarch, banana, or glucose. *J. Nutrition*, 1954, **53**, 523-532. [Dept. Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

Groups of 8 adult rats were given 3 diets of which 58 per cent. was carbohydrate in the form of maize starch, banana powder or glucose, 18 per cent. protein, 20 per cent. fat and 4 per cent. salts supplemented with vitamins A, D, E, K and those of the B group. A fourth diet had no protein and contained 78 per cent. maize starch. The diets were given for 5 days, followed by a 48-hr. fast to empty the digestive tract; the rats then received 1.5 to 2.5 g. diet; and the amount eaten was estimated by difference. Pairs of rats from each group were killed 2, 3, 4 and 5 hr. later and the contents of the digestive tract were analysed for carbohydrate and protein. The procedure was repeated 3 times for each diet.

The carbohydrates of banana and glucose were absorbed most rapidly in the second hour; starch absorption reached a maximum in the third hour. In the third and fourth hours more starch was absorbed than banana carbohydrate or glucose, but the percentage of starch absorbed was significantly less than of banana carbohydrate or glucose. The absorption of ingested protein was not readily ascertained; in every experiment except one the protein recovered was more than the amount ingested. The recovered protein was corrected by subtracting the amount of protein present after administration of the protein-free diet; "absorbed" protein was obtained by subtracting "corrected" recovered protein from ingested protein.

G. F. Garton.

2215

KIMBEL, K. H., BÜNTE, H., HEISE, E. and FISCHER, W. Untersuchungen über enterale Antibiose bei der Ratte. 3. Beeinflussung der Kohlenhydratesorption. [Studies on intestinal antibiotics in the rat. 3. Effect on carbohydrate absorption.] *Ztschr. ges. exp. Med.*, 1954, **124**, 342-344. [Med. Klin., Univ. Erlangen.]

For parts 1 and 2 see Abst. 4382, Vol. 24.

Carbohydrate absorption was studied by Cori's method in rats given terramycin or sulphaguanidine. In rats given 25 mg. terramycin daily for 12 or 16 weeks sugar absorbed in an hour was reduced to 64.5 per cent., and in those given 200 mg. sulphaguanidine daily for 16 weeks to 74 per cent. of the normal. Since the antibiotic and sulphaguanidine had a similar effect, the cause of the diminished absorption is assumed to be a change in the flora, and consequently in vitamin synthesis, in the intestine. Daily intraperitoneal injection of 25 mg. pyridoxine or 15 mg. folic acid for 8 weeks in

rats receiving terramycin appeared to improve absorption slightly, but vitamin B₁₂ given intraperitoneally and folic acid by mouth were without effect. These results indicate that earlier records of flattening of the blood sugar curve after glucose in rats given antibiotics are to be explained by decreased absorption of sugar in the intestine, and not by increased uptake of sugar by the liver.

M. B. Richards.

2216

ALARCO, E. R. Acción de la penicilina sobre la glucemia del conejo. [Effect of penicillin on blood sugar in the rabbit.] *Crón. Méd., Lima*, 1951, **68**, 85-97. [Cát. Farm., Fac. Farm., Lima.]

Penicillin reduces blood sugar in rabbits.

2217

VALENZUELA, V. T. Acción hipoglucémica de la estreptomycin. [Reduction of blood sugar by streptomycin.] *Crón. Méd., Lima*, 1951, **68**, 121-133. [Cát. Farm., Fac. Farm., Lima.]

A study with rabbits.

2218

SCOW, R. O. and CORNFIELD, J. Effect of thyroidectomy and food intake on oral and intravenous glucose tolerances in rats. *Amer. J. Physiol.*, 1954, **179**, 39-42. [Lab. Biochem. Nutrit., Nat. Inst. Health, Bethesda, Md.]

In earlier work (Abst. 5060, Vol. 21) the effect of thyroid removal on glucose tolerance was thought to be secondary to the effect on body size.

Rats had their thyroids and parathyroids removed or a sham operation when they were 21 to 27 days old. They were divided into 5 groups and received a complete purified diet; group 1, sham-operated rats fed to appetite; group 2, operated rats fed by tube with amounts nearly equal to those eaten by the first group; group 3, operated rats fed to appetite; group 4, pair-fed with group 3 but sham-operated; and group 5, pair-fed with group 2 but sham-operated. Glucose tests were not made for 45 days or more after the operations, so sham-operated rats can be called normal controls. Each animal had oral and intravenous tests, the former usually 7 to 10 days before the latter.

In oral tests the blood sugar rose higher in operated rats than in controls, whatever the method of feeding, but the curve was not prolonged in time. In intravenous tests there was marked impairment of tolerance after thyroid removal. The blood sugar value at 60 min. was about twice as high in operated rats as in controls and among the former it was higher in force-fed rats than in those fed to appetite. Removal of injected

glucose from the blood did not begin until 20 min. after injection in operated animals, and the slow fall which then began appeared to be due to urinary excretion of the glucose.—D. Duncan.

2219

MELI, A. and FRANCESCHINI, J. Ricerche sul metabolismo del glicoso-1-fosfato nei ratti normali e diabetici. [Metabolism of glucose-phosphate in normal and diabetic rats.] *Arch. Sci. biol., Bologna*, 1954, **38**, 463-468. [Lab. Biol., Ist. "Carlo Erba", Milan.]

Glucose-1-phosphate or glucose was given by intravenous injection at the rate of 100 mg. per 100 g. bodyweight to rats weighing 100 to 150 g., which had been rendered diabetic by injection of alloxan. The blood sugar levels 20 and 120 min. after injection were similar with both substances.

Similar diabetic rats also weighing 100 to 150 g. received glucose-1-phosphate similarly or glucose immediately followed by insulin given intraperitoneally. Oxygen consumption and CO_2 production were measured for 1 hr. Glucose and insulin significantly elevated the R.Q., but glucose-1-phosphate did not.

In isolated diaphragm muscle taken from normal and alloxan-diabetic rats, glucose-1-phosphate produced greater oxygen consumption than did glucose.

It is concluded that glucose-1-phosphate favoured, not increased utilisation of glucose, but an increase in other oxidative processes.—D. Duncan.

2220

KUMAR, S. and LAL, S. K. Some toxic metabolic factors concerned in the development of *Diabetes mellitus* in the albino rat. *Indian J. Med. Res.*, 1953, **41**, 213-234. [Dept. Physiol., Med. Coll., Amritsar.]

Results are given in tables and graphs; photomicrographs are given of histological studies. From statistical analysis of the data it is concluded that a correlation exists between blood levels of sugar and reduced glutathione. After the induction of diabetes, reduced glutathione fell and blood sugar rose. The administration of insulin produced a rise in reduced glutathione and a fall in blood sugar.—G. F. Garton.

2221

PATRICK, S. J. (with WEISZ, T.) Effect of hypoglycin A on liver glycogen with a method for the study of changes in liver glycogen. *J. Appl. Physiol.*, 1954, **7**, 140-142. [Div. Biochem., Dept. Physiol., University Coll. W. Indies, Jamaica.]

Hypoglycin A is a compound isolated by Hassall *et al.* (*Nature*, 1954, **173**, 356) from the ackee (*Blighia sapida*), one of the foods held responsible for vomiting sickness in Jamaica.

Biopsy specimens of liver from 4 patients acutely ill with vomiting sickness contained less than 0.7 per cent. of their wet weight as glycogen. Samples from recovered patients and from undernourished children contained 3 to 10 per cent. glycogen.

Intramuscular injection of hypoglycin A, 250 mg. per kg. bodyweight, into rats reduced liver glycogen to 0.2 per cent. of the wet weight or less in 4 to 6 hr. Blood sugar rose at first, but fell very low as liver glycogen became exhausted. In rats given glucose by vein, hypoglycin A prevented formation of glycogen in the liver, and the blood sugar fell more slowly than in normal rats.

D. Duncan.

2222

LUFU, C. I. and FARBER, E. Effects of ethionine upon hepatic glycogen formation from glucose in intact rats. *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 701-705. [Dept. Pathol., Sch. Med., Tulane Univ., New Orleans, La.]

In the first experiment groups of male and female rats were fasted for 24 hr. and were then given 2.5 g. glucose in 3 ml. water by stomach tube. Individual groups received 0.75 mg. DL-ethionine per g. bodyweight by intraperitoneal injection, half at the same time as the glucose, half 2 hr. later; DL-methionine in the same way; a mixture of methionine and ethionine; or saline. They were fasted and killed 6 hr. after receiving the glucose. The second experiment was similar, but 1.3 g. glucose in all was given subcutaneously in 4 doses at intervals of an hour and the rats were killed 6 hr. after the first dose. In the third experiment glucose was given either by mouth or subcutaneously, ethionine or saline was given 3 hr. after the initial dose of glucose and the rats were killed 4 hr. later.

Female rats injected with ethionine had almost no liver glycogen 6 hr. after receiving glucose by mouth; males had more, but still much less than controls. In both sexes there was delayed absorption of glucose. When the glucose was given subcutaneously there was less difference between the sexes, but both had less liver glycogen after ethionine than after methionine or saline. In the third experiment the females given ethionine had less liver glycogen 7 hr. after being given glucose, though controls killed at 3 hr., before the survivors received ethionine, had laid down appreciable amounts of glycogen. The males showed little or no effect of ethionine in this experiment.

Methionine partly prevented the losses of liver glycogen, but it acted like ethionine in delaying absorption of glucose. There is no known meta-

bolic function of methionine which readily explains these findings.—D. Duncan.

2223

VOLKER, J. F. and SCHNEYER, C. The effect of direct administration of sucrose on the teeth of

the Syrian hamster. *J. Dent. Res.*, 1954, **33**, 688. *Proc. [Sch. Dent., Univ. Alabama, Birmingham.]*

See also Absts. 1963, 2042, 2067, 2079, 2087, 2258, 2378, 2399, 2436, 2437, 2442, 2531, 2713.

PROTEINS AND PROTEIN DERIVATIVES

2224

ROSE, W. C., COON, M. J. and LAMBERT, G. F. The amino acid requirements of man. 6. The rôle of the caloric intake. *J. Biol. Chem.*, 1954, **210**, 331-342. [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

For part 5 and references to earlier parts, see Abst. 3316, Vol. 24.

Nitrogen balance was measured in 3 subjects receiving artificial diets of different energy value containing either casein, acid or enzymically hydrolysed casein or mixtures of purified amino-acids equivalent to the constant amount of about 10 g. N daily. The subjects weighed 65, 71 and 73 kg.

Whole casein maintained N balance at an energy value of 35 Cal. per kg. bodyweight. At this energy level acid-hydrolysed casein supplemented with tryptophan produced in 2 subjects a negative balance which was corrected by raising the energy intake to 45 Cal.; there was approximate equilibrium in the third. A mixture of the 8 essential amino-acids plus glycine and urea or a mixture in correct proportion of all the component amino-acids in casein produced a similar effect and seemed inferior to acid-hydrolysed casein with respect to the energy required for N balance. The enzymic appeared to be slightly superior to the acid preparation.

The data showed that a diet containing mixtures of amino-acids required a higher energy intake than the equivalent amount of casein for N balance.

A. Hepburn.

2225

CALLOWAY, D. H. and SPECTOR, H. Nitrogen balance as related to caloric and protein intake in active young men. *Amer. J. Clin. Nutr.*, 1954, **2**, 405-412. [Quartermaster Food and Container Inst. Armed Forces, Chicago, Ill.] Spanish summary.

From a review of the literature it is concluded that in young, normal, active men whose energy intake is adequate 8.5 g. N gives balance and there is little additional storage of N even with greatly increased protein intakes. Negative N balance is greatest when intake is 700 non-protein Cal. daily and protein is not noticeably spared when intake is as high as 2800 Cal. daily in the absence of protein from the diet. It is suggested that a food "unit" of 500 Cal. daily would be of use as a guide in the

compounding of a military survival ration or for short-term civilian emergency feeding.

G. F. Garton.

2226

PULLMAN, T. N., ALVING, A. S., DERN, R. J. and LANDOWNE, M. The influence of dietary protein intake on specific renal functions in normal man. *J. Lab. Clin. Med.*, 1954, **44**, 320-332. [Dept. Med., Univ. Chicago, Ill.]

Each of the clinically normal young subjects, 5 women and 15 men, was studied after 2 weeks on each of 3 diets, which provided about 2.6, 1.0 and 0.3 g. protein per kg. bodyweight daily. For each subject the diets were isocaloric and were designed to maintain constant bodyweight, and for half the subjects the salt intake was also constant. Glomerular filtration rates were estimated by inulin clearance. Effective renal plasma flow was estimated by Diodrast clearance in 10 subjects and by *p*-aminohippurate (PAH) clearance in the others; maximum tubular secretory capacity for PAH was also studied in the latter. Water diuresis was induced in all studies.

Glomerular filtration rates were significantly higher on the high protein intake and lower on the low protein intake than on the medium protein intake, but they remained within the normal range. Similar changes occurred in effective renal plasma flow, though the reduction on the low-protein diet failed to reach statistical significance. Changes in filtration fraction were negligible. Maximum tubular secretory capacity was increased on the high and decreased on the low protein intake, but the ratio of plasma flow to secretory capacity was inversely affected. It is not known whether this represents true ischaemia on the high- and hyperaemia on the low-protein diet.—D. Duncan.

2227

PHANSALKAR, S. V. and PATWARDHAN, V. N. Partition of urinary nitrogen in Indian adults: relation between urea N and total N. *Indian J. Med. Res.*, 1954, **42**, 363-371. [Nutrit. Res. Labs., Indian Council Med. Res., Coonoor, S. India.]

2228

RAMALINGASWAMI, V., SRIRAMACHARI, S. and PATWARDHAN, V. N. Liver injury in protein

malnutrition. *Indian J. Med. Sci.*, 1954, **8**, 433-441. [Nutrit. Res. Labs., Indian Comm. Med. Res., Coonoor.]

2220

BLOCKER, T. G., LEVIN, W. C., LEWIS, S. R. and SNYDER, C. C. The use of radioactive sulphur labeled methionine in the study of protein catabolism in burn patients. *Ann. Surg.*, 1954, **140**, 519-523 (with discussion 523). [Dept. Surg., Univ. Texas Med. Branch, Galveston.]

The subjects were 14 "normal" patients without burns and 10 with burns of 10 to 72 per cent. in extent. Each received by vein 80 to 100 μ C. of 35 S-methionine and blood samples were collected before this and at intervals afterwards. The activity of total serum, total protein and globulin was estimated.

In the control subjects the peak of serum radioactivity occurred 3 to 5 hr. after the injection, when the plasma contained about 7 per cent. of the injected radioactivity. The serum radioactivity fell gradually in the next 4 days to about half its peak value. At this time 95 to 99 per cent. of the serum activity was in the protein. Between the fourth and the 21st days the decline in serum activity was negligible, suggesting that the labelled methionine was in equilibrium with the body protein pool.

In 3 patients either relatively slightly burned or studied very long after being burned the results were similar to those in the normal group. In the rest the drop from the peak level of serum activity was more rapid, the plateau value was only 8 to 30 per cent. of the peak and in some the activity continued to decline until the 21st day.

It is suggested that the results indicate a rapid breakdown of body proteins after extensive burns.

D. Duncan.

2230

SCHØNHEYDER, F., HEILSKOV, N. S. C. and OLESEN, K. Isotopic studies on the mechanism of negative nitrogen balance produced by immobilization. *Scand. J. Clin. Lab. Invest.*, 1954, **6**, 178-188. [Biochem. Inst., Univ. Aarhus, Denmark.]

Three healthy men on a diet which normally maintained N equilibrium were immobilised in bed by a plaster of paris bandage extending from the umbilicus to the toes. After about 5 days the N balance became negative, reaching a minimum at the tenth day and then increasing somewhat. At about the tenth day, 15 N-glycine was given by mouth and the excretion of 15 N in the urine was followed for 5 days. Excretion was much faster than when the subjects were not immobilised. The results were examined mathematically as were those described in Abst. 756, Vol. 25, and indicated

that one of the model pool systems considered then led to most unlikely conclusions, but the other model gave consistent results.

According to this model, dietary N first enters pool P, of amino-acids and other compounds available for synthesis. This pool is in equilibrium with pool Q of metabolically active proteins of the plasma and internal organs, and with the large relatively stable pool V of the proteins of muscle, skin and connective tissue. N flows from pool P to pool U, the total N-containing system of the urine, and is then excreted.

Consideration of the results according to this model suggested that the negative N balance during immobilisation was primarily due to reduced synthesis of tissues proteins of pool V, while their rate of breakdown remained unchanged. The calculated sizes of pools P, Q and U were little changed by immobilisation.—C. Warner.

2231

BLAINEX, J. D. High protein diets in the treatment of the nephrotic syndrome. *Clin. Sci.*, 1954, **13**, 567-581. [Dept. Exp. Pathol., Univ. Birmingham.]

One male and 2 female patients were studied. At protein intakes varying from 97 g. to 205 g. daily, N balance was measured, serum protein fractions were estimated by electrophoresis on paper and the clinical state of each patient was assessed; urine protein and N.P.N. excretion was studied in detail and the daily loss of urea, ammonia, creatinine and other N.P.N. was estimated. Each protein intake was maintained for 9 days or longer; several periods of low protein intake concluded the study.

Positive N balances were obtained in all 3 patients with the high-protein diets and were maintained over long periods. Increased N intake produced an increase in N balance. In the 3 patients the daily output of urea was abnormally low before the start of the studies; high protein feeding produced only a slight rise in urea excretion. In one patient a rise in urine N.P.N. in excess of the rise in urea N was associated with abnormal loss of amino-acids. It is concluded that owing to the severe body protein deficiency which occurs in the nephrotic syndrome prolonged high protein intakes are necessary in treatment. The history of each patient is given in an appendix.

G. F. Garton.

2232

AUBERTIN, E., RIVIÈRE, J., LOISEAU, P., DEBOT, P. and MALINEAU, R. Effect of high plant protein regimens on the liver of dogs. *Amer. J. Clin. Nutr.*, 1954, **2**, 413-421. [Dept. Clin. Med., Fac. Med., Bordeaux.] Spanish summary.

Six dogs were maintained for 3½ months on a diet containing, in addition to vitamins and salt, about 165 g. protein and 185 g. carbohydrate provided by 250 g. bread, 200 g. lean horsemeat, and 200 g. peanut meal for 2 dogs, soya meal for 2 and sunflower seed meal for the other 2. In all 6 liver function tests revealed serum disturbances, particularly in the Gros and Kunkel tests, the serine:globulin ratio, fibrinogen, blood lipid, total cholesterol, free and ester cholesterol, cholinesterase and sulphophosphovanillic reaction (see Chabrol *et al.*, *Sem. Hôp. Paris*, 1949, p. 3446); liver biopsies revealed evidence of modifications of the mitochondria only. The diet was later modified; bread was reduced to 100 g., meat was reduced, then eliminated, and meal was raised to 400 g. and to 500 g. daily; the diet was finally composed of 260 g. protein and 200 g. carbohydrate. Under these conditions great differences were observed.

In the 2 dogs which received peanut meal there was rapid fatty degeneration of the liver; soya meal caused a similar though slower change, which led eventually to the development of annular cirrhosis; sunflower seed meal produced only modifications of the mitochondria. In one dog which received a peanut meal diet supplemented with vitamins, methionine, choline and inositol the toxicity of the diet was not less.

It is concluded that these meals, which are prepared from the oil-free residues of peanut, soya and sunflower seed, are not to be recommended in the diet of patients with liver disease.

G. F. Garton.

2233

LAL, B. M. and RAJAGOPALAN, R. **Studies on mutual supplementation in vegetable proteins.** *Indian J. Med. Res.*, 1953, **41**, 173-183. [Food Technol. Lab., Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

The biological value of 7 mixtures each consisting of 3 vegetable proteins in different proportions was estimated using 2 groups, each of 3 male and 3 female rats. The mixtures were groundnut, wheat and cottonseed; groundnut, sesame and cottonseed; groundnut, yeast and cottonseed; groundnut, wheat and yeast; groundnut, soya bean and sesame; groundnut, cottonseed and copra; groundnut, yeast and copra. One group of rats was used to evaluate 4 mixtures and the other group for the other 3 mixtures. Endogenous N excretion was estimated with an N-free diet of maize starch 71, sucrose 10, coconut oil 10, vitaminised starch 5 and salt mixture 4 per cent. The composition of the experimental diets was sucrose 10, coconut oil 10, mixture to provide 10 per cent. protein 5, vitaminised starch 5, salt mixture 4 per cent., with maize starch to 100 per cent. The

diets were given for 7-day periods; faeces and urine were collected for estimation of N during the last 4 days of each period.

Although the first and fifth mixtures had fairly high biological values the other mixtures had almost the same biological value as the individual proteins. The net protein values of the mixtures were considerably higher than those of common cereals and pulses and compared favourably with those of animal proteins. No significant difference was found between the essential amino-acid content of the mixtures with low biological values and that of the mixtures with high biological values. An explanation of the results on the basis of length of time and rate of liberation of the essential amino-acids is discussed.—G. F. Garton.

2234

CHATTOPADHYAY, H. and BANERJEE, S. **Effect of germination on the biological value of proteins and the trypsin-inhibitor activity of some common Indian pulses.** *Indian J. Med. Res.*, 1953, **41**, 185-189. [Dept. Physiol., Presidency Coll., Calcutta.]

The biological value for young rats of the proteins of 5 pulses, *Cicer arietinum*, *Phaseolus mungo*, *Lens esculenta*, *Phaseolus radiatus* and *Pisum sativum*, was estimated before and after 48 hours' germination at room temperature. The average increase in weight per g. protein consumed was taken to be the biological value of the protein for growth. The trypsin-inhibitor activity of the 5 pulses and that of another variety of *Cicer arietinum* was estimated also before and after 48 hours' germination.

The biological value of proteins of *Cicer arietinum*, *Phaseolus mungo* and *Lens esculenta* increased after germination, that of proteins of the other 2 pulses decreased. The trypsin-inhibitor activity of all 6 pulses was unchanged by germination, so it is not responsible for the altered biological values.

G. F. Garton.

2235

FROST, D. V. **Nutritive inadequacy of whole blood to support protein repletion.** *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 742-744. [Abbott Labs., N. Chicago, Ill.]

Rats depleted of protein reserves were offered 5 per cent. fibrin hydrolysate, diluted whole human blood obtained from a blood bank, or diluted blood supplemented with 1.5 per cent. DL-isoleucine and 0.32 per cent. DL-methionine to correct the known deficiencies. The animals consumed less than 20 per cent. of the whole blood offered, 120 mg. N daily, and rapidly lost weight; the fibrin and the fortified blood were completely accepted and produced almost equal weight gains.

C. Warner.

2236

MERKEL, H. and DONTENWILL, W. Die Wirkung chronischer parenteraler Eiweisszufuhr auf Blut und blutbildendes Gewebe. [The effect of prolonged parenteral administration of protein on the blood and haemopoietic tissue.] *Frankfurter Ztschr. Pathol.*, 1954, **65**, 323-329. [Pathol. Inst., Univ. Kiel.]

Of 40 white mice given daily subcutaneous injections of "Nutrose", 20 were killed after 28 days and the rest after 28 weeks. In all the total leucocyte count increased sharply in the first 2 weeks, but segmented polymorphs by only 9.25 to 17.8 per cent. The lymphocytosis generally regressed between the third and ninth weeks, but seldom reached the normal. A further increase occurred in some after about 17 to 22 weeks. The lymphocyte curve ran almost exactly parallel to the total leucocyte curve, the increase averaging 71.5 to 87 per cent. Binucleated lymphocytes and mitoses were present in small numbers. Plasma cells were not found. It is assumed that in the white mouse their function is exercised by lymphocytes. At the end of the experiment spleen and lymph nodes showed neither injury nor hyperplasia. The bone marrow presented the picture of increased activity. A small amount of amyloid was present in the liver in 3 mice. According to these findings the mice had adapted themselves successfully to the prolonged administration of foreign protein.—M. B. Richards.

2237

HARTSOOK, E. A. and MITCHELL, H. H. A study of the effect of age on the protein and sulfur-containing amino acid requirements of the rat. *J. Animal Sci.*, 1954, **13**, 987. *Proc.* [Univ. Illinois.]

2238

VÁRDI, P. (with TATÁR, I.) Studies on protein metabolism. 1. Correlation between dietary protein and stored protein as determined on the basis of changes in urinary nitrogen. *Acta physiol. hung.*, 1954, **6**, 313-320. [Inst. Nutrit. Sci., Budapest.] Russian summary.

Rats were depleted of N for 4 days, then given a test diet for 2 days and the low protein diet again. All diets contained dried yeast. Urinary N was measured during the 24 hr. before and after protein regeneration; the difference between these 2 values was called the "restitution N". There was a linear relation between restitution N and the amount of casein in the test diet up to 18 per cent. casein. Whole egg protein gave much higher and meat moderately higher restitution N values than casein; potatoes and a mixed, mainly vegetable, diet gave values similar to casein. It is concluded that urinary N excretion during the

post-regeneration protein-free periods depends primarily on the extent of restitution of protein stores by the test protein.—C. Warner.

2239

JEHOTTE, J. Etude de l'équilibre azoté chez le rat soumis à une irradiation létale. [Nitrogen equilibrium in the rat under lethal irradiation.] *C.R. Soc. Biol.*, 1954, **148**, 941-943. [Lab. Pathol. Anat., Univ. Liège.]

After lethal exposure of rats to X-rays their food consumption and N excretion dropped to a low level, rising again after about 4 days; N excretion, but not food consumption, fell again before death. Starvation did not alter the pattern of N excretion; starved, non-irradiated animals showed the fall and secondary rise of N excretion, but not the second fall.—C. Warner.

2240

ASCHKENASY, A. Action des protéines et de certains acides aminés alimentaires sur la survie de rats surrenalectomisés. Protection de ces rats contre l'effet léthal d' inanition protéique par la cortisone. [Effect of proteins and certain dietary amino-acids on the survival of adrenalectomised rats. Protection of such rats against the lethal effect of protein deficiency by cortisone.] *C.R. Acad. Sci.*, 1954, **239**, 1000-1002.

Adrenalectomised rats given a protein-free diet and 1 per cent. NaCl to drink survived much longer when cortisone was given by mouth; deoxycorticosterone had a smaller effect. Addition of protein to the diet also increased survival, 18 per cent. casein giving the best response. Single amino-acids, especially methionine, valine, lysine, tryptophan or threonine, also increased survival.

C. Warner.

2241

LINAZASORO CALVO, J. M. Accion de los androgenos sobre la retencion de nitrogeno en los animales nefrectomizados. [Effect of androgens on nitrogen retention in nephrectomised animals.] *Rev. clín. española*, 1954, **54**, 8-9. [Inst. Invest. Méd., Madrid.] English, German and French summaries.

Nitrogen retention was studied in adult rats, males, females and castrated males, normal or 48 hr. after removal of the kidneys.

The increase in N retention after kidney removal was greater in females than in males and so was the production of urea N. In castrated males the values approached those observed in females, but injection of testosterone made castrated males comparable to males in this respect. Injection of testosterone into females did not reduce the increases in protein breakdown.—D. Duncan.

N.A. and R., April 1955

2242

WINJE, M. E., HARPER, A. E., BENTON, D. A., BOLDT, R. E. and ELVEHJEM, C. A. **Effect of dietary amino acid balance on fat deposition in the livers of rats fed low protein diets.** *J. Nutrition*, 1954, **54**, 155-166. [Dept. Biochem., Univ. Wisconsin, Madison.]

Many groups each of 6 weanling rats were fed to appetite for 2 weeks on low-protein diets supplemented as required with amino-acids; the proteins included defatted and dried pork and beef, egg albumin and fibrin. At the end of the experiment liver fat was estimated by ether extraction.

Fat accumulated in the livers of the animals given the low-protein diets; as the dietary level of each protein rose the amount of fat deposited in the liver decreased. No fat accumulated in liver in the groups fed on diets low in fibrin. When the pork, beef or albumin diets were supplemented with gelatine, fibrin or threonine plus glycine the amount of liver fat deposited was reduced. In rats given the low-protein diet containing egg albumin, lysine in the presence of histidine and threonine further decreased the amount of liver fat deposited.—G. A. Garton.

2243

CANNON, P. R., FRAZIER, L. E. and HUGHES, R. H. **Fat emulsions as caloric supplements in parenteral nutrition, with particular reference to amino acid utilization.** *J. Lab. Clin. Med.*, 1954, **44**, 250-260. [Dept. Pathol., Univ. Chicago, Ill.]

Protein-depleted rats were repleted by daily subcutaneous injections of protein hydrolysate while being fed on a diet providing only 12 Cal. daily, but adequate in salts, vitamins and roughage; 10 to 15 per cent. fat emulsion in 5 per cent. glucose solution, stabilised with Tween 60, were given intraperitoneally or intravenously to some animals, providing 20 Cal. daily. The fat was absorbed and utilised well. The animals receiving fat increased in weight, body water and body protein; those not receiving fat maintained weight for about 8 days, during which they lost about 70 per cent. of their body fat, then lost weight rapidly.—C. Warner.

2244

OKREY, R. and LYMAN, M. M. **Dietary constituents which may influence the use of food cholesterol. 2. Protein, L-cystine and DL-methionine intake in adolescent rats.** *J. Nutrition*, 1954, **53**, 601-611. [Dept. Home Econ., Univ. California, Berkeley.]

Groups of 10 male and 11 female immature rats were used. One group was given the basal diet

of vitamin-free casein 5, egg albumin powder 10, fat 13.5, salt mixture 4, cholesterol 1, sucrose 64.5, a mixture of A, D, E and K vitamins 1 and a mixture of B group vitamins 1 per cent. The other 4 groups received the same diet with 15 per cent. more egg albumin or 0.9 per cent. DL-methionine or 0.3 per cent. L-cystine or 0.9 per cent. DL-methionine plus 0.3 per cent. L-cystine. After 21 days the rats were killed and liver tissue was removed for moisture estimation and lipid analysis.

The male rats which received extra egg albumin had significantly less liver cholesterol than those given the basal diet. Females had consistently less liver cholesterol than males, but showed no significant decrease with the increased egg albumin intake. DL-Methionine tended to decrease liver cholesterol content and L-cystine to increase it; differences were significant for the female rats only and were related to gain in bodyweight. These sex differences in response to both protein and cholesterol were so marked that it is essential to make separate evaluations for males and females.

G. F. Garton.

2245

EDWARDS, W. H. and WILSON, W. O. **Relationship of hyperthermy to nitrogen excretion in chickens.** *Amer. J. Physiol.*, 1954, **179**, 76-78. [Dept. Poultry Husb., Univ. California, Davis.]

Laying hens after being kept at 60° F. for about a week were starved for 20 hr. before blood and urine samples were collected; in some tests birds were kept at 90° or 100° F. for 1½ hr. to induce hyperthermy. The body temperatures of the birds at the 3 environmental temperatures were 105°, 110° and 112° F.

In 5 starved birds the uric acid N of the urine as a percentage of the total N.P.N. decreased significantly in hyperthermy; N.P.N., uric acid, purine and amino-acid N were increased irregularly, but not significantly. The blood uric acid N and percentage of uric acid in N.P.N. decreased significantly and purine N and percentage of purine in N.P.N. increased greatly. In 5 fed birds the changes in uric acid N were similar but the increase in purine N was slight.

It is suggested that overheating may affect some enzyme system necessary to convert purines to uric acid, especially in fasted birds.—D. Duncan.

2246

BOULANGER, P. **Les réactions de conversion dans le métabolisme des acides aminés. [Conversion reactions in the metabolism of amino-acids.]** *Ann. Nutrit. Alimentation*, 1954, **8**, 647-697. [Lab. Chim. Biol., Fac. Méd., Lille.]

A review.

2247

Hsia, D. Y. Y., Hsia, H. H., Green, S., Kay, M. and Gellis, S. S. **Amino-aciduria in galactosemia.** *Amer. J. Dis. Child.*, 1954, **88**, 458-465. [Dept. Paediat., Beth Israel Hosp., Boston, Mass.]

Two brothers aged $3\frac{1}{2}$ and 2 years were the subjects and studies of amino-N in blood serum and urine were made on 3 separate occasions, (1) while on galactose-free diet, (2) after 50 g. *d*-galactose had been included in the diet for 10 days, and (3) after galactose had been discontinued for 10 days. Similar studies were made of both parents (1) while on normal diet without added galactose, and (2) after 75 g. *d*-galactose had been taken daily for 10 days. In blood and urine α -amino-N was estimated and in urine the amino-acid pattern was studied chromatographically. While the children were on a galactose-free diet the amount of amino-N in the urine was similar to that in the urine of normal children, but when galactose was given there was an increase between two- and three-fold. The increase was general, no single amino-acid being present in relatively excessive amount. The metabolism of α -amino-N in the parents was normal.

Possible pathways for the appearance of these increased amounts are discussed.—D. Harvey.

2248

DENT, C. E., HEATHCOTE, J. G. and JORON, G. E. **The pathogenesis of cystinuria. 1. Chromatographic and microbiological studies of the metabolism of sulphur-containing amino-acids.**

DENT, C. E., SENIOR, B. and WALSHE, J. M. 2. **Polarographic studies of the metabolism of sulphur-containing amino-acids.** *J. Clin. Invest.*, 1954, **33**, 1210-1215; 1216-1226. [Med. Unit, University Coll. Hosp. Med. Sch., London.]

1. The subjects were a normal man and woman and 2 men with cystinuria. In separate tests each subject received, fasting, 5 g. L-cystine, 6.2 g. DL-methionine or 6.5 g. L-cystine hydrochloride, drunk dissolved or suspended in water. Blood and urine samples were taken at intervals for 7 hr. Amino-acids were estimated microbiologically and chromatographically.

In no subject was plasma cystine appreciably increased after ingestion of cystine, and there was no change in urinary cystine output. Methionine produced no consistent change in plasma cystine, but plasma and urinary methionine were increased in all subjects. After cystine plasma and urinary cystine rose considerably in all subjects, the latter especially in the cystinurics. Plasma α -amino-n-butyric acid rose in all subjects after methionine, and in one of the cystinuric subjects also after

cystine and cysteine. In no experiment was plasma or urinary lysine or arginine affected.

On ordinary hospital diet the cystinuric subjects excreted in urine 800 to 900 mg. cystine in 24 hr.

The results support the theory that the cystine output is increased in cystinuria because of a low renal threshold for cystine or kidney tubule dysfunction, and not because of any more general "error of metabolism".

2. The experiments described in the preceding paper were extended to 9 normal adults, 6 cystinuric adults, 1 cystinuric child and an apparently healthy adult who yet excreted 120 to 180 mg. cystine in 24 hr. and was regarded as heterozygous for the condition.

After ingestion of L-cystine the plasma levels were somewhat lower in cystinuric than in normal subjects, but urinary cystine clearance was about 30 times higher. As before, methionine gave no clear-cut result. L-Cystine produced marked increases in plasma and urinary cystine in all subjects. The "incomplete cystinuria" showed a small rise in cystine output after taking a mixture of arginine, lysine and ornithine, but not after glycine.

In one cystinuric the renal clearances for cystine and inulin were almost identical. Fasting plasma cystine levels in 9 cystinuric subjects were 5.88 μ g. per ml., S.D. 1.5, against 10.64 μ g. per ml., S.D. 1.87 in 17 normal subjects.

It is concluded that cystinuria results from reduction or absence of tubular re-absorption of cystine.—D. Duncan.

2249

ALMQUIST, H. J. **Utilization of amino acids by chicks.** *Arch. Biochem. Biophys.*, 1954, **52**, 197-202. [Grange Co., Modesto, Calif.]

A review.

2250

SUMIYOSHI, T. **[Experimental studies on the skeletal growth, especially on the changes of epiphyseal cartilages of albino rats receiving amino-acid deficient diet. 1. Skeletal growth, especially age changes of epiphyseal cartilages, of albino rats receiving the basal diet.]** *Shikoku Acta Med.*, 1954, **5**, No. 3, 62-72. [Dept. Int. Med., Sch. Med., Univ. Tokushima.] English summary.

2251

MAURER, W., NIKLAS, A. and LEHNERT, G. **Messung der Umsatzrate von Serumeiweiss und Korpereiweiss beim normalen Kaninchen mit S³⁵-Methionin. [Measurement of the rate of turnover of serum protein and body protein in the normal rabbit by means of methionine]**

N.A. and B., April 1955

labelled with ^{35}S .] *Biochem. Ztschr.*, 1954, **326**, 28-47. [Med. Klin., Univ. Cologne.]

A procedure is described for measuring the daily turnover of serum protein and other protein fractions. It avoids the sources of error inherent in the estimation of the breakdown rate of labelled serum proteins, and has the further advantage that the experiment lasts only a few hours. After intravenous injection of ^{35}S -methionine in trace doses, measurements are made at intervals of the specific activity of the free methionine in the serum, and the uptake of ^{35}S -methionine in the separate protein fractions. From these data the rate of turnover is calculated. The daily turnover of free serum methionine in the fasting rabbit was found to amount to 702 mg. Of this 5 mg. was taken up by the serum protein and 346 mg. by the rest of the body protein; 351 mg. was used in irreversible combination or broken down. The total amount of free methionine in the rabbit amounted to 13.8 mg. This amount was turned over once in about 29 min. Breakdown of body protein provided about 686 mg. free methionine daily.—M. B. Richards.

2252

GORDON, R. S., MADDY, K. H., JENKINS, W. T. and SIZER, I. W. Biochemical interrelationship between methionine hydroxy analogue, methionine keto analogue, and methionine. *Poultry Sci.*, 1954, **33**, 1056-1057. *Proc. [Monsanto Chemical Co., St. Louis, Mo.]*

2253

ROTH, J. S. The metabolism of methionine sulfoximine. *Arch. Biochem. Biophys.*, 1954, **52**, 269-271. [William Goldman Isotope Lab., Div. Biol. Chem., Hahnemann Med. Coll., Philadelphia, Pa.]

2254

WU, C. and BOLLMAN, J. L. Effect of ethionine on the free amino acids in the rat. *J. Biol. Chem.*, 1954, **210**, 673-680. [Sect. Biochem., Mayo Clin., Rochester, Minn.]

Intraperitoneal injection of DL-ethionine caused increases in the concentration of free amino-acids in tissues, plasma and urine of rats, particularly plasma alanine, cystine, glutamine and serine, liver cystine, glutamine acid and methionine, and kidney cystine and serine. Taurine was considerably increased in the urine of males; glutamic acid, glutamine, glycine and serine, as well as taurine, were increased in the urine of females. Simultaneous injection of methionine decreased these effects.—C. Warner.

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2255

PHILLIPS, W. A., and BERG, C. P. Effect upon growth of the D isomers in synthetic mixtures of the essential amino acids. *J. Nutrition*, 1954, **53**, 481-498. [Biochem. Lab., State Univ. Iowa, Iowa City.]

The essential amino-acids, divided into 2 groups, (1) valine, leucine, isoleucine, lysine and threonine, which previous work had shown to be poorly utilised in the D-form, and (2) tryptophan, methionine, phenylalanine, histidine and arginine, with D-forms believed to be readily available for growth, were given to rats as sole source of N. When both groups of amino-acids were given in the L-form at suboptimum levels, addition of the D-form of group 1 amino-acids led to increased growth, presumably by providing N for synthesis of non-essential amino-acids; addition of small amounts of glycine and ammonium citrate supported much better growth; addition of the D-form of group 2 amino-acids had no marked effect; substitution of the D- for the L-form of group 2 amino-acids gave poor growth, presumably because of slow inversion. Lack of response to addition of the D-forms of group 2 amino-acids, known to be readily inverted when consumed singly, was thought to be due to saturation of the inverting system.—C. Warner.

2256

SCOTT, E. B. Histopathology of amino-acid deficiencies. 3. Histidine. *Arch. Pathol.*, 1954, **58**, 129-141. [Dept. Anat., Sch. Med., Univ. S. Dakota, Vermillion.]

For previous parts see Absts. 5098, Vol. 21 and 3334, Vol. 24.

Three young rats were given to appetite a purified diet consisting of 19 crystalline amino-acids, vitamins, sucrose, cottonseed oil and salts; 12 similar rats were given to appetite the same diet without histidine, and 10 rats were pair-fed on the complete diet so that their food intake was equal to that of the deficient rats. After 42 days all, except 2 deficient rats, were killed and the adrenals, testes and pituitary were removed for examination. The 2 deficient rats were given the complete diet and were killed 45 days later.

The histidine-deficient rats showed the weight loss and poor appetite and appearance typical of protein deficiency, and their final weights were considerably less than those of the other 2 groups. Descriptions and illustrations are given of the changes in pituitary, testes, thymus, adrenals and bone, in all of which retrogression occurred. In the 2 deficient animals returned to the complete diet there was complete recovery.—G. F. Garton.

2257

NiÑO-HERRERA, H., HARPER, A. E. and ELVEHJEM, C. A. Histological differentiation of fatty

livers produced by threonine or choline deficiency. *J. Nutrition*, 1954, **53**, 469-480. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Similar groups of 6 weanling rats were given food to appetite during experimental periods of 2 weeks. The basal diet consisted of sucrose 81.4, casein 9, maize oil 5, salts 4, methionine 0.3, tryptophan 0.1 and choline chloride 0.13 per cent., supplemented with vitamins A, D, E, K and those of the B group; alterations in the diet were made by substitution for an equal weight of sucrose. In choline-deficient diets methionine was replaced by cystine. After the experiment each rat was anaesthetised and liver samples were removed for histological examination and estimation of fat.

Fatty infiltration and, occasionally, necrosis were found in rats given the basal low-protein diet; these were not apparent when the diet contained additional protein, threonine or threonine and glycine. The structure of the livers of rats given diets in which the sucrose was replaced by either glucose or dextrin appeared normal. When choline was omitted from the basal diet fatty infiltration of the liver became even more marked.

G. F. Garton.

2258

THIELE, O. W. and BOHN, H. Die Behandlung des Diabetes mellitus mit Cocarboxylase. Die Beziehungen zum Kreatinstoffwechsel. [Treatment of diabetes mellitus with cocarboxylase. Relation to creatine metabolism.] *Klin. Wochenschr.*, 1954, **32**, 815-817. [Med. Klin., Justus Liebig-Hochschule, Giessen.]

Before and after administration of 300 mg. cocarboxylase, partly intravenously and partly subcutaneously on a single day, creatine was estimated in the urine and pyruvic acid in the blood of 23 diabetics who usually excreted creatine in the urine. Creatine disappeared from the urine

of all the subjects for at least 2 days after treatment with cocarboxylase. The contents of creatinine in the urine and of pyruvic acid in the blood were not significantly affected. It is suggested that cocarboxylase relieves creatine phosphate of its phosphorylating function, so that creatine is no longer excreted.—E. M. Hume.

2259

TEDESCHI, G. G. Sul meccanismo della conversione creatina-creatinina. [Mechanism of conversion of creatine to creatinine.] *Quad. Nutrizione*, 1953, **13**, 29-35. [Ist. Fisiol. Gen., Univ. Rome.]

2260

ROSCOE, M. H. The endogenous creatinine clearance in normal subjects. *J. Clin. Pathol.*, 1954, **7**, 327-329. [Dept. Med., Univ. Manchester.]

2261

FRICK, E. Zur zentralen Genese der Kreatinurie. Ein Beitrag zum Problem der Stoffwechselstörungen bei vegetativer Dystonie. [The central origin of creatinuria. Disturbances of metabolism in disorders of the parasympathetic nervous system.] *Deutsch. Ztschr. Verdauungs- u. Stoffwechseler.*, 1954, **14**, 159-166. [Neurol. Klin., Univ. Hamburg, Eppendorf.]

2262

MCDERMOTT, W. V., ADAMS, R. D. and RIDDELL, A. G. Ammonia metabolism in man. *Ann. Surg.*, 1954, **140**, 539-554 (with discussion 555-556). [Dept. Surg., Harvard Med. Sch., Boston, Mass.]

See also Absts. 1807, 1847, 1925, 1952-54, 1958, 1965, 1966, 1974, 1986, 1995, 1999, 2000, 2022, 2023, 2098, 2122, 2173, 2206, 2222, 2268, 2271, 2401, 2439, 2443, 2444, 2456, 2457, 2474, 2517, 2714, 2723.

FATS AND OTHER LIPIDS

2263

LYNEN, F. Participation of coenzyme A in the oxidation of fat. *Nature*, 1954, **174**, 962-965. [Biochem. Dept., Chem. Lab., Univ. Munich.]
A review.

2264

BROUWER, E. Opbouw en afbraak van vetten in het dierlijke organisme. [Synthesis and breakdown of fats in the animal organism.] *Chem. Weekblad*, 1954, **50**, No. 26, 449-455.

To Liebig, in 1842, is ascribed the view that fat can be built from carbohydrate by animals. Voit did not share this view, but it was vindicated

about the end of last century. The first 30 or 40 years of this century saw the development of Knoop's theory of β -oxidation and Krebs's tricarboxylic acid cycle, and it became evident that the pattern of intermediary metabolism is the same for plants, micro-organisms and animals. More recent techniques, with studies of tissue metabolism *in vitro* and of metabolism *in vivo* with isotopes, have established the breakdown of fat by 2-carbon stages, to give a "metabolic pool" of acetic acid or some related 2-carbon compound, and of carbohydrate to the same end product, via pyruvic acid. Synthesis up to C_{16} acids is by the reverse process and coenzyme A, a pantothenic acid derivative, is the link.—I. Leitch.

N.A. and R., April 1955

2265

AHRENS, E. H. (JR.), BLANKENHORN, D. H. and TSALTAS, T. T. **Effect on human serum lipids of substituting plant for animal fat in diet.** *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 872-878. [Hosp., Rockefeller Inst. Med. Res., New York.]

One man and 6 women, who were normal except for obesity of exogenous origin, were studied for 4 months. All received solid foods with fat- and protein-rich supplements; sufficient food was allowed to maintain weight throughout the study, which was divided into periods of several weeks when the dietary fat was almost entirely of animal or of vegetable origin.

In all the subjects serum free and esterified cholesterol and phospholipins fell abruptly when plant fat was substituted at the same energy level for animal fat, rose when animal fat was given and fell again when plant fat was given a second time.

G. A. Garton.

2266

HIRSCH, E. F. **Studies of the hyperlipemia in diabetes and other disorders.** *Ann. Int. Med.*, 1954, **41**, 546-552. [Henry Baird Favill Lab., St. Luke's Hosp., Chicago, Ill.]

A review.

2267

POMERANZE, J., BEINFELD, W. H. and CHESSIN, M. **Serum lipid and fat tolerance studies in normal, obese and atherosclerotic subjects.** *Circulation*, 1954, **10**, 742-746. [Dept. Med., New York Med. Coll.] Spanish summary.

A fat tolerance test was made on 5 men with normal serum lipid values, 4 men with abnormal serum lipid values, 6 men over 70 years old with clinically established atherosclerosis, 10 moderately obese and 11 extremely obese subjects. For the test 204 g. fat was given in a test meal; blood samples were taken before the meal and at intervals during the next 24 hr. for estimation of total cholesterol, phospholipins and total fatty acids. All subjects except the obese were then given a diet containing less than 20 g. fat daily for up to 6 weeks and the fat tolerance test was repeated. The moderately obese subjects were given a 1000-Cal. diet containing at least 60 g. fat daily for 5 weeks, during which serial studies of serum cholesterol were made. The extremely obese individuals were given a diet providing 1200 to 1500 Cal. daily, including at least 60 g. fat, for up to 50 weeks; total serum cholesterol was estimated at regular intervals and fat tolerance tests were made before and after weight reduction.

Blood fat after the test meal rose and remained high in obese and atherosclerotic subjects and in those with abnormally high blood cholesterol

values. In the last and in those with atherosclerosis, restriction of fat resulted in marked improvement of fat tolerance; a similar improvement followed reduction in weight of extremely obese subjects.—G. A. Garton.

2268

VAN ITALLIE, T. B., MOORE, F. D., GEYER, R. P. and STARE, F. J. **Will fat emulsions given intravenously promote protein synthesis? Metabolic studies on normal subjects and surgical patients.** *Surgery*, 1954, **36**, 720-731. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Emulsions containing 15 per cent. lipid were administered intravenously to 2 healthy volunteers and to 2 patients who had undergone subtotal gastrectomy. The emulsions were composed of olive oil or coconut oil or equal parts of each 15 g., soya bean lecithin preparation 1 g., Demal-14 (emulsifying agent) 1 g. and glucose 4.3 g. per 100 ml. Metabolic effects were studied by analysis of the diets and of faeces and urine for N, K and Na; eosinophil counts were also made.

Both normal subjects were given a constant diet inadequate in energy and marginal with respect to protein intake. In one negative N and K balance diminished when fat was administered and increased when its administration ceased. In the other normal subject no effect of intravenous fat on N balance was observed, though cessation of intravenous fat injection was followed by a marked increase in K excretion.

The surgical patients were given enough intravenous fat for 6 days after the operation to maintain a daily intake of 1800 to 2000 Cal. The characteristic metabolic response to this type of surgical procedure was not measurably affected by the extra energy derived from fat. These patients may have been receiving less than their basal energy requirement, though they received more than is usual after major surgical operations.

G. A. Garton.

2269

POPPER, H. and SCHAFFNER, F. **Nutritional hepatic injury.** *Arch. Int. Med.*, 1954, **94**, 785-800. [Hektoen Inst. Med. Res., Chicago, Ill.]

2270

RAMSEY, H. A., WISE, G. H., TOVE, S. B. and WAUGH, R. K. **Effects of various diets on the diurnal patterns of blood plasma lipides of dairy calves.** *J. Dairy Sci.*, 1954, **37**, 1357-1367. [Dept. Animal Indust., N. Carolina State Coll., Raleigh.]

Four calves were fed on 4 semi-synthetic milks composed of casein, minerals, vitamins, NaHCO₃ and butter or hydrogenated cottonseed oil with

lactose or glucose in a rotation of 2-week periods. Hourly samples of blood were taken for 12 hr. on the 7th and 14th day of each period.

The diurnal patterns of total lipids, lipid P and total cholesterol were similar in all. "Plasma fat", measured by Allen's method, which approximates to the sum of neutral fat, free cholesterol and cholesterol esters (Abst. 1332, Vol. 21), showed different diurnal patterns. In calves given butterfat, "plasma fat" began to fall immediately; after hydrogenated cottonseed oil it rose to a peak after 2 hr., then fell below the initial level. Both patterns were similar to those of total lipids after 5 hr. Blood sugar from calves fed on glucose rose more rapidly to a higher peak, declined more precipitously and equilibrated more slowly than when the diet contained lactose. Neither carbohydrate affected the "plasma fat", nor did the type of fat influence the blood sugar.

In a similar experiment the effect of 2 diets, one containing cottonseed oil and lactose and the other containing non-fat milk solids instead of casein, lactose, vitamins and the mineral mixture, were studied. In 4 calves, after the diet containing non-fat milk solids, "plasma fat" increased during the first 3 hr., dropped slightly, then increased to the 7th hr. With the other diet "plasma fat" fell for 4 hr., then rose to a peak at the 8th hr., after which both patterns were the same. From the 2 experiments it was evident that "plasma fat" reflected not only the nature of the dietary fat but also other influences, which are discussed.—A. Hepburn.

2271

PERETTI, G. and LIGUORI, G. L'assorbimento dei lipidi durante il digiuno proteico. [Absorption of lipids during protein deprivation.] *Arch. Sci. biol., Bologna*, 1954, **38**, 481-492. [Ist. Fisiol. Umana, Univ. Cagliari.]

Three groups, of 10, 4 and 10 rats, received initially 3 diets containing 8 to 9.56 per cent. casein and 3 to 4.3 per cent. ovalbumin, with 2, 10 and 20 per cent. olive oil. Each diet provided 35.2 Cal. per g. protein. The rats were kept in individual metabolism cages for quantitative collection of faeces and urine. After 9 days on these diets they received similar diets with the protein replaced by starch, until N excretion stabilised at a low level. They were then re-fed on the original diets until they again reached N equilibrium. Fat balances were studied. At the end of each phase some rats of each group were starved for 12 hr., given olive oil by stomach tube and killed 6 hr. later for estimation of the amount remaining in the stomach and intestine.

The results for 2 rats on different diets are presented in full, and mean fat balances for each rat in each period are tabulated for the rest. Fat

absorption was slightly reduced after protein depletion, as shown both by the balance studies and by the uptake of olive oil from the digestive tract. On protein repletion the fat uptake rose above the control level.—D. Duncan.

2272

BURK, W. W. (JR.), DUNKELBERG, C., MCPHERSON, J. C. and TIDWELL, H. C. Blood levels of absorbed labeled fat and chylomicronemia. *J. Biol. Chem.*, 1954, **210**, 531-537. [Dept. Biochem., Southwestern Med. Sch. Univ. Texas, Dallas.]

Rats were given water and glucose to appetite for 48 hr. and then by stomach tube 0.3 ml. lipid, 1.3 per cent. palmitic acid-1-¹⁴C in olive oil, per sq. dm. body surface. Blood samples were taken hourly for radio-activity studies or chylomicron counts. Two and 4 hr. after the labelled acid was given, animals were anaesthetised and blood was obtained by heart puncture.

More than 90 per cent. of the total radio-activity of blood was in the lipid fraction. The radio-activity of blood lipids was proportional to the chylomicron counts, confirming the observation of Moreton (Abst. 3792, Vol. 20) that the increase in chylomicrons during alimentary lipaemia is due to active uptake of fat.—G. A. Garton.

2273

SWANK, R. L. Effect of high fat feedings on viscosity of the blood. *Science*, 1954, **120**, 427-428. [Div. Neurol., Dept. Med. Sch., Univ. Oregon, Portland.]

Hamsters fed on a diet in which about half the energy came from butterfat for 5 to 7 days were then given a single fat meal of 2 to 3 ml. of 35 per cent. cream. The animals were anaesthetised and their blood viscosities and haematocrits were studied 3, 6, 9, 14, 24, 48 and 72 hr. after the meal of cream.

The blood viscosity increased after about 3 hr. and continued to increase to a maximum at 6 to 9 hr., followed by a decline to normal by the end of 24 hr. During the first 9 hr. minor variations in the haematocrit were noted; this was followed by a significant fall and then a return to normal in between 24 and 72 hr.

Gross inspection of the viscera of the animals with increased blood viscosity revealed an unusual degree of cyanosis of the venous blood, hyperaemia, engorged arteries in the stomach and omentum and a reduced tendency to bleed from the vena cava when puncture wounds were made for blood sampling.—G. A. Garton.

2274

HOLASEK, A. Über den Ursprung des Kofettes. 1. Untersuchungen an fettfrei ernährten

N.A. and R., April 1955

Ratten. [Origin of faecal fat. 1. Experiments with rats on a fat-free diet.] *Hoppe-Seyler's Ztschr.*, 1954, 298, 55-64. [Med. Chem. Inst., Univ. Graz.]

Fat in faeces was estimated: the faeces were extracted with hot acid alcohol, then repeatedly with ether. The ether was evaporated. The residue was dissolved in alcohol, saponified with NaOH and extracted with light petroleum: after evaporation of the solvent the residue was dissolved in 86 per cent. ethanol and the higher fatty acids were precipitated with urea and titrated with 0.1 N NaOH.

The results are presented in terms of dry weight of faeces, NaOH for the final titration in ml. and m. equiv. fatty acids for 10 rats. The diet was of separated milk, with 0.03 per cent. lipid as a maximum, sugar, extracted starch or bread and, in 3 of the 5 experiments, cellulose. In the experiments with cellulose, the dry weight of faeces per 10 rats was 18 to 21, 27 to 50 (unrestricted food for part of the time) and 22 to 30 g. daily. Corresponding fatty acid, m. equiv. per 10 rats, was 0.34 to 0.42, 0.44 rising to 0.47 with increase of food and falling to 0.25, and 0.47 falling to 0.03 on the third of 4 days when terramycin was given.

In the first of the 2 experiments without cellulose, with a diet of bread and milk, the dry weight of faeces was from 7.3 to 8.9 g. and m. equiv. fatty acids from 0.76 to 0.89 per 10 rats daily. When aureomycin was given with this diet, faeces became so soft they could not be collected completely and there was coprophagy. The fall of fatty acids to 0.24 m. equiv. is in part attributed to coprophagy and in part to the aureomycin.

The conclusions drawn are that the fat in faeces of rats on diets almost free from fat is bacterial fat and that the smaller total amount of fat when the diet contains cellulose is due to the faster passage of food through the gastro-intestinal tract. [No marker seems to have been used and no estimate was made of cellulose in faeces.]

I. Leitch.

2275

HOCK, A., HUBER, G., PILCHAU, A. P. v. and SANDERSLEBEN, J. v. Chemische und morphologische Veränderungen im Lebergewebe von Ratten unter ernährungsbedingten Leberschädigungen. [Chemical and morphological changes in the liver of rats with dietary liver damage.] *Arch. Tierernährung*, 1954, 4, No. 4, Beihefte, 256-270. [Zellstoff Fabrik Waldhof, Giessen.]

Albino Wistar-type rats were fed on a diet of defatted casein 16, lard treated with ferric chloride to destroy tocopherol 51, maize starch 30 and McCollum salt mixture 3 per cent., with per kg. of the mixture, vitamin B₁ 2, riboflavin 2.5, pyri-

doxine 2, Ca pantothenate 10, nicotinamide 25, *p*-aminobenzoic acid 25, inositol 25 and biotin 0.2 mg.; and 500 I.U. of vitamins A and D. The diet was almost free from choline, tocopherol, vitamin B₁₂ and folic acid. The casein contained 1.56 per cent. methionine which, at 10 g. of the mixture daily, gave 25 mg. methionine, enough for all normal needs. The average initial weight was about 130 g. and rats were killed at intervals up to 230 days on experiment. In liver, total lipids, phospholipins, protein and nucleic acid were estimated. The results are presented in tables, a graph and photomicrographs.

Liver fat rose to 60 per cent. of dry matter and was deposited mostly in the centre of the lobules. Towards the end of the experiment, in survivors, small foci of necrosis appeared but there was little nuclear change and no fibrosis. Phospholipins, protein and nucleic acids were greatly reduced in relation to liver weight for a time but were normal again by the end of the experiment. About a tenth of the rats died after 160 days of acute necrosis.—I. Leitch.

2276

NIEMAN, C., GROOT, E. H. and JANSEN, B. C. P. The nutritive value of butter fat compared with that of vegetable fats. 1. Biological experiments. *Proc. Kon. Ned. Akad. v. Wetensch. Amsterdam Ser. C*, 1952, 55, 587-604. [Netherlands Inst. Nat. Nutrit., Amsterdam.]

A survey is made of the results of a large number of growth experiments with rats to compare the nutritive value of arachis oil plus vitamins A and D with butter. The growth figures obtained in the older, similar experiments of Boer and Jansen (*Arch. néerl. Physiol.*, 1942, 26, 1) were also investigated statistically.

It is concluded that butterfat has a greater nutritive value than arachis oil, even when the latter is supplemented with β -carotene and calciferol or with the unsaponifiable matter of butterfat.

Part 2, Statistical Analyses, has been published by C. van Eeden (Report S 63 of the Statistical Department of the Mathematical Centre at Amsterdam), *Proc. Kon. Ned. Akad. v. Wetensch., Amsterdam Ser. C*, 1952, 55, 605-616, and is obtainable on request.—G. A. Garton.

2277

DEUEL, H. J. (Jr.), MARTIN, C. R. and ALFIN-SLATER, R. B. The effect of fat level of the diet on general nutrition. 12. The requirement of essential fatty acids for pregnancy and lactation. *J. Nutrition*, 1954, 54, 193-199. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California, Los Angeles.]

See also Abst. 4821, Vol. 24.

Female weanling rats were given a fat-free diet for 10 weeks. They were then divided into 2 series of groups which received supplements of cottonseed oil or linoleate with a control group for each series, and were mated with proven stock males. In the first series most of the groups contained 25 females and the daily supplements of cottonseed oil given to the 6 groups ranged from 10 to 1000 mg. In the second series there were 16 animals to a group and the daily supplements of linoleate given to the 6 groups ranged from 2.5 to 80 mg.

In the control group of the first series 83 per cent. of females had litters of average size 6.4 at birth, compared with 92 to 100 per cent. litters of average size 8.3 to 9.9 in the supplemented groups. During the first 3 days of life mortality in the control young was 100 per cent. The level of cottonseed oil required for optimum lactation, as judged from percentage survival and average bodyweight of young at 21 days, was between 100 and 200 mg. daily, which was considered to be equivalent to between 50 and 100 mg. linoleate. In the second series 87 per cent. of control females had litters of average size 4.9 at birth, compared with 87 to 100 per cent. and average size 6.6 to 7.5 in the supplemented groups. None of the young in the control group or in the groups receiving 2.5 and 5.0 mg. linoleate daily survived 3 days. The group which received 80 mg. linoleate daily yielded lactation results comparable with the optimum recorded for cottonseed oil.—F. C. Aitken.

2278

CHENG, A. L. S., ALFEN-SLATER, R. B. and DEUEL, H. J. (Jr.) The effect of fat level of the diet on general nutrition. 13. The effect of increasing dosages of x-irradiation on the protective action of fat on radiation injury. *J. Nutrition*, 1954, 54, 201-207. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California, Los Angeles.]

Male rats were given at weaning one of 3 test diets. These were 2 low-fat diets containing 20 per cent. vitamin-test casein or 20 per cent. commercial casein and one containing 24 per cent. commercial casein and 15 per cent. cottonseed oil. The test diets were given for 3, 5, or 8 weeks before animals were exposed to X-rays. The levels of irradiation were 300 r weekly for 1 to 5 weeks; 400 r weekly for 1 to 3 weeks; 500 r weekly for 1 or 2 weeks. In all 33 tests were made. With a few exceptions rats given the diet containing fat survived better than rats on the low-fat diets and rats on the low-fat diet containing commercial casein survived better than those on the diet containing purified casein. Three weeks of the fat diet sufficed for its protective effect to be shown.

F. C. Aitken.

2279

ERSHOFF, B. H. Beneficial effect of low-fat diets on the swimming performance of rats and mice in cold water. *J. Nutrition*, 1954, 53, 439-449. [Dept. Biochem. Nutrit., Univ. S. California, Los Angeles.]

The swimming performance of young mice was studied at 20° and 37° C., that of adult mice at 20° C. and of rats at 20° and 37° C. At 20° C. all animals which had received a fat-free diet or a similar diet supplemented with 1 per cent. cottonseed oil or 1 per cent. hydrogenated cottonseed oil swam for a significantly longer time than did animals given a similar diet supplemented with 10 per cent. cottonseed oil or 10 per cent. hydrogenated cottonseed oil. When the fat-free diet was supplemented with 2.5 per cent. of oil, adult mice swam for a time intermediate between that swum by those on the fat-free and 10 per cent. fat diets. The protective effects of the fat-free diets were evident within 3 days of administration. In the swimming tests at 37° C. there was no significant difference in performance due to diet.

G. F. Garton.

2280

FAWCETT, D. W. and LYMAN, C. P. The effect of low environmental temperature on the composition of depot fat in relation to hibernation. *J. Physiol.*, 1954, 126, 235-247. [Dept. Anat., Harvard Med. Sch., Boston, Mass.]

Groups of hamsters were given, for 6 to 12 weeks, 3 diets: (1) Purina chow, (2) chow plus 20 per cent. peanut oil (iodine value 93) and (3) chow plus 20 per cent. beef tallow (iodine value 45). Half the animals in each group were kept in an environmental temperature of 20° to 25° C. and half in a cold room at 5° ± 2° C. in individual cages with suitable bedding. Of 2 groups of rats treated similarly, one group received chow and the other diet 3. Fat was obtained from subcutaneous tissue and abdominal depots for estimation of the I value.

The fat of hamsters, which hibernate, when they were maintained on stock diet at room temperature had an I value of 83.7, compared with 87.3 for animals on the same diet at 5° C. The corresponding I values of the fats of the hamsters given peanut oil or tallow were 87.4 and 92.1, and 71.5 and 77.7. It was concluded that a low environmental temperature occasions a significant decrease in saturation of depot fats, the extent of which is about the same whatever the pre-existing level of saturation determined by the dietary fat. No such change was found in the depot fats of the rats. No effect of cold on the I value of the fat of ground-squirrels (*Citellus tridecemlineatus*) was found, since they entered into hibernation so

quickly that there was not enough time for replacement of their depot fat (I value 93.5 on chow diet with fat synthesised in the cold environment.

G. A. Garton.

2281

TOVE, S. B., SMITH, F. H., YOUNG, C. T. and SHERWOOD, F. W. **Effect of source of dietary protein on the unsaturated fatty acids in the carcass fat of the rat.** *J. Nutrition*, 1954, **54**, 49-57. [Animal Nutrit. Sect., Dept. Animal Indust., N. Carolina Agric. Exp. Stat., Raleigh.]

Groups of weanling male rats were fed to appetite for 6 or 7 weeks on 17 diets, details of which are given in a table; several of the diets contained a high proportion of ether-extracted cottonseed meal or soya bean meal. The animals were then killed and their carcass fat was extracted and analysed for unsaturated fatty acids by alkali-isomerisation and spectrophotometric examination.

It was concluded that the unsaturated fatty acid composition of the dietary fat exerted a major influence on the unsaturated fatty acid composition of the depot fats. The results suggest that soya bean meal and cottonseed meal contain one or more substances which can affect the metabolism of unsaturated fatty acids, since these meals, although ether-extracted, increased the content of diethenoid acids and decreased that of monoethenoid acids in the carcass fats.

G. A. Garton.

2282

BASNAYAKE, V. and SINCLAIR, H. M. **Skin permeability in deficiency of essential fatty acids.** *J. Physiol.*, 1954, **126**, 55P-56P. [Lab. Human Nutrit., Univ. Oxford.]

2283

BERGSTRÖM, S., BLOMSTRAND, R. and BORGSTRÖM, B. **Route of absorption of distribution of oleic acid and triolein in the rat.** *Biochem. J.*, 1954, **58**, 600-604. [Dept. Physiol. Chem., Univ. Lund, Sweden.]

Male rats, some with thoracic duct fistulae, were given oleic acid or triolein labelled with ^{14}C by stomach tube. The lipids of lymph subsequently collected were fractionated into neutral fat and phospholipins on silicic acid columns for estimation of the radio-activity of their constituent fatty acids. The fatty acids of the lipids of the intestinal wall were also examined and the amount of radio-activity in the respired CO_2 was measured.

When labelled oleic acid was given, 66 to 92 per cent. of the activity was absorbed in 24 hr.; the figures for triolein were 57 to 92 per cent. The activity recovered from the lymph lipids,

mainly in the neutral fat, was 38 to 96 per cent. of that absorbed from the free acid and 51 to 83 per cent. of that from the triglyceride; only about 2 per cent. of the activity was in phospholipins.

The considerable variation in the results between different animals is discussed, and it is suggested that those rats on which the highest recoveries of radio-activity were made were those most approaching the normal physiological state. It is concluded that there is no detectable difference between the pathways of absorption from the intestine of oleic acid and triolein.—G. A. Garton.

2284

BERGSTRÖM, S., BORGSTRÖM, B., TRYDING, N. and WESTRÖÖ, G. **Intestinal absorption and metabolism of 2:2-dimethylstearic acid in the rat.** *Biochem. J.*, 1954, **58**, 604-608. [Dept. Physiol. Chem., Univ. Lund, Sweden.]

Adult male rats, housed in metabolism cages, were fed to appetite on a diet of white bread and water and given by stomach tube 2:2-dimethyl-[1- ^{14}C]-stearic acid dissolved in olive oil. Respiratory CO_2 , faeces and urine were collected for measurement of radio-activity and identification of urinary metabolic products. In another experiment a rat with a cannula in the thoracic duct was similarly given the labelled acid and lymph was collected for 24 hr. The lymph fat was examined by chromatography on silicic acid and Amberlite columns.

The labelled acid was well absorbed and more than 90 per cent. of the radio-activity absorbed was accounted for as [^{14}C]-dimethyl-adipic acid in the urine; no radio-activity was detected in the respired CO_2 . The acid was present in lymph glycerides and phospholipins. Experiments *in vivo*, in which the labelled glyceride fraction of lymph lipids was incubated with pancreatic juice and bile, showed that the glyceryl ester bond was resistant to the action of lipase.—G. A. Garton.

2285

REINIUS, L. and TURPEINEN, O. **Biosynthesis of ^{14}C -labeled linoleic acid and its fate in normal and fat-deficient rats.** *Acta chem. scand.*, 1954, **8**, 1001-1006. [Dept. Physiol. Biochem., Vet. Coll., Helsinki.]

Linoleic acid labelled with ^{14}C was prepared by culturing the yeast-like organism *Trichosporon pullulans* in a medium containing ^{14}C -labelled sugars. Fatty acids were isolated from the mycelium and the radio-active linoleic acid was prepared as ethyl ester by the bromination-debromination procedure. The ester was given to 2 female rats, one of which had been maintained on a stock diet and the other on a fat-deficient regimen. Six hr. later the animals were killed and lipids were extracted from liver, kidneys,

heart, brain, subcutaneous tissue, perirenal adipose tissue, mesentery and omentum, genital adipose tissue and gastro-intestinal tract, and from faeces, for estimation of their radio-activity.

In the fat-deficient rat the intestinal absorption of linoleate was more rapid and a proportionally greater part of the absorbed activity was found in liver, kidney and heart lipids than in the similarly treated animal fed on the stock diet. In the latter rat the subcutaneous adipose tissue contained relatively more of the absorbed ^{14}C .

G. A. Garton.

2286

HOLMAN, R. T. and ENER, S. Use of urea-inclusion compound containing essential fatty acid in an experimental diet. *J. Nutrition*, 1954, **53**, 461-468. [Hormel Inst., Univ. Minnesota, Austin.]

Four groups of 4-month-old rats which had been fed from weaning on a basal fat-free diet were then fed for several months on the basal diet plus, per kg. diet, (1) 80 g. urea-inclusion compound of the ethyl esters of the fatty acids of maize oil, or (2) 20 g. maize oil, or (3) 60 g. urea; the control group continued to receive the fat-free diet. The rats were inspected periodically for signs of deficiency of essential fatty acids. At the end of the experiment total carcass fat was analysed for arachidonic acid.

The changes in the skin and in arachidonic acid content of the carcass fat indicated that the essential fatty acid esters were equally active in the free state or as urea-inclusion compounds. The animals with urea in the diet suffered no injury, though the diuretic effect was reflected in increased water intake.

It is not recommended that urea-inclusion compounds should be used generally for the incorporation of fats in experimental diets, except when supplementation with unsaturated fatty acids or esters is an essential part of an experimental procedure; the acids or esters would then be protected from oxidation and could be incorporated directly into the diet instead of being given separately as has been common practice.

G. A. Garton.

2287

REID, M. E. Production and counteraction of a fatty acid deficiency in the guinea pig. *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 708-709. [Lab. Biochem. Nutrit., Nat. Inst. Health, Bethesda, Md.]

In 3 groups, each of 8 male and 8 female guinea-pigs, half the animals received the diet previously described (Abst. 3515, Vol. 24), the others a similar diet with fat replaced by cerelose.

After 6 to 8 weeks the guinea-pigs on the fat-free diet showed retardation of growth, dermatitis,

drying of the inside of the ears, and, in some, ulcers, loss of fur and swollen cyanotic feet. All these signs were abolished by administration of maize oil or linoleic acid by mouth, which showed that this acid or other fatty acids present in maize oil are essential in the diet of the guinea-pig.

G. A. Garton.

2288

ALFEN-SLATER, R. B., AFTERGOOD, L., WELLS, A. F. and DEUEL, H. J. (Jr.) The effect of essential fatty acid deficiency on the distribution of endogenous cholesterol in the plasma and liver of the rat. *Arch. Biochem. Biophys.*, 1954, **52**, 180-185. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California, Los Angeles.]

Adult rats were fed for 20 weeks on a low-fat diet to deplete them of essential fatty acids. Blood was then obtained by heart puncture and the livers were removed. Plasma lipids were studied after extraction with ethanol and acetone and liver lipids after extraction with light petroleum; in some the lipids of the adrenals were estimated after ethanol and ether extraction. All extracts were analysed for cholesterol by the method of Nefit and Deuel (Abst. 599, Vol. 19).

The cholesterol content of the liver and adrenals was higher and that of the plasma lower in animals which had received the low-fat diet than in controls which received a diet containing 12.5 per cent. cottonseed oil. The extra liver cholesterol was almost entirely in the ester form.

It is suggested that, in deficiency of essential fatty acids, cholesterol esters containing fatty acids other than polyunsaturated acids may be formed and be unavailable for normal metabolism.

G. A. Garton.

2289

HUTCHENS, T. T., VAN BRUGGEN, J. T. and WEST, E. S. Fatty acid and cholesterol synthesis rates in the intact rat. *Arch. Biochem. Biophys.*, 1954, **52**, 261-268. [Dept. Biochem., Med. Sch., Univ. Oregon, Portland.]

The rates of formation of fatty acids and cholesterol from labelled acetate are tabulated for rats examined in the postprandial, postabsorptive and 18-hr. fasted states.—G. A. Garton.

2290

MAYER, G. A., CONNELL, W. F., DEWOLFE, M. S. and BEVERIDGE, J. M. R. Diet and plasma cholesterol levels. *Amer. J. Clin. Nutrit.*, 1954, **2**, 316-322. [Dept. Med., Fac. Med., Queen's Univ., Kingston, Ont.] Spanish summary.

Five healthy men who had been in nutritional balance for 3 to 4 months received for 4 weeks a diet which supplied 100 to 180 mg. cholesterol

N.A. and R., April 1955

daily, and 10.9 to 18.9 per cent. of the total energy in the form of fat. For the next week they received a diet which supplied 900 to 980 mg. cholesterol daily with the same proportion of fat as in the first diet. For the sixth week the subjects received a diet which supplied 100 to 180 mg. cholesterol daily and 34 to 46 per cent. of the total energy as vegetable fat; during the last 2 weeks of experiment they received a diet which supplied 210 to 300 mg. cholesterol daily and 34 to 46 per cent. of the total energy as animal fat. The intakes of cholesterol and animal and vegetable fat were closely controlled, but carbohydrate foods such as potatoes, sugar, marmalade, bread and arrowroot biscuits were allowed to appetite in order to maintain bodyweight. Blood samples were taken before breakfast at intervals throughout the experiment, and total and free cholesterol were estimated in the plasma.

The diet low in fat and cholesterol produced a highly significant fall in plasma cholesterol; the addition of cholesterol in the form of egg yolk to the diet did not produce any change in plasma cholesterol. When the intake of vegetable fat was increased a significant rise occurred in plasma cholesterol; it remained high, but was not increased further, on substitution of animal for vegetable fat and consequent increase of cholesterol intake.—G. F. Garton.

2291

RÍOS Mozo, M. Arteriosclerosis experimental. [Experimental arteriosclerosis.] *Rev. clín. española*, 1954, 54, 195-207. [Inst. Invest. Méd., Madrid.]

A review with 215 references.

2292

WALKER, A. R. P. and ARVIDSSON, U. B. Fat intake, serum cholesterol concentration and atherosclerosis in the South African Bantu. 1. Low fat intake and the age trend of serum cholesterol concentration in the South African Bantu.

HIGGINSON, J. and PEPLER, W. J. 2. Atherosclerosis and coronary artery disease. *J. Clin. Invest.*, 1954, 33, 1358-1365; 1366-1371. [Human Biochem. Unit, S. African Inst. Med. Res., Johannesburg.]

1. The fat in the diet of Bantu in Southern Africa who are consuming their customary foods appears, from dietary studies, to provide less than 20 per cent. of their energy intake.

Preliminary to a comparative study the effects of ageing on the level of cholesterol in the blood serum of Bantu were studied. Two hundred and eighteen subjects, 167 men and 51 women between 15 and 93 years of age, were chosen from hospital patients with diseases unlikely to affect either

their nutritional state or the level of cholesterol in their blood. The findings were compared with those of Keys *et al.* (Abst. 5242, Vol. 20) for Minnesota inhabitants. Below 40 years the means for 10-year age groups did not differ, but after that age those for Bantu were significantly lower than those for Americans.

Five racial groups were investigated, one of which was subdivided into 2 age groups. Descriptions of these groups, the number of subjects and distributions of ages and levels of cholesterol per 100 ml. serum were as follows: (1) Johannesburg Bantu, 85 between 21 and 40, mean 31 years, 88 to 265 mg., mean 167 ± 33 mg.; (2) Bechuanas, 38 between 21 and 38, mean 30 years, 86 to 210 mg., mean 149 ± 36 mg.; (3) Basutos, 31 between 21 and 40, mean 29 years, 94 to 221 mg., mean 153 ± 37 mg.; (4) Europeanised Bantu, 69 between 21 and 40, mean 31 years, 100 to 249 mg., mean 178 ± 36 mg.; (5) South African Europeans, 55 between 21 and 30, mean 28 years, 145 to 322 mg., mean 206 ± 35 mg. and 46 between 41 and 50, mean 46 years, 186 to 328 mg., mean 238 ± 38 mg. The level for group 4 was significantly higher than the levels for groups 2 and 3 but not so in comparison with that for group 1.

This result and consideration of the findings of Groen *et al.* (Title 1803, Vol. 23) and of Donath *et al.* (Abst. 4919, Vol. 23) suggested that the low fat content of the diet of rural Bantu may not solely have been responsible for the low serum cholesterol levels; the high fibre content may also have played a part.

2. In post-mortem examinations of Bantu subjects, 300 men and 223 women, cardiovascular disease was established as the cause of death of 84 men and 66 women. From information available on the condition of the aorta and coronary vessels such comparisons as were possible were made with the data of Wanscher *et al.* (*Brit. J. Cancer*, 1951, 5, 172) for Danes, and those of Clawson (*Amer. Heart J.*, 1939, 17, 387) for Americans. The incidence of atherosclerosis among Bantu was concluded to be lower than in the white populations. These results in association with those in Part 1 support the view that a population with a low serum cholesterol level tends to have a low incidence of severe atherosclerosis.—D. Harvey.

2293

HOLMAN, R. L. Cholesterol in the pathogenesis of arterial lesions. *Southern Med. J.*, 1954, 47, 537-543 (with discussion 543-544). Dept. Pathol., Sch. Med., Louisiana State Univ., New Orleans.]

The author distinguishes as arteriosclerosis changes in the walls of the arteries that are due to

age, and as atherosclerosis those of metabolic origin.

Arterial lesions resembling rheumatic arteritis and *periarteritis nodosa* were produced in 90 per cent. of dogs when they were fed on a high fat diet for 8 weeks or longer, after which renal insufficiency was produced by removal of both kidneys or subcutaneous injection of a heavy metal such as uranium nitrate. Search revealed no evidence of disturbance in lipid metabolism. Contrary to expectation, cholesterol, added to the diet before or during the induction of renal insufficiency, prevented the arterial lesions instead of modifying or increasing them.

A preliminary report is made on the state of the aorta in 96 human subjects aged from 1 to 17 years with juvenile atherosclerosis. Staining with Sudan IV showed focal deposits of lipid material on the intimal surface of the aorta in all but 7, and in all of those beyond the age of 3 years.

Fatty acid in some form is considered more likely to be culpable than cholesterol.

E. M. Hume.

2294

COOK, R. P., KLIMAN, A. and FIESER, L. F. The absorption and metabolism of cholesterol and its main companions in the rabbit. With observations on the atherogenic nature of the sterols. *Arch. Biochem. Biophys.*, 1954, 52, 439-450. [Converse Mem. Lab., Harvard Univ., Cambridge, Mass.]

Rabbits 3 to 6 months old and weighing 2 to 3 kg. were fed for 23 to 25 days on diets containing 16.6 per cent. olive oil and 1 per cent. cholesterol, lathosterol (Δ^7 -cholesterol), 7-dehydrocholesterol or cholestanol. Faeces were collected daily and the sterols were extracted for estimation of "apparent" absorption. Blood sterols were estimated after 10 days and again at the end of the experiment. At post mortem the aortas were examined for atheromatous lesions and portions of liver and brain tissue were taken for histological examination and analysis for sterols; sterols were also estimated in the lipids of the carcass.

The unsaturated sterols were absorbed to the extent of about 90 per cent., corresponding to 0.25 g. per kg. bodyweight daily; the absorption of cholestanol was about 0.2 g. per kg. bodyweight daily. The concentration of sterol in serum and livers was much higher than in control animals; interconversion of unsaturated sterols occurred and it was established that Δ^5 -cholestenol (cholesterol) was the main sterol present in the equilibrium mixture. After the administration of cholestanol the percentage of this sterol found in serum, liver and carcass was much greater than with any of the other sterols, indicating storage. All the sterols gave rise to atheromatous lesions of the aorta.—G. A. Garton.

2295

BENITZ, K. F. Zur Histochemie der sogenannten experimentellen Arteriosklerose. [Histochemistry of so-called experimental arteriosclerosis.] *Arch. exp. Pathol. Pharmacol.*, 1954, 223, 420-424. [Pharmacol. Inst., Univ. Hamburg.]

Changes typical of cholesterol atheromatosis were found in young rabbits given 2×1.0 g. cholesterol weekly by stomach tube and a daily injection of adrenaline. The histology is described. Polysaccharide complexes were identified such as have been found in the "presclerotic" changes in man.—I. Leitch.

2296

BYERS, S. O. and FRIEDMAN, M. (with GUNNING, B., OMOTO, C. and HAYASHI, W.) Observations concerning the production and excretion of cholesterol in mammals. 13. Role of chylomicra in transport of cholesterol and lipid. *Amer. J. Physiol.*, 1954, 179, 79-84. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

The distribution of cholesterol and lipid was studied in the upper (chylomicron) and lower layers of centrifuged intestinal lymph and plasma from groups of male rats given excess of dietary cholesterol. Similar studies were made on the plasma of animals with high blood lipids and cholesterol occasioned by a diet supplemented with cholesterol and cholic acid, by the injection of rabbit anti-kidney serum or by biliary obstruction.

Absorbed dietary cholesterol was found almost exclusively in particulate (chylomicron) form in the lymph and a considerable proportion was found in particulate form in the plasma. Cholesterol produced endogenously in the normal rat was dissolved in the plasma, but in nephrotic animals (those injected with anti-kidney serum) some was in chylomicrons.—G. A. Garton.

2297

RICE, L. I., SCHOTZ, M. C., POWELL, J. R. and ALFEN-SLATER, R. B. Effect of reticulo-endothelial blocking agents on plasma and liver cholesterol levels in the rat. *Amer. J. Physiol.*, 1954, 178, 483-485. [Dept. Biochem. Nutrit., Univ. S. California, Los Angeles.]

Groups of rats were fed on either a low-cholesterol diet or one containing 1 per cent. cholesterol and 0.5 per cent. sodium glycocholate, and were given repeated intravenous injections of saline or a mixture of 1 vol. of 4 per cent. Trypan Red in 0.85 per cent. saline and 2 vol. Thorotrast, a stabilised suspension of thorium dioxide. Blood was taken by heart puncture and plasma lipids were extracted for estimation of free and total

cholesterol; liver lipids were similarly examined and samples of liver tissue were studied histologically for fatty infiltration and blocking of Kupffer cells.

Treatment with Trypan Red and Thorotrast prevented the increased deposition of liver cholesterol normally found in rats fed on cholesterol; no effect was noted on the liver cholesterol of animals on the low-cholesterol diet. After injection of the blocking agents plasma cholesterol was less in animals on high-cholesterol or low-cholesterol diets than in animals on similar diets given saline injections.

The role of the reticulo-endothelial system in cholesterol metabolism is discussed.

G. A. Garton.

2298

ALFEN-SLATER, R. B., WELLS, A. F., AFTERGOOD, L., MELNICK, D. and DEUEL, H. J. (Jr.) The effect of plant sterols on cholesterol levels in the rat. *Circulation Res.*, 1954, 2, 471-475. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California, Los Angeles.]

Weanling rats were fed for 6 weeks on diets containing either 1 per cent. cholesterol, 3 per cent. soya bean sterols (sitosterol and stigmasterols) or a combination of these. At the end of the experiment blood was obtained by heart puncture. Lipids were extracted from plasma, liver and carcase for estimation of free and total cholesterol.

Lower plasma cholesterol levels were not found when soya bean sterols and cholesterol were both included in the diet; no significant difference was noted in carcase cholesterol or carcase total lipid values. The cholesterol and total lipid contents of the livers of animals given both soya bean sterols and cholesterol were much less than in livers of rats which received cholesterol only.

G. A. Garton.

2299

BURKE, K. A., McCANDLESS, R. F. J. and KRITCHEVSKY, D. Effect of soybean sterols on liver deposition of cholesterol- C^{14} . *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 87-88. [Div. Nutrit., Lederle Labs. Div., American Cyanamid Co., Pearl River, N.Y.]

Three groups each of 4 rats were used. The animals in groups 1 and 2 were fed for 120 days on rat chow supplemented with 3 per cent. cholesterol dissolved in 4 per cent. maize oil, and group 3 was given rat chow with 3 per cent. cholesterol and 5 per cent. mixed soya bean sterols for the same periods. Each rat was then given, by stomach tube, 10 mg. randomly-labelled C^{14} -cholesterol dissolved in 1 ml. maize oil; in group 2 the labelled sterol was followed immediately by 1 g. mixed soya bean sterols. Faeces and urine were collected from each animal for 4 days and pooled for C^{14}

assay; the rats were then killed and the livers were analysed for C^{14} activity in the cholesterol (unsaponifiable) and acidic fractions.

The average recovery of labelled cholesterol from the livers was 6.61 per cent. in group 1, 1.80 per cent. in group 2 and 0.47 per cent. in group 3; the average recoveries of C^{14} in the unsaponifiable matter of faeces were 20.14, 25.13 and 27.76 per cent.—G. A. Garton.

2300

PETERSON, D. W., SHNEOUR, E. A. and PEEK, N. F.

Effects of dietary sterols and sterol esters on plasma and liver cholesterol in the chick. *J. Nutrition*, 1954, 53, 451-459. [Dept. Poultry Husb., Coll. Agric., Univ. California, Berkeley.]

Male chicks were fed on a stock diet until they were 3 weeks old and were then transferred to diets containing 4 per cent. cottonseed oil and cholesteryl acetate, caprate, myristate, palmitate, stearate or oleate; each ester was incorporated in the diet at a level equivalent to 1 per cent. of cholesterol. Total plasma cholesterol was estimated weekly for 4 weeks, after which the animals were killed and liver cholesterol was estimated.

Cholesteryl esters produced lower plasma and liver cholesterol levels than did free cholesterol. Cholesteryl, ergosteryl and dihydrocholesteryl palmitates, when given together with cholesterol, did not prevent the increases in tissue cholesterol which occurred with the free sterols alone.

In similar experiments cholic acid, oleic acid or cottonseed oil given with cholesterol enhanced increases in plasma cholesterol values; these increases were prevented by the addition of mixed soya bean sterols to the diet.

G. A. Garton.

2301

RIDOUT, J. H., LUCAS, C. C., PATTERSON, J. M. and BEST, C. H. Changes in chemical composition during the development of 'cholesterol fatty livers'. *Biochem. J.*, 1954, 58, 297-301. [Banting and Best Dept. Med. Res., Univ. Toronto.]

Groups of rats were fed on hypolipotropic diets without or with 0.2, 0.5, 0.8 or 1.6 per cent. crystalline cholesterol. Animals were killed after 3, 7, 14, 21, 35 and 49 days and the liver lipids were extracted and analysed as already described (Abst. 4235, Vol. 16).

During the first 3 weeks the increased weight of the livers was mainly accounted for by increased incorporation of glycerides and water. After this the nature of the deposited materials changed; the amount of glycerides decreased and the water content increased, though the sum of the 2 accounted for about 80 per cent. of the gain in liver

weight. The percentage of total liver lipids reached a limit in about 3 weeks, though the absolute amount of glycerides and cholesterol esters continued to increase.—G. A. Garton.

2302

RIDOUT, J. H., LUCAS, C. C., PATTERSON, J. M. and BEST, C. H. **Preventive and curative studies on the 'cholesterol fatty liver' of rats.** *Biochem. J.*, 1954, **58**, 301-306. [Banting and Best Dept. Med. Res., Univ. Toronto.]

In experiments similar to those described in the preceding abstract, choline, betaine hydrochloride, vitamin B₁₂ or inositol was given to rats fed on hypolipotropic diets containing 0.2, 0.4, 0.8 and 1.6 per cent. cholesterol.

The excessive deposition of glycerides and cholesterol esters was prevented by the addition of choline or betaine to the diet containing 0.2 per cent. cholesterol, but not with more. Vitamin B₁₂ had a much greater lipotropic effect on liver glycerides than on cholesterol esters. Inositol was without lipotropic effect.—G. A. Garton.

2303

RIDOUT, J. H., PATTERSON, J. M., LUCAS, C. C. and BEST, C. H. **Effects of lipotropic substances on the cholesterol content of the serum of rats.** *Biochem. J.*, 1954, **58**, 306-312. [Banting and Best Dept. Med. Res., Univ. Toronto.]

Free and total cholesterol were estimated in serum of some rats in the study reported in the preceding abstracts. When the diet contained lipotropic agents and excess cholesterol the post-prandial rise of bound serum cholesterol was related to the amount of cholesterol in the ration; increased amounts of dietary lipotropic substances, e.g., choline, produced no further effect. The elevated serum cholesterol values returned slowly to normal after about 18 to 24 hr. The bound serum cholesterol values of animals fed on purified hypolipotropic diets fell progressively during the experiment. Choline or betaine or vitamin B₁₂ quickly restored serum cholesterol to normal; inositol was ineffective.

It is concluded that lipotropic substances which prevent or cure fatty livers are also involved in the regulation of serum cholesterol, though the present findings do not support claims that lipotropic compounds reduce the level of bound cholesterol in serum.—G. A. Garton.

2304

DUFF, G. L., BRECHIN, D. J. H. and FINKELSTEIN, W. E. **The effect of alloxan diabetes on experimental cholesterol atherosclerosis in the rabbit. 4. The effect of insulin therapy on**

the inhibition of atherosclerosis in the alloxan-diabetic rabbit. *J. Exp. Med.*, 1954, **100**, 371-380. [Dept. Pathol., Pathol. Inst., McGill Univ., Montreal.]

For previous parts see Absts. 5155, Vol. 19 and 5431, Vol. 20.

Rabbits were fed on chow and water to appetite and 50 were injected with alloxan, but only 6 diabetic animals survived to complete the experiment. When their metabolism was stabilised they received 0.75 g. cholesterol in 15 ml. maize oil daily, and 4 to 6 days later insulin treatment began. From 57 to 90 days after first receiving cholesterol the survivors were killed. Controls were 18 rabbits which received cholesterol, but not alloxan or insulin; 9 of these died.

The extent of atherosclerosis in the aorta was not greater in the alloxan-diabetic rabbits treated with insulin than in controls.

In a second experiment there were 16 survivors after alloxan injection; all 16 and 13 controls received cholesterol and 10 of the diabetic rabbits received insulin. Diabetic rabbits had the highest average serum cholesterol levels, insulin-treated rabbits came next and controls had the lowest levels, but the differences were not great. The atherosclerosis was slight in diabetic rabbits and extensive in the other groups, especially in the treated diabetic group.

It was concluded that the inhibition of experimental atherosclerosis in alloxan diabetes was reduced by insulin and that it was associated with the diabetic state and not a direct effect of alloxan. The diabetes was never completely controlled by the insulin treatment.—D. Duncan.

2305

GOLDNER, M. G., LOEWE, L., LASSER, R. and STERN, I. **Effect of caloric restriction on cholesterol atherogenesis in the rabbit.** *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 105-108. [Jewish Chronic Dis. Hosp., Brooklyn, N.Y.]

Groups of adult rabbits were fed on restricted amounts of a commercial diet with or without 1 or 2 g. cholesterol daily for several weeks; control groups were allowed the same diet to appetite. Blood samples were taken periodically for estimation of fatty acids, lipid P, total cholesterol and lipoproteins. At the end of the experiments the animals were killed and the aortas were examined for arteriosclerotic changes.

Rabbits which received severely restricted diets with cholesterol showed significantly higher blood cholesterol, fatty acids, phospholipids and lipoproteins. The degree of these changes, and also of the arteriosclerosis induced, was greater than in control groups given the same amount of cholesterol.—G. A. Garton.

2306

WEISS, S. B., HENKIN, G. and MARX, W. **Cholesterol balance studies in mice with modified thyroid activities.** *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 800-803. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California.]

Total cholesterol balance was studied on groups of 6 to 10 mice. Two groups of females and 2 of males were pair-fed on a Purina chow diet containing 0.65 per cent. cholesterol; one group of females was given 0.4 per cent. dried thyroid, one group of males 0.5 per cent. thiouracil, and the other group of males received both thyroid and thiouracil.

In animals which received thyroid the cholesterol output was significantly smaller than the intake and also significantly less than that recovered from the controls. The cholesterol recovery of animals given thiouracil exceeded 100 per cent. When a diet low in cholesterol (0.15 per cent.) was given to appetite to 2 groups of mice, one of which was given thyroid and thiouracil and the other thiouracil only, cholesterol recovery was significantly greater than intake in the hyperthyroid group and even greater than that of hypothyroid mice.—G. A. Garton.

2307

ANTONINI, F. M., GRANDONICO, F. and PIVA, G. **Effetto protettore della colesterina su alcune alterazioni metaboliche prodotte dal cortisone nel coniglio.** [Protective action of cholesterol on metabolic changes caused by cortisone in the rabbit.] *Sperimentale*, 1953, **103**, 331-356. [Clin. Med. Gen., Univ. Florence.]

In rabbits simultaneous administration of cholesterol tended to counteract the effect of cortisone on serum proteins, lipids, lipoproteins and polysaccharides.—E. M. Hume.

2308

BRAGDON, J. H. **Hyperlipemia and atheromatosis in a hibernator, *Citellus columbianus*.** *Circulation Res.*, 1954, **2**, 520-524. [Lab. Metabol., Nat. Heart Inst., Bethesda, Md.]

Groups of a total of 23 ground-squirrels (*Citellus columbianus*) were fed to appetite for 3 to 18 months on a high- or low-fat vegetable diet or commercial rabbit pellets with and without the addition of 1 per cent. cholesterol. From time to time the serum was analysed for total and free cholesterol, lipid P and total fat; triglyceride values were obtained by difference. Similar estimations were made on 5 animals after 10 weeks of hibernation in a cold room at 5° C. Twenty-one of the squirrels were killed at the end of the experiment and examined for atheromatous lesions of the heart and thoracic aorta.

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Extremely high serum lipid values were often found in the non-hibernating animals, especially in the group fed on the high-fat diet. Triglycerides predominated and values were as high as 10 g. per 100 ml. serum; cholesterol and phospholipid values were among the highest recorded for any mammalian species. Cholesterol feeding did not produce high blood levels of sterol. Hibernation resulted in relatively low serum triglyceride values. Atheromatous lesions were found in the 3 animals with the highest serum cholesterol values.

G. A. Garton.

2309

PORTWICH, F., LEUFOLD, F. and BÜTTNER, H. **Über die alimentäre Plasmalogenämie beim Menschen.** [Plasmalogens of dietary origin in human blood.] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselerk.*, 1954, **14**, 174-177. [Med. Klin., Univ. Kiel.]

When 10 normal subjects took 200 or 300 g. ox brain by mouth, acetalphosphatide in the serum rose to a peak after 10 or 12 hr. and returned to normal after 48 to 60 hr. The mean increase was 70 per cent. When the ox brain was given to 2 subjects as a homogenate by duodenal tube the peak was reached after 7 to 9 hr., otherwise results were similar. The peaks of serum lipid and cholesterol occurred earlier, 1½ to 2 and 2 to 3 hr. after the meal.—D. Duncan.

2310

ANNISON, E. F. **Studies on the volatile fatty acids of sheep blood with special reference to formic acid.** *Biochem. J.*, 1954, **58**, 670-680. [Agric. Res. Coun. Inst. Animal Physiol., Babraham, Cambridge.]

A procedure is described for extraction of the volatile fatty acids in 10 to 20 ml. blood, for chromatographic analysis by the procedure of James and Martin (Abst. 77, Vol. 22). Formic acid was identified as a constituent of sheep blood to the extent of 10 to 30 per cent. (molar) of the volatile fatty acid present; the acid was also identified chromatographically in the blood of man, goats, cattle, horses, rabbits, cats and dogs. Arterio-venous comparisons did not show the uptake (or production) of appreciable amounts of formate by the actively secreting mammary gland of the goat or the head of the sheep. The total amount of formate in the digestive tract of the sheep was probably insufficient to account for the major part of the blood formate. Sheep urine contained traces of volatile fatty acids, including formate. In sheep and cattle, distribution of volatile fatty acids between cells and plasma indicated that formate was concentrated in the cells.

G. A. Garton.

2311

CLAASSEN, V., VOGELS, R. J., and WÖSTMANN, B. Extrahepatic formation of plasma phospholipids in rats. *Acta physiol. pharmacol. neerl.*, 1951-1952, 2, 553-559. [Netherlands Inst. Nutrit., Amsterdam.] French and German summaries.

Radio-active phosphate was injected into the marrow cavity of the femurs of adult rats. The

animals were killed 5, 12, 15 and 60 min. later. Liver and plasma phospholipids were isolated and their radio-activity was measured.

In all the specific activity of the plasma phospholipids was greater than that of the liver phospholipids, indicating that plasma phospholipids were synthesised outside the liver.—G. A. Garton.

See also Absts. 1484, 1972, 2063, 2242, 2243, 2257, 2328, 2393, 2406, 2407, 2669.

MINERALS

GENERAL

2312

MUHLER, J. C. and DAY, H. G. The effect of various inorganic salts on experimental caries in the rat. *J. Dent. Res.*, 1954, 33, 676. *Proc.* [Dept. Chem., Univ. Indiana, Bloomington.]

2313

LIKINS, R. C., ZIPKIN, I., STEERE, A. C. and McCURE, F. J. The effect of fluorine on the deposition of radiocalcium in the rat. *J. Dent. Res.*, 1954, 33, 670-671. *Proc.* [Nat. Inst. Dent. Res., Bethesda, Md.]

See also Absts. 2372, 2538.

CALCIUM AND PHOSPHORUS

2314

GOVAERTS, J. Isotopic exchanges and the existence of tricalcium phosphate in bone. *Nature*, 1954, 174, 831-832. [Inst. Nuclear Studies, Univ. Liège.]

The results of exchange experiments *in vitro* with radio-active Ca and P supported the view that bone mineral is related to tricalcium phosphate and not to hydroxyl apatite with adsorbed phosphate.—R. Hill.

2315

DALLEMAGNE, M. J., FARRY, C. and POSNER, A. S. The relation between bone salts and certain synthetic apatites. *J. Physiol.*, 1954, 126, 18P-19P. [Inst. Thérap. Exp., Univ. Liège.]

2316

KLINKE, K. Citrat- und Calcium-Resorption. [Citrate and absorption of calcium.] *Monatsschr. Kinderheilk.*, 1954, 102, 372-375. [Kinderklin., Med. Akad., Düsseldorf.]

2317

ACKERMANN, P. G. and TORO, G. Calcium balance in elderly women. *J. Gerontol.*, 1954, 9, 446-449. [St. Louis Chronic Hosp., Mo.]

The subjects were 7 women aged from 68 to 83 years and one only 48 years old but at least 5 years past menopause; all were physically fairly healthy and without marked osteoporosis. They

were on an accurately regulated and well balanced diet providing 35 Cal. per kg. bodyweight daily and all were in positive N balance. Four subjects were tested on 3 levels of Ca intake and 4 on 2 levels. Balance tests lasted 45 or 60 days, with 15 or more days for adjustment beforehand.

The intake in mg. Ca per kg. bodyweight daily when plotted against the balance in the same units gave a regression line intersecting the horizontal axis at an equilibrium intake of 16.7 mg. per kg. The value for elderly men on the same diet at the same time (Abst. 798, Vol. 24) was 18.6 mg. per kg. The value of 16.7 mg. per kg. is much higher than those reported for young adults.—D. Duncan.

2318

ACKERMANN, P. G., TORO, G., KOUNTZ, W. B. and KHEIM, T. The effect of sex hormone administration on the calcium and nitrogen balance in elderly women. *J. Gerontol.*, 1954, 9, 450-455. [St. Louis Chronic Hosp., Mo.]

The subjects were 7 of the women used in the preceding study, and received the same diet. Six of them received 1 mg. oestradiol benzoate in oil intramuscularly twice weekly, the seventh acted as control. Menstruation was later induced in 3 subjects by cyclic withdrawal of oestradiol during one week in each month, and in the other 3 by administration of progesterone on 3 successive days each month.

No effect was found on the N balance, but the 3 subjects initially in negative Ca balance increased their retention. Later administration of large doses of testosterone propionate, 30 mg. daily for 30 days, to 2 subjects greatly increased their retention of both N and Ca, but similar doses of progesterone were less effective.—D. Duncan.

2319

NORDIN, B. E. C. and FRASER, R. The effect of intravenous calcium on phosphate excretion. *Clin. Sci.*, 1954, 13, 477-490. [Dept. Med., Postgrad. Med. Sch., London.]

Five normal young adults and 9 patients not suffering from bone disease, 7 patients with osteomalacia and 10 with osteoporosis were given a

N.A. and R., April 1955

diet containing 100 mg. Ca and 500 to 700 mg. P daily for 3 days before administration of 15 mg. Ca per kg. bodyweight by intravenous infusion in 4 hr. Urine samples were collected at intervals for 24 hr. starting 4 hr. before infusion, and blood samples were taken at the beginning and end of the infusion and 4 and 20 hr. later for estimation of P, Ca and creatinine.

The infusions of Ca produced a decrease in urinary phosphate and a rise in blood phosphate and hence a decrease in the phosphate: creatinine clearance ratio, which reached its lowest level 12 hr. after the beginning of the infusion. The fall was less pronounced with infusions of 8 mg. Ca per kg. bodyweight and was even more pronounced with infusions of 30 mg. Ca per kg. bodyweight. In 2 hypoparathyroid patients there was a rise in the phosphate: creatinine clearance ratio and in urinary P. In the 7 osteomalacia patients the phosphate: creatinine clearance ratio was abnormally high; Ca infusion caused the greatest decrease in the ratio among this group. The administration of 200 U.S.P. units of parathyroid hormone after the infusion of Ca and at the point of maximum depression of phosphate output caused a phosphate diuresis; the absolute rise in hourly phosphate output was the same as that obtained without preceding Ca infusion, but the percentage increase in phosphate: creatinine clearance was greater when the hormone was given after Ca infusion.—G. F. Garton.

2320

SHIRLEY, R. L., JETER, M. A., FEASTER, J. P., MCCALL, J. T., OUTLER, J. C. and DAVIS, G. K. Placental transfer of ^{99}Mo and Ca^{45} in swine. *J. Nutrition*, 1954, **54**, 59-64. [Dept. Animal Husb., Univ. Florida, Gainesville.]

Two sows weighing 299 and 308 lb. during their first pregnancy received, 6 days before the expected date of parturition, 0.9 mC. of ^{99}Mo as sodium molybdate and 0.3 mC. of ^{45}Ca as chloride, in water by stomach tube. Two other sows, weighing 335 and 300 lb. during their second pregnancy, received in the same way 3.16 mC. of ^{99}Mo and 0.87 mC. of ^{45}Ca . All were killed 30 hr. later, after urine and faeces had been collected.

The distribution of the isotopes in the foetal and maternal tissues is tabulated. Very little Mo crossed the placenta, although the concentration in the maternal tissues was high. ^{45}Ca was as widely distributed in the foetal tissues as in those of the sow, and was especially concentrated in the foetal bones.

Most of the ^{99}Mo given was absorbed; on the average 54.7 per cent. of the dose was excreted in urine in the 30-hr. experiment, and only 8.19 per cent. in the faeces, 3 per cent. remaining in the digestive tract. Of the ^{45}Ca , on the other hand,

47.03 per cent. was excreted in the faeces, 6.3 per cent. remained in the digestive tract and only 0.25 per cent. appeared in the urine.—D. Duncan.

2321

HANSARD, S. L. and PLUMLEE, M. P. Effects of dietary calcium and phosphorus levels upon the physiological behavior of calcium and phosphorus in the rat. *J. Nutrition*, 1954, **54**, 17-31. [Univ. Tennessee—Atomic Energy Commission Agric. Res. Programme, Oak Ridge.]

Four groups of weaned rats were fed on diets containing 0.013, 0.3, 0.5 and 1.0 per cent. Ca for 55 days. They were then given radio-active Ca and placed in metabolism cages for 4 days, and were finally killed for analysis.

The low-Ca group showed gross rickets after 55 days on the diet and their weight was only 62 per cent. of that of the other groups. There was no liveweight or other clinical difference between the other 3 groups.

Absorption of dietary Ca was 98 per cent. in the low-Ca group and 45 per cent. in the high-Ca group and there was an increase in endogenous faecal Ca from 8 mg. per kg. bodyweight in low-Ca to 50 mg. in high-Ca animals. From these data daily Ca maintenance requirements for the 3 groups which were apparently normal, receiving diets containing 0.3, 0.5 and 1.0 per cent. Ca, were 5, 11 and 21 mg. Ca.

A larger proportion of radio-active Ca was retained by rats on the low-Ca diets than by those on the high-Ca diet, but the distribution of retained Ca did not differ significantly.

Radio-active P administered to rats reared on low-Ca (0.013 per cent.) and on optimum-Ca (0.5 per cent.) diets was absorbed readily by both groups, but less was retained on the low-Ca than on the optimum-Ca diet.—R. Hill.

2322

BHARUCHA, R. P. and MCCAY, C. M. The retention of calcium from gypsum and phytin by the albino rat in relation to life span. 1. *J. Gerontol.*, 1954, **9**, 439-445. [Dept. Animal Nutrit., Cornell Univ., Ithaca, N.Y.]

The 160 weanling rats were divided into 4 groups on different diets, and 6 males and 6 females from each group were used for 10-day balance studies every 30 or 40 days up to 180 days of age and every 90 to 100 days thereafter. When animals died or became ill they were replaced by healthier animals; this may explain a rise in the Ca balance at 462 days. At the time of each balance trial a rat of each sex from each group was killed for bone studies, but after 270 days only one more lot were killed, at 460 days. The diets contained

(1) 0.3 per cent. Ca phytate and white flour; (2) 0.3 per cent. CaSO_4 and whole wheat flour; (3) 0.6 per cent. CaSO_4 and whole wheat flour; and (4) 0.3 per cent. CaSO_4 and potato flour. These 4 mixtures made up 69 per cent. of the diet, and the other 31 parts consisted of brewer's yeast 10, casein 5, salt mixture without Ca 3, cottonseed oil 10 and cod liver oil 3. The protein content was 15 per cent.

Growth of females was similar on all 4 diets. Males on diet 3, with the highest CaSO_4 intake, became larger than the others, their greatest mean weight being 475 g. against 400 g. Rats on the Ca phytate and white flour diet had rough yellow coats, those on potato flour were very smooth. There was no significant difference in mortality at the 5 per cent. level related to diet, but females outlived males by 113 days.

There was greater retention of Ca from CaSO_4 in the first year. The rats with least available Ca, on the first 2 diets, went into negative balance later than those on the other 2 diets. Except on diet 3, males tended to go into negative balance before females. All were still in positive balance at 280 days of age, and bone volume continued to increase. Differences in percentage of bone Ca were highly significant at the 1 per cent. level; the availability of Ca in the 4 diets by this criterion was, in descending order, diets 4, 3, 2 and 1.

D. Duncan.

2323

CANALS, E., MARIGNAN, R. and CORDIER, S. Recherches sur la médication phosphorée et calcique. Étude des inosito-hexaphosphates. [Research on phosphorus and calcium therapy. Study of the inositol hexaphosphates.] *Bull. Soc. Chim. biol.*, 1954, **36**, 1015-1020. [Lab. Phys., Fac. Pharm., Montpellier.]

Barley was grown in culture solution containing orthophosphoric acid labelled with ^{32}P , and labelled phytin was obtained from the grain and administered to growing cats, rabbits, mice and rats.

Rabbits fixed in their tissues more phytin ^{32}P than did cats of similar age; a kitten of 15 days, fed only on milk, fixed more than one aged $2\frac{1}{2}$ months and fed on meat, but still less than the rabbits. Rats fixed slightly more in the brain, liver and kidneys than rabbits, much more in muscle and bone, which supports the view that the rat has an intestinal phytase. Mice were intermediate between cats and rabbits; they fixed in bone on the average 13 per cent. of the total ^{32}P of phytin, but 24 per cent. of that from tricalcium phosphate.

Commercial phytin reduced the utilisation of ^{45}Ca from a labelled salt in young mice, but only when they received the high dose of 10 mg. phytin daily for 4 days.—D. Duncan.

2324

CLAASSEN, V. and WÖSTMANN, B. S. J. Verschillen tussen de opnemng van Ca^{45} en P^{32} in het skelet van jonge ratten na intraveneuze injectie. [Difference between uptake of ^{45}Ca and of ^{32}P in the skeleton of young rats after intravenous injection.] *Chem. Weekblad*, 1954, **50**, No. 2, 18-21. [Lab. Physiol. Chem., Univ. Amsterdam.]

When ^{45}Ca and ^{32}P are injected into growing rats on a rachitogenic diet with or without vitamin D, about 85 per cent. of ^{45}Ca is taken up by the skeleton in the first hour but only 19 per cent. of ^{32}P . Equations are set up to express the rate of uptake on the assumption that it occurs by exchange at the surface of the bone crystal. Absorption of P by the skeleton is profoundly affected by its ready uptake in other tissues.

When rachitic and normal animals are compared, there is little difference in uptake of ^{32}P by the rat femur at 15 min., but at 24 hr. twice as much has been taken up by the normal femur and very little more by the rachitic femur than was taken up in 15 min. Since the rate of decrease of specific activity of plasma was similar in normal and rachitic groups, the failure of deposition of ^{32}P in rickets is probably to be attributed to the deficit of inorganic P in plasma, 30 μg . per ml., as compared with 65 μg . per ml. in normal rats.

I. Leitch.

2325

BERGER, M., CIER, A. and CIER, J. F. Étude de la croissance et de la minéralisation de greffes de tissu osseux chez le rat blanc. [Growth and mineralisation of bone grafts in the white rat.] *Arch. Sci. physiol.*, 1954, **8**, 357-375. [Lab. Phys. Biol., Inst. Physiol., Lyons.]

Pieces of tail from young rats aged about 20 days were implanted under the skin of the back of host rats of different ages. After from 3 to 64 days the host received 1 μC . of ^{32}P as phosphate by intraperitoneal injection and was killed 24 hr. later. The tail of the host served as control. Total Ca, P and N and ^{32}P were estimated in homogenated digests of graft and control.

In normal tails protein N increased rapidly during growth, but after reaching about 3.10 per cent. of fresh tissue at the 40th day it remained remarkably constant, though in animals aged 500 days or more it tended to be less. The ratio Ca : N rose slowly from the 20th to about the 70th day and then rapidly until the 100th, when it stabilised at about 5. In the old rats it was about 2.4. The P : N ratio behaved similarly. The Ca : P ratio was about 2.3 at all ages. The amount of ^{32}P fixed in 24 hr. fell regularly and rapidly until the 100th day and thereafter did not vary significantly with age. It was considered to indicate the relative rate of calcification of the protein matrix.

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Grafts placed in hosts of the same age as the donor accumulated Ca and P at the same rate as the hosts' tails; the curves were almost identical. Until the 21st day after grafting the grafts took up ^{32}P at about the same rate as the controls, but after this they took up a little more. The adaptation of the graft tissue was thus rapid and complete.

Grafts placed in hosts of 100 days were less regular in behaviour. Of 14 grafts examined 16 to 64 days after insertion 9 had not grown, 3 had grown well and 2 had grown well and also calcified. Total N in the grafts fell in the first week and then rose rapidly in the grafts which took, but in the others it remained low. Ca and P rose from the second week onwards in most grafts. Calcification tended to be more rapid but less regular than in grafts in young hosts. Fixation of ^{32}P was from 5 to 37, on the average 12, times that in the host's tail.

Grafts placed in senescent rats aged about 500 days made little or no linear growth in 5 rats but grew well in 2. Calcification was regular, not rapid and erratic as in the adult rats. The Ca:P ratio was low, mean 1.9. The graft fixed 7 to 41 times as much ^{32}P as the control. N increase was irregular.—D. Duncan.

2326

MUNSON, P. L., TOVERUD, S. U. and KENNY, A. D.
Restriction of dietary calcium intake during the period of molar calcification in the suckling rat. *J. Dent. Res.*, 1954, **33**, 676-677. *Proc. [Biol. Res. Labs., Harvard Sch. Dent. Med., Boston, Mass.]*

2327

TAYLOR, S. **Calcium as a goitrogen.** *J. Clin. Endocrinol.*, 1954, **14**, 1412-1422. [Dept. Surg., Post-grad. Med. Sch., Univ. London.]

Two groups of rats were fed on low-iodine diet containing 358 mg. Ca per 100 g. One group was given 2 per cent. CaCO_3 in addition. A third group was given KI in drinking water. At the end of 6 weeks the rats weighed on the average $150 \text{ g.} \pm 1.0$, 169 ± 3.3 and 200 ± 6.9 respectively. They were then given ^{131}I in $5\text{-}\mu\text{C.}$ doses by intraperitoneal, subcutaneous, or stomach tube injections according to the requirements of the experiments. The radio-activity of the thyroids was measured every 2 hr. and the radio-activity of the alimentary tract after death. The addition of CaCO_3 to the diet increased thyroid weight and ^{131}I uptake, but Ca had little or no effect on the absorption of ^{131}I from the gut. Injection of 50 mg. sodium thiocyanate showed that much of the accumulated ^{131}I was not protein-bound, and most of it was discharged. On the other hand, excess I prevented the goitrogenic action of the high Ca intake, and in this respect Ca differed in its goitrogenic effect

from the thiourea compounds. The mode of action of CaCO_3 in producing goitre is discussed.

B. W. Simpson.

2328

KLEIN, P. D. and JOHNSON, R. M. **Phosphorus metabolism in unsaturated fatty acid-deficient rats.** *J. Biol. Chem.*, 1954, **211**, 103-110. [Detroit Inst. Cancer Res., Mich.]

Male rats weaned at 18 days of age were fed on a fat-deficient diet or a similar diet containing 5 per cent. maize oil. After 14 weeks 4 animals from each group were each given a single subcutaneous injection of $0.45 \mu\text{C.}$ of $\text{Na}_2\text{H}^{32}\text{PO}_4$ per g. body-weight; 4 hr. later they were killed and the livers were removed for estimation of acid-soluble inorganic and organic P, phospholipin, phosphoprotein, deoxypentose nucleic acid (DNA) and pentose nucleic acid (PNA); fractions were assayed for radio-activity and, if appropriate, N content.

No difference in the uptake of ^{32}P into phosphoprotein, phospholipin, DNA or PNA was found between normal and fat-deficient rats. Since after 4 hr. the incorporation of ^{32}P into the acid-soluble P fractions had passed its maximum (Abst. 3258, Vol. 13), the lower specific activity of the acid-soluble organic P found in the livers of fat-deficient animals could not definitely be ascribed to a difference in the rate of incorporation of ^{32}P . The experiment was therefore repeated and the animals were killed 75 min. after injection of the isotope, to correspond with the rate of maximum incorporation of ^{32}P into the acid-soluble P fraction and to precede the time of maximum ^{32}P incorporation into the acid-soluble organic P fraction. No significant difference was observed between the specific activities of the acid-soluble inorganic P in the livers of either group, but the specific activity of the acid-soluble organic P in the livers of the animals given the fat-deficient diet was significantly lower than that found in the rats fed normally.

Further studies *in vitro* on the liver tissue from both diet groups of rats showed no difference in anaerobic glycolysis, suggesting that the decreased uptake of ^{32}P into the acid-soluble organic P fraction in the livers of the fat-deficient animals is related to a dissociation of oxidation from phosphorylation accompanying the oxidation of intermediates in the Krebs cycle by the DPN-linked dehydrogenases.—G. A. Garton.

2329

KUNKEL, H. G. and BEARN, A. G. **Phospholipid studies of different serum lipoproteins employing P_{32} .** *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 887-891. [Hosp., Rockefeller Inst. Med. Res., New York.]

Each of 3 normal subjects and 3 with mild liver disease was given about 0.2 mC. of $\text{Na}_2\text{H}^{32}\text{PO}_4$ by

mouth, and blood samples were taken after 6, 12, 24 and 48 hr. Serum lipoproteins were separated electrophoretically and the radio-activity of the different fractions was estimated after extraction of the phospholipins with ethanol and ether.

The phosphate labelled the α_1 , α_2 and β -lipoproteins; after ordinary meals both the phospholipoid P and the radio-activity of the α_2 -lipoprotein fraction increased. Specific activities of several lipoproteins were similar at different times after the administration of ^{32}P . In experiments *in vitro* the transfer of phospholipid radio-activity from labelled β -lipoproteins to unlabelled α_1 -lipoproteins and from labelled α_1 -lipoproteins to unlabelled β -lipoproteins was demonstrated.

G. A. Garton.

2330

ÅGREN, G., DE VERDIER, C. H. and GLOMSET, J. The incorporation rate of phosphorus into phosphoproteins from different organs. *Acta chem. scand.*, 1954, 8, 1097-1098. *Proc.* [Inst. Med. Chem., Univ. Upsala.]

2331

NEUMANN, H. H. and DiSALVO, N. A. Phosphorus exchange rate in enamel as influenced by chewing. *J. Dent. Res.*, 1954, 33, 677. *Proc.* [Coll. Phys. Surg., Columbia Univ., New York.]

2332

BOGDONOFF, P. D. (Jr.) and SHAFFNER, C. S. Antibiotics and calcium metabolism. *Poultry Sci.*, 1954, 33, 1044. *Proc.* [Univ. Maryland, College Park.]

2333

POLIN, D. and STURKIE, P. D. Effects of starvation on diffusible and non-diffusible plasma calcium in the fowl. *Poultry Sci.*, 1954, 33, 1077. *Proc.* [Rutgers Univ., New Brunswick, N.J.]

2334

SHERLEY, R. L., DRIGGERS, J. C., MCCALL, J. T., NIENBERG, M. and DAVIS, G. K. The rate of deposition and turnover of P^{32} and Ca^{45} in the tissues of the laying hen. *Poultry Sci.*, 1954, 33, 932-936. [Dept. Animal Husb., Univ. Florida Agric. Exp. Stat., Gainesville.]

Ten laying hens and 2 just out of production were injected in the gastrocnemius and breast muscles with 100 μC . of ^{32}P and 50 μC . of ^{45}Ca and were killed after 0.25, 0.5, 1, 2, 3, 8, 24, 96, 98, 240 and 504 hr.

In the bones, both elements reached a maximum concentration 1 to 3 hr. after administration, which remained constant to 240 hr. and then fell. Of the bones studied the pubis and atlas contained least isotope.

^{32}P reached a maximum concentration of 0.05 per cent. in the lungs, spleen, pancreas, brain and bile and slightly more in the heart. Within 2 hr. of the injection, the liver contained 17 per cent., and still 1 per cent. between 240 and 504 hr. The kidney contained a maximum of 6.5 per cent. after 3 hr. Muscles, magnum and uterus reached a maximum after 24 hr., ovaries at 96 hr., but no turnover was observed in the last during 21 days.

^{45}Ca was found in the non-osseous tissue at a very low level, only traces remaining after a few hours.

The daily excreta of the first 3 days contained 15, 7 and 4 per cent. of the ^{32}P dose and 2, 1 and 0.8 per cent. of the ^{45}Ca dose. Thereafter the excreta contained daily about 2.2 per cent. of the ^{32}P and 0.2 per cent. of the ^{45}Ca .—M. J. Head.

2335

WILCOX, R. A., CARLSON, C. W., KOHLMAYER, W. and GASTLER, G. F. The availability of phosphorus from different sources for poult fed purified diets. *Poultry Sci.*, 1954, 33, 1010-1014. [Dept. Poultry Husb., S. Dakota Agric. Exp. Stat., College Station.]

In each of 5 experiments, 10 groups of 20 to 22 day-old poult were given a synthetic ration with 0.06 per cent. P for 4 weeks. The following P supplements were given at 0.8 and 1.0 per cent. levels: (1) dibasic Ca phosphate U.S.P., (2) monobasic Ca phosphate, (3) tribasic Ca phosphate, (4) β tricalcium phosphate, (5) steamed bonemeal, (6) (7) and (8) different defluorinated calcium phosphates, (9) and (10) different commercial dicalcium phosphates, (11) and (12) different rock phosphates, (13), (14) and (15) different colloidal phosphates. CaCO_3 was used to balance the supplementary P.

Supplements 1, 2, 7 and 8 were the most suitable and 11, 12, 13, 14 and 15 were unsuitable; the remainder were intermediate. It is not known why there was such a large variation in the usefulness of the same product from different sources.

M. J. Head.

See also Absts. 1877, 1878, 1942, 2011, 2213, 2372, 2408, 2462, 2666.

MAGNESIUM

2336

YAMANE, G. M. Continuation study of the effects of subminimal amounts of magnesium on the Syrian hamster. *J. Dent. Res.*, 1954, 33, 691. *Proc.* [Sch. Dent., Univ. Minnesota, Minneapolis.]

SODIUM, POTASSIUM, AND SODIUM CHLORIDE

2337

EDELMAN, I. S., JAMES, A. H., BROOKS, L. and MOORE, F. D. Body sodium and potassium. 4. The normal total exchangeable sodium;

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its measurement and magnitude. *Metabolism*, 1954, 3, 530-538. [Dept. Surg., Peter Bent Brigham Hosp., Boston, Mass.]

For parts 2 and 3 see Abst. 865, Vol. 25.

Total exchangeable Na in tissue and red cells from men, women and dogs, all healthy, was calculated after intravenous injection of ^{24}Na as the difference between ^{24}Na injected and that excreted in the urine, divided by the serum specific activity ($^{24}\text{Na}/^{23}\text{Na}$). From the ratio of serum to tissue specific activities equilibrium of distribution was deemed complete 15 to 24 hr. after injection in skin, skeletal and smooth muscle, gastric mucosa and red cells in man, and in skin, skeletal muscle, kidney, brain, liver, heart and red cells in dogs. The mean total exchangeable Na in 21 men was 40.9 and in 6 women 37.8 m. equiv. per kg. bodyweight. The results agree with those in the literature and no trend based on age or sex was revealed, although numbers were insufficient to eliminate statistical differences. The normal standard for human adults was estimated to be 41.0 ± 5 m. equiv. per kg. bodyweight.—A. Hepburn.

2338

IKKOS, D., LUFT, R. and SJÖGREN, B. Distribution of fluid and sodium in healthy adults. *Metabolism*, 1954, 3, 400-404. [Div. Endocrinol., Dept. Int. Med., Serafimerlasarettet, Stockholm.]

Five healthy men and 4 women, aged 21 to 60 years, were subjects in a simultaneous estimation of total body water with antipyrine, of total exchangeable Na with ^{24}Na and of extracellular water with inulin and thiosulphate.

With inulin, intracellular water appeared to represent 70.1 ± 0.7 per cent. and extracellular water 29.9 ± 0.7 per cent. of total body water; the ratio of intracellular to extracellular water was 2.4 ± 0.1 . With thiosulphate the figures were 69.5 ± 0.8 , 30.5 ± 0.8 and 2.3 ± 0.1 . If the figure for inulin space was used, intracellular Na represented 39.7 ± 1.5 per cent. of total exchangeable Na; the mean intracellular Na content was 42.4 ± 2.0 m. equiv. per litre of intracellular water. Extracellular Na represented 60.3 ± 1.5 per cent. of total exchangeable Na. With the figure for thiosulphate space, the corresponding Na figures were 38.8 ± 1.4 , 41.7 ± 1.7 and 61.2 ± 1.4 .

G. F. Garton.

2339

CHEEK, D. Total body chloride of children in potassium deficiency and under circumstances of poor nutrition. *Pediatrics*, 1954, 14, 193-200. [Dept. Paediat., Univ. Toronto.] Spanish summary.

The methods and technique used in a previous study of normal children (Cheek, *J. Appl. Physiol.*,

1953, 5, 639; Abst. 653, Vol. 25) were applied to the study of 9 children with malnutrition and 8 with K deficiency. The first group consisted of 2 with liver disease and low blood protein, 2 with undiagnosed dystrophy and 5 with fibrocystic disease of the pancreas. In this group there was an increase of extracellular water and of total chloride per unit bodyweight, except in one infant with fibrocystic disease of the pancreas who was studied during a heat wave. This infant showed, in terms of bodyweight, loss of extracellular water and of chloride. Subjects with K deficiency were in 2 groups of 4. One group had chronic diarrhoea and were receiving glucose and hypotonic saline intravenously. The other children were in a state of electrolyte depletion, untreated. The first group showed raised extracellular water and total chloride. In the second group there were chloride deficits and, with one exception, reduction of extracellular water. This last responded to KCl administration with an increase in total chloride and clinical improvement. Administration of potassium lactate by vein and KCl and calcium gluconate by mouth to one of the first group caused a reduction of extracellular water and a return to normal total chloride.—F. C. Aitken.

2340

ARIEL, I. M. The effects of acute hypochloremia on the distribution of body fluid and composition of tissue electrolytes in man. *Ann Surg.*, 1954, 140, 150-163. [Dept. Surg., Univ. Minnesota, Minneapolis.]

2341

ROMNEY, S. L., MERRILL, J. P. and REID, D. E. Alterations of potassium metabolism in pregnancy. *Amer. J. Obstet. Gynecol.*, 1954, 68, 119-130. [Dept. Obstet., Harvard Med. Sch., Boston, Mass.]

The histories of 4 patients are discussed: one with low blood K and 3 with high. Electrocardiograms were used to confirm the alteration of blood K levels. The first woman's blood K became low in association with the severe dehydration of *hyperemesis gravidarum*: intravenous K resulted in dramatic improvement. The 3 high levels arose from anuria in association with, respectively, eclampsia, toxic separation of the placenta, and uterine atony after caesarean section. Of these patients the first died 5 days after induction of labour and spontaneous delivery, dialysis with an artificial kidney having been considered and a decision deferred. The second recovered well after dialysis. In the third, dialysis caused improvement which was not maintained, probably because of severe renal damage, but ACTH therapy produced a favourable response.—A. M. Thomson.

2342

FREED, S. C., ROSENMAN, R. H. and SMITH, M. K.
Effect of adrenalectomy upon the pressor action of potassium in hypotensive, potassium-deficient rats. *Circulation Res.*, 1954, 2, 494-498. [Harold Brunn Inst. Cardiovascular Res., Mount Zion Hosp., San Francisco, Calif.]

The low blood pressure of rats depleted of K on a low-K diet was restored to normal in intact rats by parenteral administration of K. In K-depleted rats adrenalectomised 1 or 3 days previously there was only a slight rise in blood pressure in response to parenteral K. The spontaneous retention of K which occurred in K-deficient rats during 30 days after adrenalectomy failed to induce spontaneous recovery of their low blood pressures.

F. C. Aitken.

2343

RACE, G. J. and PESCHEL, E. Pathogenesis of polyarteritis nodosa in hypertensive rats. *Circulation Res.*, 1954, 2, 483-487. [Dept. Pathol., Sch. Med., Duke Univ., Durham, N.C.]

High blood pressures were produced in 80 young female rats by a technique to be described in another paper (Kempner *et al.*, *Circulation Res.*, 1955, 3, 73). These rats were then divided into 5 groups of 10 to 22 and received the following diets: rice with 25 to 50 mg. NaCl daily; rice and meat with 25 to 75 mg. NaCl daily; rice with 75 mg. NaCl daily for 1 to 3 weeks, then without NaCl; a mixed diet of carbohydrate and small amounts of protein, with 75 mg. NaCl daily; rice with 50 to 250 mg. NaCl daily. The 20 normal controls received dog chows containing 200 mg. NaCl daily. The rats with high blood pressure died at ages of from 54 to 454 days with a mean of 127 days, and the means for the different diet groups were similar. Controls were killed at intervals. All were examined histologically for arterial lesions.

The incidence of *polyarteritis nodosa* in the experimental rats was 31.2 per cent. None was found in controls. The initial arterial lesion produced fibrinoid necrosis of the intima, the repair of which led to fibroblastic proliferation throughout the wall and extensive scarring.

D. Duncan.

2344

LESCHI, J. Action d'un régime riche en chlorure de sodium sur le poids des glandes surrénales du rat blanc en période de croissance. [Effect of a diet rich in sodium chloride on the weight of the adrenals of the white rat during growth.] *C.R. Acad. Sci.*, 1954, 239, 720-721.

Groups of young rats received from weaning to the age of 2 or 2½ months diets differing in salt content. The low-salt diet contained, per cent., wheat 87, casein 10, cod liver oil 2 and CaCO₃ 1, with distilled water to drink; the high-salt diet

contained NaCl 2 and NaHCO₃ 2 per cent., at the expense of wheat, with 1 per cent. salt solution to drink. In an experiment run from January to March the adrenals of both diet groups were heavier in relation to bodyweight than those in a similar experiment run from April to June. In both experiments the rats given salt had significantly larger adrenals than those on low salt intake.—D. Duncan.

2345

ROSS, E. J. and SPENCER, A. G. Observations on cation exchange resins in the small and large intestines. *Clin. Sci.*, 1954, 13, 555-566. [Med. Unit, University Coll. Hosp. Med. Sch., London, W.C.1.]

Cation exchange resins were placed in isolated loops of rat small and large intestine and observations were made on the transfer of Na and K ions. By means of radio-active Na and K the absolute rates of transfer and the net exchange were calculated. In the small intestine the uptake per g. resin was 1.7 m. equiv. Na in the first hour; there was a simultaneous transfer off the resin of 0.7 m. equiv. during this time. The net rate of Na uptake was 1.0 m. equiv. per g. resin per hr. Corresponding values for K were 0.5 m. equiv. on and 0.2 equiv. off with a net transfer on to the resin of 0.3 m. equiv. per g. per hr. In the large intestine the rate of transfer of Na was 0.1 m. equiv. per g. hr. on the resin and 0.45 m. equiv. per g. per hr. off the resin with a net exchange of -0.35 m. equiv. per g. per hr. Corresponding values for K were 0.4 m. equiv. on and 0.02 m. equiv. off with a net exchange of 0.38 m. equiv. per g. per hr. Restriction of Na intake produced slower turnover rates for both Na and K in the small intestine and no significant difference in the rates of transfer in the large intestine, but the faecal excretion of Na bound to resin in a group on a low Na diet was only 25 per cent. of that in a normal group.

Adrenalectomised rats on normal Na intake excreted more Na and less K on the resin in the faeces than did normal rats; injection of deoxycorticosterone restored the faecal excretion of these cations to normal. Adrenalectomised rats on a low Na diet excreted less Na on the resin than did adrenalectomised rats on a normal diet, but the ability to conserve Na was considerably less in the adrenalectomised animals.—G. F. Garton.

See also Absts. 2377, 2440, 2762, 2763, 2811.

HALOGENS

2346

FRANKOVSKAYA, S. I. Vliyaniye mestnoi flyuorizatsii na mikroskopicheskiy strukturu i pronitzaemost' tverdykh tkaney zuba. [Effect of local fluoridation on microscopic structure

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and permeability of hard tissue of the tooth.] *Stomatologiya*, 1953, No. 6, 27-28. [Med. Stomatol. Inst., Kiev.]

In preparations of teeth treated with fluoride before extraction, there were, in contrast to untreated teeth, destruction of the surface layer of enamel, extension of the transparent zone of dentine at the enamel-dentine border and loss of definition or disruption of the canals in this area. In permeability of enamel to methylene blue there was no significant difference between treated and untreated teeth. Permeability of enamel to silver nitrate, and, where silver nitrate had been injected into the pulp cavity, the depth of staining of dentine, were less in treated teeth than in untreated.—D. W. Taylor.

2347

BISHOP, J. G., RICHARDSON, A. W. and MUHLER, J. C. Studies concerned with the effects of fluorides on the blood vascular system. *J. Dent. Res.*, 1954, **33**, 648. *Proc.* [Univ. Indiana, Bloomington.]

2348

ZIPKIN, I., LIKINS, R. C., MCCLURE, F. J. and STEERE, A. C. Urinary fluoride excretion on exposure to a fluoridated drinking water. *J. Dent. Res.*, 1954, **33**, 692. *Proc.* [Nat. Inst. Dent. Res., Nat. Inst. Health, Bethesda, Md.]

2349

WEDDLE, D. A. and MUHLER, J. C. Fluorine metabolism in the albino rat. *J. Dent. Res.*, 1954, **33**, 688-689. *Proc.* [Dept. Chem., Univ. Indiana, Bloomington.]

2350

LEHMAN, D., and MUHLER, J. C. Storage of fluorine in the developing rat embryo. *J. Dent. Res.*, 1954, **33**, 669-670. *Proc.* [Dept. Chem., Univ. Indiana, Bloomington.]

2351

HARRIS, N. O. Tracer study of the effect of acute and chronic exposure to sodium fluoride on the thyroid iodine metabolism of rats. *J. Dent. Res.*, 1954, **33**, 661. *Proc.* [U.S. Air Force Sch. Aviation Med., Randolph Air Force Base, Randolph Field, Tex.]

2352

VAN MIDDLESWORTH, L. Radioactive iodide uptake of normal newborn infants. *Amer. J. Dis. Child.*, 1954, **88**, 439-442. [Dept. Physiol., Univ. Tennessee Coll. Med., Memphis.]

The thyroid uptake of radio-active I in 7 normal newborn male infants was studied with a specially constructed scintillation counter. The

test dose of ^{131}I was drawn into a 0.25 ml. syringe with a 27-gauge needle. The gamma radiation in the syringe was counted. The test dose, which was between 1 and 1.5 μC ., was injected deeply into the gluteus maximus muscle of the infant and the gamma radiation in the syringe and needle was again counted, the difference being taken as the amount injected. After 24 hr. the thyroid area was examined and 3 counts of 1 min. each were recorded. The background was counted over the thigh and subtracted from the thyroid count. Corrections for radio-activity decay were also made. Thyroid uptake was computed as a percentage of the injected dose.

In 6 of the 7 infants, 60 per cent. of the ^{131}I was taken up and retained by the thyroids. Two of the infants accumulated 90 per cent. and the lowest amount collected was 46 per cent. These figures suggest that the newborn infant may experience a period of hyperthyroidism.

The results confirm previous investigations which established that in infants 1 to 3 days old, protein-bound I and butanol-extracted I values were compatible with hyperthyroidism. Stress is laid on the fact that the risks attendant on the use of radiation in the very young are unknown. The implications and precautions of the procedure are discussed.—B. W. Simpson.

2353

HICKEY, F. C. and BROWNELL, G. L. Dynamic analysis of iodine metabolism in 4 normal subjects. *J. Clin. Endocrinol.*, 1954, **14**, 1423-1436. [Med. Res. Lab., Providence Coll., R.I.]

Iodine was assumed to be present in the body in 3 identifiable compartments: (1) inorganic iodide in plasma, extracellular fluid and thyroid tissue; (2) organic iodine in the thyroid; (3) organic iodine in the blood and extrathyroidal tissues. The object of this investigation was to find whether this 3-compartment model would explain the metabolism of iodine in normal man. Four comparable subjects from 32 to 48 years, weighing from 182 to 229 lb. and with B.M.R. from ± 0 to -10 per cent. were selected and injected with ^{131}I . Thyroid uptake, renal clearance rate and serum protein-bound iodine were studied for 3 weeks. The data were analysed and I equilibrium values were estimated with an analogue computer. Three of the 4 subjects appeared to be in I balance according to this method of assessment.

B. W. Simpson.

2354

BERSON, S. A. and YALOW, R. S. Quantitative aspects of iodine metabolism. The exchangeable organic iodine pool, and the rates of thyroidal secretion, peripheral degradation and fecal excretion of endogenously synthesized

organically bound iodine. *J. Clin. Invest.*, 1954, **33**, 1533-1552. [Radioisotope Unit, Veterans Admin. Hosp., Bronx, N.Y.]

From 100 to 200 μC . ^{131}I was given by vein as carrier-free NaI to patients in hospital. At intervals thereafter, the radio-activity of the thyroid, blood, urine and faecal excreta was measured. Protein-bound I in plasma was estimated. From these data estimates of the organic I pools of the body, thyroïdal secretion of organic I, metabolic degradation and faecal excretion of organic I were made. The rate of replacement of the organic I pool with newly ingested I was also studied.—D. Duncan.

2355

GLASCOCK, R. F. The secretion of a single tracer dose of labelled iodide in the milk of the lactating cow. *J. Dairy Res.*, 1954, **21**, 318-322. [Nat. Inst. Res. Dairying, Univ. Reading.]

A tracer dose of about 50 μg . radio-active potassium iodide was administered to a 12-year-old lactating Shorthorn cow and the radio-activity in the milk was measured. The maximum specific activity of the milk occurred on the first day and by the fifteenth day it fell to 0.5 per cent. of the maximum. The radio-activity in the milk was in the chemical form of iodide ion. There was some evidence that the specific activity of the urine was much higher than that of the milk.

J. N. Aitken.

2356

HOGNESS, J. R., WONG, T. and WILLIAMS, R. H. ^{131}I excretion after injection of radiothyroxine into hyperthyroid, hypothyroid or normal rats. *Metabolism*, 1954, **3**, 510-517.

Rats of 200 to 240 g. weight were divided into 5 groups of 10: controls, rats given 0.2 per cent. propylthiouracil in the diet for 3 weeks before and during the experiment, rats thyroidectomised 3 weeks before the experiment, rats given subcutaneous injections of 50 μg . L-thyroxine twice daily for 8 days before and during the experiment and rats given subcutaneous injections of 5 mg. thyrotropin in saline twice daily for 4 days before and during the collection period of 4 days, when urine and faeces were separated and collected daily. On the first day all the rats were injected with 10 μC . (0.6 to 0.9 μg .) of ^{131}I -labelled L-thyroxine subcutaneously. Aliquots of the excreta were assayed for total radio-activity and other aliquots for radio-activity associated with thyroxine-like compounds.

The total faecal excretion was much the same for all except the thyroidectomised rats, whose faecal excretion was approximately half that of the others owing to constipation. At the end of 4 days the carcasses were assayed for residual activity and 90 per cent. of the initial activity was

accounted for in all groups. Calculated as a percentage of the dosage, the urinary radio-activity of the groups in order was 32, 17, 34, 41 and 29 and the faecal radio-activity 51, 64, 26, 43 and 51. The most striking features were the fall in urinary radio-activity and the rise in faecal radio-activity in the rats given propylthiouracil, the reduction in faecal activity associated with reduced faecal output in the thyroidectomised rats and the marked contrast between the second and third groups; and the similarity in total radio-activity excreted over the 4 days in all but the thyroidectomised group. Most of the changes observed may be explained on the basis of altered rates of renal and intestinal excretion.—B. W. Simpson.

2357

FAWCETT, D. M. and KIRKWOOD, S. Role of the salivary glands in extrathyroidal iodine metabolism. *Science*, 1954, **120**, 547-548. [Dept. Chem., McMaster Univ., Hamilton, Ont.]

The submaxillary, parotid and sublingual glands of rats under Nembutal anaesthesia were removed and 100 μg . of diiodotyrosine labelled with 100 μC . of ^{131}I was injected into the jugular vein. A 0.5-ml. sample of blood was collected from the tail vein as soon as possible after the injection to give zero-time values for iodide and diiodotyrosine. Further samples were collected after 10, 30, 60 or more minutes. The proportions of iodide and diiodotyrosine were compared by counting over the appropriate spots on paper chromatograms with a Geiger counter. Control rats were treated in the same way, but the glands were left intact.

Injected diiodotyrosine remained in the blood of the operated rats, but disappeared very rapidly from the blood of the intact rats. The salivary glands had removed the I from the diiodotyrosine and returned it to the thyroid. It is suggested that the salivary glands have a major role in extrathyroidal metabolism of organic I in the body and act as "reverse thyroids".—B. W. Simpson.

2358

ALLGRETTE, N. and AZABAGIĆ, S. Effect of iodine on the insular apparatus of the pancreas in the rat. *Arch. internat. Pharmacodyn.*, 1954, **98**, 369-372. [Inst. Physiol., Med. Fac., Univ. Zagreb.]

Three comparable groups of 10 rats weighing 106 to 152 g. were fed on a standard ration to appetite. Instead of water they were given solutions of 0.01 N NaCl, NH_4I and NaI, the average volumes consumed being 8.48, 8.26 and 6.65 ml. per rat daily. After 60 days the rats were killed; the pancreas of each was fixed and stained by the method of Gomori, and alpha and beta cells of the islets of Langerhans were counted.

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The proportion of beta to alpha cells was normal in the group which had NaCl, but in both groups given iodides the ratio was significantly depressed. Na, NH_4 and Cl ions did not induce any change in the ratio, but the depressive effect of the iodide ions was highly significant at $P < 0.001$. The average beta to alpha cell ratio for the 3 groups was 15.24, 9.84 and 8.50, respectively. It is suggested that the iodide first became organically bound, and in this form was responsible for the action on the pancreas.—B. W. Simpson.

2359

SHELLABARGER, C. J. and GODWIN, J. T. **Studies on the thyroidal uptake of astatine in the rat.** *J. Clin. Endocrinol.*, 1954, **14**, 1149-1160. [Brookhaven Nat. Lab., Div. Pathol., Med. Dept., Upton, Long Island, N.Y.]

Experiments were made to test the ability of the thyroid gland to concentrate the heavy radio-halogen element 85 (astatine, At) and to compare its effects with those of ^{131}I . In experiments with rats At was concentrated by the thyroid, but not to such an extent as ^{131}I . Thiouracil enhanced the uptake of At. In histological preparations of thyroid tissue, clusters of x-ray tracks were thought to represent clusters of At atoms.—B. W. Simpson.

2360

HAMILTON, J. G., DURBIN, P. W. and PARROTT, M. **The accumulation and destructive action of astatine²¹¹ (eka-iodine) in the thyroid gland of rats and monkeys.** *J. Clin. Endocrinol.*, 1954, **14**, 1161-1178. [Div. Med. Phys., Crocker Lab., Univ. California, Berkeley.]

Both ^{211}At and ^{131}I slowed growth in rats and monkeys. The early effect was ascribed to radiation injury and the late effect to lack of thyroid hormone. Myxoedema was observed in 4 of the monkeys injected with ^{211}At . In the rats, ^{131}I completely obliterated the thyroid gland, parathyroids and adjacent peritracheal tissues. ^{211}At had no such effect on parathyroids or peritracheal tissues, but did destroy thyroid tissue. A high incidence of neoplastic-looking mammary tumours was found in rats after injection of ^{211}At , and some pulmonary metastases occurred. The tumours were ascribed to endocrine changes, not to the direct action of radiation.—B. W. Simpson.

See also Absts. 1983, 2170, 2640, 2748, 2777.

IRON AND COPPER

2361

OTTINGER, L. (Jr.), MILLS, W. B. and HAHN, P. F. **Iron absorption in premature and full-term infants.** *J. Pediat.*, 1954, **45**, 302-306. [Dept. Paediat., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

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A single test dose of ^{59}Fe was given in the first week of life to 14 full-term and 10 premature infants. The iron was given as ferrous chloride and amounted to about 1.0 μg . elemental Fe. Two to 6 weeks later samples of blood were withdrawn. The blood of premature infants contained from 0.29 to 6.8, mean 2.8, per cent. of the test dose of ^{59}Fe and that of full-term infants contained from 0.4 to 8.2, mean 3.2, percent. No relation was found between the percentage of the test dose of Fe in the infant's blood and the Hb value of the mother's. F. C. Aitken.

2362

INGALLS, R. L. and JOHNSTON, F. A. **Iron from gastrointestinal sources excreted in the feces of human subjects.** *J. Nutrition*, 1954, **53**, 351-363. [New York State Coll. Home Econ., Cornell Univ., Ithaca.]

The subjects were 8 women 23 to 37 years of age, 145 to 168 cm. in height and 48.6 to 64.4 kg. in weight, but only 5 completed the experiment. Before each experimental period the subject avoided foods rich in Fe for 3 days; the experimental diet was then taken for 2 days of adjustment and 6 days of balance studies. In 3 such experimental periods the diets supplied about 1, 2 and 3 mg. Fe daily. The diet containing 1 mg. Fe consisted of 2 kg. milk daily and sugar dissolved in distilled water to meet the energy requirements. In the second period bread, apple sauce and peaches replaced part of the sugar, and in the third period egg and more peaches.

When the mean Fe intake was 1.03 mg. the mean excretion was 0.99 mg. The differences rose to 0.23 and 0.51 mg. when the intakes were 2.15 and 3.22 mg., and variability also increased. A regression was calculated of faecal excretion on intake, using also 3 pairs of values given by Johnston *et al.* (Abst. 886, Vol. 25) for women on intakes of 1.48 and 1.70 mg. Fe. The regression line when extended to zero intake gave a faecal excretion of 0.17 mg.

When it was assumed that gastro-intestinal Fe in the faeces is constant at all Fe intakes, and that the percentage absorbed at all the 3 low intakes of 1 to 3 mg. is nearly the same, the percentage absorbed was estimated to lie between 18 and 25 per cent. and the gastro-intestinal Fe output between 0.12 and 0.27 mg., which agrees with the estimate by the regression method.

The positive correlation between faecal dry weight and Fe output was highly significant except in 2 subjects given mineral oil.

D. Duncan.

2363

HUTCHISON, H. E., LOWTHER, C. P. and ALEXANDER, W. D. **On the appearance in the marrow of iron administered intravenously.**

- J. Clin. Pathol.*, 1954, 7, 281-283. [Dept. Pathol., Univ. Glasgow.]
- In a study of 20 patients with Fe-deficiency anaemia treated with intravenous Fe, the appearance and distribution of the stainable Fe in the marrow were thought to be accounted for by the phagocytic activities of the reticulo-endothelial system.—F. C. Aitken.

2364

- KEIDERLING, W., WÖHLER, F. and ALTMEYER, H. Zur Physiologie und Pathologie des Speichereisens. 2. Tierexperimentelle Untersuchungen über Ferritin und Hämosideringehalt von Leber und Milz unter physiologischen und pathologischen Bedingungen. [Physiology and pathology of stored iron. 2. Experimental studies with animals on the ferritin and haemosiderin content of liver and spleen in physiological and pathological conditions.] *Arch. exp. Pathol. Pharmacol.*, 1954, 223, 375-387. [Med. Klin., Univ. Freiburg i. B.]

2365

- CONLEY, C., MATRONE, G., WISE, G. H. and WAUGH, R. K. Iron and copper studies with dairy calves. *J. Animal Sci.*, 1954, 13, 980. *Proc. [N. Carolina Agric. Exp. Stat.]*

2366

- CARTWRIGHT, G. E., HODGES, R. E., GUBLER, C. J., MAHONEY, J. P., DAUM, K., WINTROBE, M. M. and BEAN, W. B. Studies on copper metabolism. 13. Hepatolenticular degeneration. *J. Clin. Invest.*, 1954, 33, 1487-1501. [Dept. Med., Coll. Med., Univ. Utah, Salt Lake City.]

2367

- DICK, A. T. Preliminary observations on the effect of high intakes of molybdenum and of inorganic sulphate on blood copper and on fleece character in crossbred sheep. *Austral. Vet. J.*, 1954, 30, 196-202. [Div. Animal Health Prod., C.S.I.R.O., Animal Health Res. Lab., Parkville, Victoria.]

Four groups of 4 wether sheep received for 2 months a basal diet of chaffed oat hay 80 and wheat bran 20 per cent., with copper sulphate and ammonium molybdate to make their total daily intake 10 mg. Cu and 5 mg. Mo. Potassium sulphate was added to make the sulphate intakes of the 4 groups 1.1, 1.8, 3.1 and 5.7 g. daily. Blood samples were taken twice, with 2 days between, and after the second sample the 4 sheep on each sulphate intake received a different dose of Mo, 15, 30, 60 and 90 mg., respectively. Blood samples were taken after 24 hr., and the Mo drench and blood sampling were repeated for 3 days.

Blood Mo rose in all sheep during the days of high Mo intake, and at each level of sulphate the rise of blood Mo was related to the Mo intake. For each Mo intake the rise was less as sulphate intake increased. The rise in blood Cu for each sulphate intake also was greater the higher the Mo intake, and the effect of the Mo increased with higher sulphate intake.

In another experiment 3 sheep received a basal ration of equal parts by weight of chaffed alfalfa and oat hays. The mineral intakes were adjusted to 8 g. sulphate, 80 mg. Mo and 4.6 mg. Cu daily. Blood Cu rose within 3 days to about 0.125 mg. per 100 ml. Within 7 days the wool lost its crimp and became straight and steely (see Abst. 2669, Vol. 18). When after 6 weeks the Mo intake was reduced to 20 mg. daily the wool regained its crimp. The experiment was repeated in one sheep; in another, withdrawal of Mo from the diet had no effect on the fleece. The liver Cu values did not fall.

It is suggested that with high intakes of Mo and sulphate a large proportion of the circulating Cu is not physiologically available.—D. Duncan.

See also Absts. 2160, 2446, 2447, 2789, 2791, 3125.

OTHER MINERALS

2368

- WYNN, W. and HALDI, J. Dental caries in the albino rat on high sucrose diets containing different amounts of aluminum. *J. Nutrition*, 1954, 54, 285-290. [Dept. Physiol., Div. Basic Sci. Health Serv., Emory Univ., Ga.]

The difference in caries-producing effect between 2 synthetic diets rich in sucrose (see Abst. 957, Vol. 24) was considered to have possibly arisen from the presence of a small amount of Al in the Emory salt mixture and its absence from the Harvard one. Groups of Wistar rats were therefore given a synthetic diet of sucrose 64, casein 20, fat 8, extract of yeast and liver 4, and salt mixture 4 per cent., without added Al or with Al at levels of 0.16, 2 or 20 p.p.m. Experiments were made with normal rats and with rats desalivated at 120 days old; all were killed at 180 days old.

Desalivation increased both the number of lesions and their severity, but the differences produced by the variation in Al intake were small and not statistically significant. At these levels, too, the appetite and growth of the rats were unaffected.—D. Harvey.

2369

- PARKER, H. E., ANDREWS, F. N., CARRICK, C. W., CREEK, R. and HAUGE, S. M. Effect of manganese on bone formation studied with radioactive isotopes. *Poultry Sci.*, 1954, 33, 1075. *Proc. [Purdue Univ., Lafayette, Ind.]*

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2370

WEIR, W. C. and RENDIG, V. V. **Serum inorganic sulfate sulfur as a measure of the sulfur intake of sheep.** *J. Nutrition*, 1954, **54**, 87-96. [Dept. Animal Indust., Univ. California, Davis.]

Yearling wethers received different quantities of sulphur and serum inorganic sulphate was estimated.

A daily intake of 1.7 to 2.3 g. S, of which almost half was from methionine added to the hay diet, gave serum values during 8 days of 2.2 to 3.9 mg. per 100 ml. This was followed by 10 days during which the intake was 1.0 to 1.5 g., derived from the same hay without methionine added. The serum S fell to just under 1.0 mg. per 100 ml. Finally the same sheep were fed on unsupplemented hay to appetite for 11 days. The daily S intake increased to 1.6 to 2.3 g., and serum sulphate S to about 2.7 mg. per 100 ml.

In a second experiment a semi-synthetic diet containing only 0.02 per cent. S was given with and without elemental S. Serum values fell to about 0.07 μ g. per 100 ml. on the unsupplemented diet providing 0.2 g. S daily, but rose rapidly to 2.9 to 4.1 μ g. per 100 ml. when elemental S was given in amounts from about 4.0 to 6.0 g. daily.

It is suggested that serum sulphate concentration is useful for detecting low S intake in sheep.

R. Hill.

2371

KULWICH, R., STRUGLIA, L., BOURNE, H. C. and PEARSON, P. B. **Uptake of radiolabeled sodium sulfate given repeated doses of labeled sodium sulfate.** *J. Animal Sci.*, 1954, **13**, 990-991. *Proc.* [U.S. Dept. Agric.]

2372

FRIBERG, U. and RINGERTZ, N. R. **Uptake of radiosulphate and radiophosphate in various tissues of normal and scorbutic guinea pigs.** *Exp. Cell. Res.*, 1954, **6**, 527-528. [Dept. Histol., Karolinska Inst., Stockholm.]

Young female guineapigs weighing about 200 g. were given a scorbutogenic diet with or without addition of ascorbic acid. Some deprived and non-deprived animals were given an injection of radioactive ^{35}S in Na_2SO_4 , and some were given radioactive ^{32}P as orthophosphate. They were killed 48 hr. later. With ^{35}S the radio-activity in counts per min. per mg. wet tissue of blood, liver, spleen, brain, kidney, skin, muscle and bone from scorbutic animals was only about one-third that in tissues from non-deprived animals. In cartilage the radio-activity was less, but not significantly so. With ^{32}P there was no significant difference except in bone, where the uptake was less by about one-third in the scorbutic animals.

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It is concluded that the results probably, at least in part, reflect diminished formation of sulphomucopolysaccharides.—E. M. Hume.

2373

DAVIS, G. K. and LINDENSTRAUTH, R. W. **The effect of molybdenum upon the metabolism of bone.** *J. Animal Sci.*, 1954, **13**, 980. *Proc.* [Florida Agric. Exp. Stat.]

2374

JETER, M. A. and DAVIS, G. K. **The effect of dietary molybdenum upon growth, hemoglobin, reproduction and lactation of rats.** *J. Nutrition*, 1954, **54**, 215-220. [Dept. Animal Husb., Florida Agric. Exp. Stat., Gainesville.]

Rats were given a synthetic diet with Cu at 2 levels and Mo at 2 or 4. With Cu at 20 p.p.m., Mo was either < 1 or 80 p.p.m. and with Cu at 5 p.p.m., Mo was < 1, 20, 80 or 140 p.p.m. Growth was studied from weaning to 11 weeks of age, and reproductive performance thereafter.

With the high Cu intake, Mo did not affect growth in rats of either sex; at 5 p.p.m. of Cu growth of males was retarded at all levels of Mo intake and more so as the levels rose, but in females no retardation of growth was seen until the Mo level reached 80 p.p.m. In contrast to findings reported with ruminants, Hb values provided no evidence that Mo produced anaemia in rats. Achromotrichia, sometimes with alopecia, appeared with 80 or 140 p.p.m. Mo, but it was not universal. At these levels reproduction in females was reduced by infertility which, from matings with females of proven fertility and from histological examination of testes, was shown to be in the males. At the higher levels loss of weight by the females per young rat nursed and lower weight of the young at weaning showed that lactation had been adversely affected.—D. Harvey.

2375

FEASTER, J. P., HANSARD, S. L., McCALL, J. T., SKIPPER, F. H. and DAVIS, G. K. **Absorption and tissue distribution of radiozinc in steers fed high-zinc rations.** *J. Animal Sci.*, 1954, **13**, 781-788. [Florida Agric. Exp. Stat., Gainesville.]

Of Zn given by mouth to growing steers about 70 per cent. appeared in faeces and 0.3 per cent. in urine. When it was administered by vein, about 20 per cent. was recovered in faeces and 0.25 per cent. in urine.

Radio-active Zn given 6 days before the steers were killed was retained chiefly in the soft tissue, particularly the pancreas, liver, pituitary, kidney and adrenals. Zn in the skeleton was distributed approximately according to the metabolic activity.

of bones or parts of bones; *i.e.*, cancellous bone retained more than compact bone.

Steers given zinc carbonate supplying 1000 p.p.m. Zn in the diet gave the same results as those given 50 p.p.m. Zn.—R. Hill.

2376

WOLFF, H. and RINGLEB, D. Histochemische Untersuchungen über das Inselzink. [*Histochemical studies of zinc in the islets of Langerhans.*] *Ztschr. ges. exp. Med.*, 1954, **124**, 236-256. [Med. Poliklin., Univ. Marburg a.d. Lahn.]

Zn was studied in the pancreas of several species of small animals after intravenous injection of dithione in aqueous solution.

Of 24 rabbits all showed a strongly positive reaction for Zn in the islet cells. Under high magnification the reaction was shown mostly by violet-stained intracellular granules distributed near capillaries, in both alpha and beta cells. In

20 rats the alpha cells were strongly positive, the beta cells lightly stained. In 12 guineapigs no Zn was detected in cells of either type. Normal dogs showed a high concentration in the beta cells but none in the alpha cells and alloxan-diabetic dogs showed no reaction.

Mice received the dithione intraperitoneally instead of by vein; the positive reaction for Zn was almost confined to beta cells.

The Zn content of alpha cells in rats fell during starvation and was small after 72 hr.; it was also reduced after insulin, in the compensatory hypoglycaemic phase after glucose injection, after adrenaline injection and after stimulation of sympathetic nerves, though intraperitoneal infusion of acetylcholine was without effect.

In rabbits the Zn content of the beta cells rose during starvation for 96 hr., and decreased somewhat after administration of glucose or adrenaline, though not after insulin.—D. Duncan.

See also Abst. 2117.

ACID BASE EQUILIBRIUM

2377

VAN GOIDSSENHOVEN, G. M. T., GRAY, O. V., PRICE, A. V., and SANDERSON, P. H. The effect of prolonged administration of large doses of sodium bicarbonate in man. *Clin. Sci.*, 1954, **13**, 383-401. [Med. Unit, St. Mary's Hosp., London, W.2.]

Thirty-three patients with peptic ulcer were given up to 140 g. NaHCO₃ daily for 3 weeks without ill effect. There was no evidence of kidney damage except in one patient who developed persistent albuminuria. All showed marked alkalosis. Large quantities of Na were retained, and this was associated with a greatly expanded extracellular space. Two patients with pyloric stenosis are discussed separately because of their unusual response to alkali. Plasma CO₂ rose much higher than would have been expected in normal subjects, but blood urea was not much increased.—F. C. Aitken.

2378

LIPSKY, S. R., ALPER, B. J., RUBINI, M. E., VAN ECK, W. F. and GORDON, M. E. The effects of alkalosis upon ketone body production and carbohydrate metabolism in man. *J. Clin. Invest.*, 1954, **33**, 1269-1276. [Dept. Int. Med., Sch. Med., Yale Univ., New Haven, Conn.]

The effect of large infusions of sodium acetate or equimolar solutions of sodium bicarbonate was studied in normal and diabetic subjects. In normal subjects there was no appreciable change in blood sugar after acetate or bicarbonate. Blood ketones increased slightly but significantly after acetate but not after bicarbonate. In diabetes,

blood sugar decreased after acetate or bicarbonate; blood ketones increased significantly in mild diabetes after acetate and in severe diabetes after acetate or bicarbonate. In 2 diabetic subjects acetate caused depression of splanchnic glucose output and peripheral glucose concentration and increase of splanchnic ketone production and peripheral blood ketones.—F. C. Aitken.

2379

BONTING, S. L. The effect of a prolonged intake of phosphoric acid and citric acid in rats. *Thesis, Univ. Amsterdam*, 1952, pp. viii + 97.

The literature on regulation of acid base equilibrium and the effects of acid intake is reviewed: there are 170 references. The work was done because of the widespread use of phosphoric acid and citric acid in soft drinks.

Rats were fed to appetite on a basal diet containing, per cent., casein 6, dried whole milk 10, whole wheat flour 34.5, potato flour 33, groundnut oil 6.5, cod liver oil 0.5, linseed oil 0.5, brewer's yeast 5 and salt mixture 4. Phosphoric acid was added at 0.05, 0.15, 0.40 and 0.75 per cent. for some groups, and others received 0.15, 0.45 or 1.20 per cent. citric acid. Only the groups with the 2 highest intakes of phosphoric acid and the highest of citric acid were kept in the experiment after 6 months, and observations continued through 2 filial generations.

There was no harmful effect of even the highest intakes of either acid on growth in 3 generations, or on reproduction, or on the blood picture of the first 2 generations. No pathological change could be attributed to the acids. The incidence of

caries was the lowest ever recorded in the colony, but calcium was deposited in the dentine and the molar teeth of rats receiving phosphoric acid were very white. Dental attrition was greatest in rats receiving phosphoric acid. Two metabolism experiments were made, one with control periods at beginning and end and acid given for 8 weeks, the other comparing control rats with rats given acid for the preceding 8 months. P turnover was higher in both experiments in rats given phosphoric acid; P excretion in urine increased, but not that in faeces. There was a probable, but not significant, increase in Ca retention. Total N balance was unchanged, but phosphoric acid, though not citric, caused a considerable increase in ammonia excretion at the expense of urea. Total base

excretion was unchanged, but titratable acidity of the urine was increased and its pH was reduced by phosphoric acid. Serum inorganic P was raised by both acids. Serum Ca was less in rats receiving citric acid than in other groups. There was no acidosis even with the highest acid intake in the second generation after a year. There was no important change in liver weight or total P, K, Na or Cl content, or in the kidneys. Tests with ^{32}P indicated no change in the P metabolism of bone.

It is concluded that since in man the mechanisms involved in neutralisation and excretion of ingested acids resemble those in the rat, no ill effect is to be expected from prolonged consumption of beverages acidulated with phosphoric acid or citric acid.—D. Duncan.

METABOLISM OF WATER

2380

YAMAGUCHI, Y., ASANO, S., MATSUKI, S., HIWATARI, S., TANIDA, R., DOI, K. and KATO, E. The effect of muscular exercise on the body fluid balance. *Keio J. Med.*, 1953, 2, 49-58. [Dept. Int. Med., Sch. Med., Univ. Keio.]

Three healthy young men were maintained on a constant diet for 9 weeks, during the middle 3 of which they exercised continuously for 50 min. twice a day on a bicycle ergometer and received an additional 500 Cal. daily as fat and carbohydrate. Bodyweight, water intake and output, plasma volume and thiocyanate space were measured. It was concluded that body fluid to the extent of about 1 litre was retained, chiefly in extracellular space, during the period with exercise, and was excreted within a few days after the exercise ceased.

E. M. Hume.

2381

TENG, H. C., SHAPIRO, A. P. and GROLLMAN, A. Volume of the fluid compartments in human and experimental hypertension. *Metabolism*, 1954, 3, 405-411. [Dept. Int. Med., Southwestern Med. Sch. Univ. Texas, Dallas.]

Plasma volume, extracellular fluid volume and total body water were estimated in 20 hypertensive patients and 20 normal subjects of nearly similar age, height, weight and body conformation. Antipyrine space was estimated in 16 hypertensive and 12 normal dogs, total body water was estimated with antipyrine in 5 dogs before and after induction of hypertension, and deuterium oxide space in 5 male hypertensive dogs and 5 male control animals matched for size, weight and breed.

There was a significantly greater extracellular fluid volume in the 20 hypertensive patients, slightly but not significantly more total body water and no greater plasma volume than in the normal subjects. Significant increases in total body water

occurred in dogs after induction of hypertension; in the other groups of dogs studied the difference was not significant.—G. F. Garton.

2382

LINAZASORO, J. M., JIMÉNEZ DÍAZ, C. and CASTRO MENDOZA, H. El riñón y la regulación de la sed. [The kidney and the regulation of thirst.] *Rev. clín. española*, 1954, 54, 138-141. [Sección Bioquím., Inst. Invest. Med., Madrid.] English, German and French summaries.

In nephrectomised animals thirst is not in proportion to their water requirement, but thirst occurs normally in nephrectomised animals given an injection of active renal extract after operation. For 20 normal fasting rats the average daily intake of water for 2 days was 8.62 ml., for 24 nephrectomised animals it was only 5.04 ml., and 25 rats given renal extract after operation drank 7.08 ml.

It is suggested that the kidney contributes to osmotic regulation by producing a thirst hormone. M. B. Richards.

2383

CRAMPTON, E. W. and LLOYD, L. E. The effect of water restriction on the food intake and food efficiency of growing rats. *J. Nutrition*, 1954, 54, 221-224. [Dept. Nutrit., Macdonald Coll., McGill Univ., Que.]

In 4 tests 164 rats aged from 4 to 8 weeks were fed to appetite on stock diet. They were paired and one of each pair was allowed half the water voluntarily taken by the other.

The 50 per cent. restriction of water intake led to an average reduction of 27 per cent. in food intake and 51 per cent. in weight gain, and the ratio of gain to food intake was reduced by 30 per cent.—D. Duncan.

See also Absts. 1684, 2146, 2338, 2339.

METABOLISM OF OTHER SUBSTANCES

2384

TEDESCHI, G. G. Eliminazione urinaria della coarbossilasi e degli acidi lattoflavinfosforico, serinfosforico, treoninfosforico e creatinfosforico. [Excretion in the urine of coarboxylase and of the phosphates of riboflavin, serine, threonine and creatine.] *Quad. Nutrizione*, 1952, 12, 486-493. [Ist. Fisiol. Gen., Univ. Rome.] French, English and German summaries.

Experiments were made on groups of 3 rats weighing about 100 g. and maintained on stock diet, but allowed only water for 24 hr. before each test. The substances to be studied were injected subcutaneously. Urine was then collected for an hour and the bladder was emptied at the end. The composition of the urine was studied by paper chromatography.

All the phosphorylated compounds given, coarboxylase and riboflavin, serine, threonine and creatine phosphates, were excreted at least partly unchanged.—D. Duncan.

2385

SIRNES, T. B. Voluntary consumption of alcohol in rats with cirrhosis of the liver. A preliminary report. *Quart. J. Studies Alcohol*, 1953, 14, 3-18. [Dept. Pharmacol., Univ. Oslo.]

Twenty rats, 3 months old, maintained on stock diet, were injected twice a week with 0.2 ml. carbon tetrachloride. Some were killed and histological changes characteristic of cirrhosis were found in the liver. Injection with CCl_4 was stopped and, 3 weeks later, the rats were given the choice of water or 20 per cent. ethanol solution to drink. The amounts consumed were measured daily for from 36 to 55 days. Some rats died and others were killed. The presence of cirrhosis was confirmed at autopsy. Rats without experimental cirrhosis were given alcohol in the same way for comparison. For 10 rats with confirmed cirrhosis the mean daily consumption was 0.82 ml. absolute alcohol per 100 g. bodyweight, compared with 0.19 for normal rats of the same age.

Estimations of alcohol in the blood and urine showed that alcohol could be oxidised rapidly by cirrhotic rats.—E. M. Hume.

2386

VITALE, J. J., NAY, J. and HEGSTED, D. M. Partial starvation and alcohol metabolism. An example of adaptation to undernutrition. *J. Nutrition*, 1954, 53, 533-541. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Adult rats were given to appetite a standard purified diet containing 20 per cent. protein;

intake was on the average 12 to 14 g. per rat daily. Six similar rats were given 10 g. per rat daily. When no loss of weight occurred in 5 days the intake of both groups was reduced to 8 g., then to 6 g. daily. Another group of rats which received food to appetite was changed immediately to an intake of 5 g. daily. At different times animals from each group were injected with 20 per cent. ethanol containing ethanol- $1\text{-}^{14}\text{C}$, at 2 g. per kg. bodyweight; the ability to oxidise the ethanol was estimated from the excretion of $^{14}\text{C}_2\text{O}$ in the next 6 hr.

Oxidation of ethanol became slower as the rats lost weight; normal rats metabolised 80 per cent. of the injected ethanol in 6 hr., a bodyweight loss of 10 g. produced a 12 per cent. decrease in the amount of ethanol oxidised and there was a 40 per cent. decrease when the animals had lost 40 g. bodyweight. When weight became stabilised on the lower food intakes the ability to oxidise ethanol returned to normal. When the rate of weight loss was increased by more severe restriction the results were similar but more rapid. In vitamin- B_1 -deficient rats the amount of ethanol oxidised fell as the deficiency progressed, but, as bodyweight never became stabilised, the fall in ethanol oxidation continued until death.

G. F. Garton.

2387

VITALE, J. J., HEGSTED, D. M., McGRATH, H., GRABLE, E. and ZAMCHECK, N. The effect of acetate, pyruvate, and glucose on alcohol metabolism. *J. Biol. Chem.*, 1954, 210, 753-759. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

The oxidation of injected ethanol- $1\text{-}^{14}\text{C}$ as measured by expired radio-active CO_2 in rats was decreased by about half by injection of pyruvate or acetate; the disappearance of alcohol from the blood was delayed. In rats deficient in vitamin B_1 the inhibition of oxidation of alcohol produced by pyruvate was less.

The alcohol was presumably oxidised to acetaldehyde by alcohol dehydrogenase, which requires diphosphopyridine nucleotide (DPN) as a coenzyme, and then further to acetate, which is oxidised in the tricarboxylic acid cycle along with pyruvate. The inhibition may be due to competition for DPN, which is also essential in the tricarboxylic acid cycle. This view was supported by the observation that nicotinamide, which is the active constituent in the DPN molecule, when given in large amounts also prevented the inhibition.

Sucrose administered by mouth raised the blood sugar and decreased the rate of disappearance of alcohol in human subjects.—A. Hepburn.

2388

- VIDAL, L. T. Influencia del alcohol sobre la glucemia. [Effect of alcohol on blood sugar.] *Crón. Méd., Lima*, 1952, **69**, 3-17. [Cát. Farm., Fac. Farm., Lima.]
A study with rabbits.

2389

- WARMING-LARSEN, A. Ketone metabolism in obesity. 2. *Acta med. scand.*, 1954, **150**, 47-52. [Med. Afrd., Blegdamshosp., Copenhagen.]

For part 1 see Title 3366, Vol. 18.

Blood ketones were studied during fasting in 42 obese persons, including the 16 described in the earlier paper. The controls were the same 25 subjects as before.

At the beginning of starvation blood ketone concentrations, expressed as β -hydroxybutyric acid, did not differ significantly between obese and normal subjects, but on the 4th morning of fasting the values in the obese persons showed a much wider range of variation than in the normal. No endocrine disturbance was found in these patients. The metabolic change involved is discussed.

D. Duncan.

2390

- HOVE, E. L., COPELAND, D. H. and SALMON, W. D. Choline deficiency in the rabbit. *J. Nutrition*, 1954, **53**, 377-389. [Dept. Animal Husb., Agric. Exp. Stat., Alabama Polytech. Inst., Auburn.]

Weanling rabbits fed on a basal diet deficient in choline gained a little weight and then remained about the same or else lost weight. They lost their hair, and death ensued within 66 to 217 days. There was moderate or severe nodular cirrhosis of the liver and extensive tubular necrosis of the kidneys. Two adult rabbits fed on the same diet immediately began to lose weight and died after 45 and 53 days with severely cirrhotic and fatty livers.

The addition of choline to make up 0.13 per cent. of the diet prevented these disorders and maintained growth. There was no further increase in growth rate with 0.20 per cent. choline, and 0.05 per cent. was insufficient. Methionine could replace choline to a certain extent, and with monomethylethanolamine, but not ethanolamine, there was immediate growth. Vitamin B₁₂ with folic acid appeared to improve the utilisation of methionine, but did not spare suboptimum levels of choline or promote the methylation of monomethylaminoethanol by methionine to form choline.

Moderate anaemia developed and the plasma was bright golden yellow after 70 days. There was no jaundice, and a test for bile pigments was

only slightly positive at a much later stage of choline deficiency. A substance, apparently porphobilinogen, a proposed intermediate in Hb formation, was found in the urine. Methionine or suboptimum levels of choline partly prevented the anaemia. Vitamin B₁₂ with folic acid produced no further improvement.—A. Hepburn.

2391

- HOVE, E. L. and COPELAND, D. H. Progressive muscular dystrophy in rabbits as a result of chronic choline deficiency. *J. Nutrition*, 1954, **53**, 391-405. [Dept. Animal Husb., Agric. Exp. Stat., Alabama Polytech. Inst., Auburn.]

Rabbits fed on a diet deficient in choline developed progressive muscular dystrophy after 70 to 100 days. Muscular weakness occurred especially in the hind legs, with hyaline degeneration. Urinary creatine progressively increased to more than 40 mg. per kg. bodyweight daily, and urinary creatinine gradually decreased, both effects characteristic of human dystrophies. Choline rapidly effected a cure.

Since all the rabbits received 10 mg. α -tocopheryl acetate daily and had normal plasma tocopherol values and tissues rich in tocopherol, vitamin E deficiency was not the cause of the dystrophy.

The effect of a single dose of α -tocopheryl acetate in vitamin-E-deficient rabbits was prolonged when acetylcholine chloride, 0.1 or 1.0 per cent., was added to the diet.—A. Hepburn.

2392

- MIRONE, L. Effect of choline-deficient diets on growth, reproduction and mortality of mice. *Amer. J. Physiol.*, 1954, **179**, 49-52. [Dept. Nutrit., Univ. Georgia, Athens.]

Weanling mice fed on a diet with little or no choline grew normally during the first 9 weeks. Blood red and white cell counts and Hb were not significantly different after 3 and 7 months. The conception rate and viability of the young were lower than in mice fed on stock diet. Most of the litters from mice fed to appetite on the basal diet containing 50 mg. choline chloride per 100 g. died during the first 4 days. Survival was increased by the addition of 5 μ g. vitamin B₁₂, but death occurred before weaning. In the absence of choline vitamin B₁₂ was not beneficial. Mortality in adult mice was highest during the third and fourth months of life, and death at parturition was due to incomplete expulsion of the foetus accompanied by profuse bleeding. Loss of contractility of the uterus was considered a possible cause.

A. Hepburn.

2393

- RAULIN, J. and JACQUOT, R. Essai d'interprétation de l'action protectrice de la choline vis-à-vis

de la toxicité de l'association alimentaire "acides gras libres + cholestérol". [Interpretation of the protective action of choline against the toxicity of the association in food of free fatty acids and cholesterol.] *C.R. Acad. Sci.*, 1954, 239, 726-728.

When incorporated in the diet of young rats cholesteryl esters prepared from the fatty acids of sunflower seed oil did not impair growth, nor did a mixture of cholesterol, sunflower seed oil fatty acids and choline; when choline was omitted from the latter mixture growth was inhibited and signs of toxicity appeared.

G. A. Garton.

2394

HIMWICH, W. A. and PETERSEN, I. M. (with GRAVES, J. P.) Ingested sodium glutamate and plasma levels of glutamic acid. *J. Appl. Physiol.*, 1954, 7, 196-199. [Thudichum Psychiat. Res. Lab., Galesburg State Res. Hosp., Galesburg, Ill.]

Plasma glutamic acid varied widely in adult and elderly subjects and was not affected by continued ingestion of 45 g. glutamic acid daily. The response to a single dose of sodium glutamate varied with the individual and with the dose.

D. Duncan.

See also Absts. 1931, 1996, 2244, 2542.

METABOLISM OF CELLS, TISSUES, ETC.

GENERAL PHYSIOLOGY

2395

CANDELA, J. L. R., VALLADARES, Y. and CANDELA, R. R. Mecanismo patogénico de la disminución de la tolerancia a los hidrocarbonados en la enfermedad de Cushing. [Pathogenesis of the reduced tolerance to carbohydrates in Cushing's syndrome.] *Medicamenta*, 1954, 22, 295-298. [Cat. Patol. Gen., Madrid.]

The method is described by Candela *et al.* (*Rev. Ibér. Endocrinol.*, in the press). The "insulin effect" of plasma was estimated from the glucose consumption and glycogen formation of isolated diaphragm muscle from rats. The plasma of 4 subjects with Cushing's syndrome had the same "insulin effect" as that from 4 normal subjects, but when extra insulin was added the plasma from the 4 patients inhibited the activity of the insulin. It is suggested that there is a synergy between glucagon and insulin.—D. Duncan.

2396

KOCHETOV, G. A. Obmen uglevodov v myshechnoi tkani serdtsa globulya. [Metabolism of carbohydrates in pigeon heart muscle.] *Biokhimiya*, 1954, 13, 189-196. [Gosud. Univ. Moscow.]

2397

PRETERS, G., COUSSENS, R. and SIERENS, G. L'influence du mono-fluoro-acétate de sodium sur le métabolisme du pis de vache isolé. [The effect of sodium monofluoroacetate on the metabolism of the isolated udder of the cow.] *Arch. internat. Pharmacodyn.*, 1954, 98, 288-301. [Lab. Physiol., École Méd. Vét., Univ. Ghent.] English summary.

The inhibitory effect of fluoromonoacetate on respiration of the isolated udder, in the presence of glucose or butyrate and sometimes with acetate, demonstrated the presence of the carboxylic cycle in the tissue.—D. Duncan.

2398

ABRAHAM, S., HIRSCH, P. F. and CHAIKOFF, I. L. The quantitative significance of glycolysis and non-glycolysis in glucose utilization by rat mammary gland. *J. Biol. Chem.*, 1954, 211, 31-38. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

2399

NORDMANN, J., MANDEL, P. and ACHARD, M. Inhibition of sugar metabolism in the lens. *Brit. J. Ophthalmol.*, 1954, 33, 673-679. [Clin. Ophthalmol., Strasbourg.]

Lenses of calves were studied *in vitro*; one of each pair had an inhibitor of carbohydrate metabolism added to the Tyrode glucose medium. All the inhibitors produced cataracts. Glyceraldehyde, moniodoacetic acid, sodium fluoride and phloridzin affect the anaerobic cycle, sodium malonate and fluoroacetic acid the citric acid cycle; cataracts appeared most rapidly with the first 4.—D. Duncan.

2400

KHESIN, R. B. Vkluychenie mechenykh aminokislot v syvorotochyi al'bumin kletok pecheni krysa. [Inclusion of labelled amino-acids into the serum albumin of the cells of rat liver.] *Biokhimiya*, 1954, 19, 304-312. [Inst. Biol. Khim., Akad. Med. Nauk SSSR, Moscow.]

The rate of inclusion of tracer amino-acids into the serum albumin component of structural entities of the liver cell was studied by comparing the curves of radio-activity of the free amino-acid fraction of liver cells with changes in radio-activity of the albumin of these structural entities within the cells. Live male rats were injected and killed, and liver slices were homogenised and centrifuged at different speeds to separate intracellular structures. The precipitates were washed with butanol and/or water to extract the albumin. After subcutaneous injection of ^{35}S -methionine and

N.A. and R., April 1955

^{14}C -tyrosine the labelled amino-acids were incorporated most quickly in that fraction of serum albumin "tightly bound" in the large cytoplasmic granules. The radio-activity of the "tightly bound" moiety in the large granules was dependent on that of the free acid fraction. It was concluded, from comparison of changes in radio-activity of the albumin of different cell fractions, that albumin formed in the large granules is transferred to other cell structures, e.g., microsomes, not as a result of mechanical disintegration of these granules, but by an active process necessitating aerobic conditions.

The serum albumin liberated from rat liver exists in large granules similar to the secretory granules of the pancreas.—D. W. Taylor.

2401

DASGUPTA, P. R. and BASU, K. P. **Metabolism of amino acids in heart and lung tissues.** *Indian J. Med. Res.*, 1954, **42**, 405-409. [Biochem. Lab., Univ. Dacca.]

Oxygen consumption and ammonia production by rat heart or lung slices were estimated in the presence of *d*-, *l*- or *dl*-isoleucine, *d*-, *l*- or *dl*-valine, *d*-histidine hydrochloride, *d*-ornithine dihydrochloride, *l*-oxyproline, *l*-phenylalanine, *l*-diphenylalanine, *l*-tryptophan, asparagine or cysteine hydrochloride. In both heart and lung *l*-isoleucine and *l*-valine, in heart tissues only *d*-histidine hydrochloride and in lung tissues only *d*-isoleucine, *dl*-isoleucine and *d*-valine suffered both oxidation and deamination. Cysteine hydrochloride was oxidised without ammonia production by heart tissues.—C. Warner.

2402

STERN, I. and SHAPIRO, B. **The transport of lipids into adipose tissue.** *Metabolism*, 1954, **3**, 539-543. [Dept. Biochem., Hadassah Med. Sch., Hebrew Univ., Jerusalem.]

Fat-depleted adipose tissue from starving male rats was incubated in air at 38° C. in human serum, rat serum or lipid suspensions containing triolein, egg lecithin, sorbitan monolaurate, sorbitan monopalmitate, sorbitan mono-oleate, sodium oleate or ^{14}C -labelled sodium stearate; in some experiments 0.05 *M* NaF was added to the incubation medium. Samples of the medium were removed after incubation for 7 min., 2 hr. or 4 hr. for analysis of the lipid components; the first sample represented the initial values.

When adipose tissue was incubated in serum the total fatty acid content of the serum decreased; no decrease was observed in the phospholipid and cholesteryl ester fractions. Fatty acids were absorbed from emulsions of triolein and of the sorbitan esters; absorption was inhibited by NaF. Egg lecithin was not absorbed. The fatty acids

of the soap emulsions were taken up by the tissue and absorption was not inhibited by NaF. Good recovery of absorbed fatty acids (in a combined form) from the incubated tissue was obtained.

It is concluded that uptake of fatty acids from serum into adipose tissue probably occurs as a result of enzymic cleavage of the ester linkages of triglycerides and other neutral esters.

G. A. Garton.

2403

EVANS, J. D., RIEMENSCHNEIDER, R. W. and HERB, S. F. **Fat composition and *in vitro* oxygen consumption of marrow from fed and fasted rabbits.** *Arch. Biochem. Biophys.*, 1954, **53**, 157-166. [Dept. Physiol., Sch. Med., Temple Univ., Philadelphia, Pa.]

Six young male rabbits were given no food for 4 to 11 days, during which they lost on the average 28 per cent. of their original bodyweight; water was unlimited. Bone marrow from the long bones was pooled for study of oxygen consumption in a Warburg apparatus and estimation of Fe and of polyunsaturated fatty acids by alkali-isomerisation. Another 6 control rabbits were given a stock diet and fresh vegetables.

Unsaturated fatty acids comprised 62 per cent. of the total marrow fat of both groups, though the linoleic acid contents were different, accounting for 33 per cent. of the fat of the control group and 25 per cent. in the fasted group. The absolute amounts of all fatty acids decreased during starvation, and the relative amounts of linoleic and linolenic acids decreased while the percentages of arachidonic, pentaenoic and oleic acids increased. The rate of oxygen consumption was not related to the concentration or fatty acid composition of the marrow fat. It is concluded that the polyunsaturated fatty acids of marrow fat are not metabolised *in situ*.—G. A. Garton.

2404

TURNER, C. **Aerobic and anaerobic synthesis of fatty acids in mammary-gland homogenates.** *Biochem. J.*, 1954, **58**, xxxi-xxxii. [Nat. Inst. Res. Dairying, Univ. Reading.]

2405

BLOMSTRAND, R. and RUMPF, J. A. **The conversion of [^{14}C] cetyl alcohol into palmitic acid in the intestinal mucosa of the rat.** *Acta chem. scand.*, 1954, **8**, 1100. *Proc.* [Dept. Physiol. Chem., Univ. Lund.]

2406

HANEL, H. K., CHRISTENSEN, F. and DAM, H. **Alimentary production of gallstones in hamsters. 4. Cholesterol synthesis *in vitro* from 2-C- 14 -acetate in the liver of hamsters with**

and without gallstones. 5. Cholesterol synthesis from 2-C-14-acetate by the liver *in vivo*. *Acta pathol. microbiol. scand.*, 1954, **35**, 237-239; 423-425. [Dept. Biochem. Nutrit., Polytech. Inst., Copenhagen.]

For part 3, see Abst. 1033, Vol. 25.

4. Liver slices were prepared from male hamsters which had been fed on normal diets or a diet which gave rise to gallstones (Abst. 4874, Vol. 23). The slices were incubated in the presence of ^{14}C -labelled acetate for 3 hr. at 37.5°C . in an atmosphere of oxygen with 5 vol. per cent. CO_2 . After saponification, cholesterol was isolated as the digitonide and its radio-activity was measured.

The results showed no significant difference in the rate of cholesterol synthesis in the liver tissue of hamsters with and without gallstones.

5. Male hamsters were reared for about 2 months on diets similar to those used in the study just reported. They were then given ^{14}C -labelled acetate by subcutaneous injection and liver slices were prepared and examined as described above. Again, the rates of liver cholesterol synthesis were not significantly different in the animals given the normal and the lithogenic diets.—G. A. Garton.

2407

PILGEMAN, L. O. and GREENBERG, D. M. Susceptibility to experimental atherosclerosis and the methylation of ethanolamine-1, 2- C^{14} to phosphatidyl choline. *Science*, 1954, **120**, 760-761. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

The formation of lecithin from free ethanolamine was studied in liver slices from rats, guinea-pigs and chickens. The total liver capacity for lecithin formation in the guinea-pig was 3.8 per cent. and in the chicken 3.1 per cent. of its value in the rat, and the capacity relative to bodyweight was even less in the 2 species first named. The higher activity of rat liver was seen also when $^{14}\text{CH}_3$ -methionine was used as methyl donor for unlabelled ethanolamine.

The findings are discussed in relation to the susceptibility of guinea-pigs and chickens to atherosclerosis, and it is suggested that this may be related to a low capacity for phospholipin formation.—D. Duncan.

2408

SOBEL, A. E. and BURGER, M. Calcification. 14. Investigation of the role of chondroitin sulfate in the calcifying mechanism.

HEIMER, C. B., MASLOW, H., SOBEL, A. E. and GRAYZEL, D. M. 15. *In vitro* calcification of rachitic bone cartilage of thyroparathyroidectomized rats. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 7-13; 13-16. [Dept. Biochem., Jewish Hosp., Brooklyn, N.Y.]

14. Calcification *in vitro* of bone sections from rachitic rats was inhibited by toluidine blue or by protamine, but inhibition was less when Ca was present as well, and could be reversed if the sections were treated with Ca after toluidine blue or protamine.

Metachromasia, but not calcification, was prevented by high concentrations of Ca ions, and calcification, but not metachromasia, was prevented by protein denaturants.

When rachitic bone was shaken with a Ca solution and afterwards with a phosphate solution calcification took place, but not when the phosphate treatment preceded the Ca treatment. It is suggested that an initial part of the process of calcification is the formation of a Ca compound with the matrix.

Complexes of collagen and chondroitin sulphate were prepared and treated in the same way as the rachitic bone sections. Metachromatic staining and calcification took place and were inhibited in the complexes under conditions similar to those affecting rachitic bone.

It is concluded that complexes similar to those prepared in these experiments are involved in calcification.

15. Rickets was produced as readily in thyroparathyroidectomized rats as in controls by a diet high in Ca and low in both P and vitamin D. Calcification was similar in bone sections from thyroparathyroidectomized and from control rats.

R. Hill.

2409

ENGELFELDT, B. and HJERTQVIST, S. O. Biophysical studies on bone tissue. 10. The *in vivo* and *in vitro* uptake of radioactive isotopes and ionic exchange reactions in bone tissue. *Acta pathol. microbiol. scand.*, 1954, **35**, 205-216. [Dept. Phys. Cell Res., Karolinska Inst., Stockholm.]

See also Abst. 796, Vol. 24.

By means of autoradiography and microradiography the uptakes of ^{32}P , ^{45}Ca and ^{35}S were studied *in vivo* and *in vitro* in the bone tissue of dogs. All the isotopes were taken up by the newly laid down, poorly mineralised areas of bone tissue, but S uptake differs from that of P and Ca. Part of the sulphate goes to the organic and part to the inorganic phase, whereas ^{32}P and ^{45}Ca both go to the inorganic phase. All 3 isotopes, both *in vivo* and *in vitro*, show exchange reactions with ions in the surrounding fluid. ^{45}Ca seems to be more firmly fixed to the bone tissue than ^{32}P , and ^{35}S less.

The more pronounced ionic exchange in the poorly mineralised areas may be due to the smaller size and hence greater surface area of the crystallites or, since they are presumably still growing, to the presence of many imperfect zones in their crystal lattices.—M. B. Richards.

2410

- WEIKEL, J. H. (Jr.), NEUMAN, W. F. and FELDMAN, I. The surface chemistry of bone. 8. On the mechanism of ionic exchange. *J. Amer. Chem. Soc.*, 1954, **76**, 5202-5207. [Dept. Radiation Biol., Sch. Med. Dent., Univ. Rochester, N.Y.]

See also Absts. 5511, Vol. 20 and 2485, Vol. 22.

2411

- LITTLE, M. F., BUONACORE, M. G. and SOMMER, B. Comparative study of the enamel decalcifying ability of different acids. *J. Dent. Res.*, 1954, **33**, 671. *Proc.* [Eastman Dent. Dispensary, Rochester, N.Y.]

2412

- FRANKERD, T. A. J. and ALTMAN, K. I. A study of the metabolism of phosphorus in mammalian red cells. *Biochem. J.*, 1954, **58**, 622-633. [Dept. Med., Univ. Rochester, N.Y.]

2413

- BERNSTEIN, R. E. Potassium and sodium balance in mammalian red cells. *Science*, 1954, **120**, 459-460. [Dept. Physiol., Med. Sch., Univ. Witwatersrand, Johannesburg.]

2414

- BOTKIN, A. L., ESKELSON, C. D., FIRSHEIM, H. E. and JENSEN, H. *In vitro* studies of the intact thyroid gland. *J. Clin. Endocrinol.*, 1954, **14**, 1219-1229. [Dept. Biochem., Army Med. Res. Lab., Fort Knox, Ky.]

¹³¹I was injected intraperitoneally into adult rats 18 hr. before they were killed. Injections of thyroxine and thyroid-stimulating hormone (TSH) were given to some. Thyroids were removed quickly and incubated at 37°C. \pm 1° for 4 hr. From the results of 6 experiments it was concluded that thyroxine *in vitro* had not the inhibitory effect on thyroid activity which it exerts *in vivo*. There was no evidence from the studies *in vitro* of any influence of thyroxine on the release of inorganic or organic I from thyroid tissue. The primary effect of TSH *in vitro* was to release thyroid hormone from the gland and to increase the content of inorganic and organic ¹³¹I within the gland. The effect of thiocyanate *in vitro* was to inhibit the uptake of I by the gland.

B. W. Simpson.

2415

- CHRISTIANSEN, J. V. Melanindannelsen i huden. [Melanin formation in the skin.] *Nord. Med.*, 1954, **52**, 1609-1612. [Finseninstit., Copenhagen.] English summary.

A review.

See also Absts. 1951, 1954, 1960, 1964, 1965, 1973, 2088.

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GROWTH AND METABOLISM OF TUMOUR CELLS

2416

- BITTNER, J. J. Mammary cancer in mice observed in different laboratories and during the war period. *J. Nat. Cancer Inst.*, 1954, **15**, 359-366. [Div. Cancer Biol., Dept. Physiol., Med. Sch., Univ. Minnesota, Minneapolis.]

Changes in the incidence and age of incidence of spontaneous mammary cancer in 2 inbred strains of mice moved from Bar Harbor, Maine to Minnesota in 1942 and fed throughout on Purina fox chow and tap water are ascribed to war and post-war changes in the composition of the chow. The manufacturers state that during the war the content of animal products and hence of animal-protein factor and vitamin B₁₂ was reduced. It is suggested that the physiological effects of the hormonal patterns were thereby altered, though not sufficiently to affect breeding behaviour.

W. M. Deans.

2417

- BABSON, A. L. and WINNICK, T. Protein transfer in tumor-bearing rats. *Cancer Res.*, 1954, **14**, 606-611. [Radiation Res. Lab., Coll. Med., State Univ. Iowa, Iowa City.]

In young adult rats bearing Walker carcinomas in both hind legs and killed 8 days after transplantation, when the combined weight of both tumours was from 12 to 23 g., free and combined amino-acid concentrations were higher in the liver than in normal rats, and combined amino-acids were higher in muscle, though free and total amino-acids were less. The tumours had high concentrations of bound and free amino-acids.

Plasma protein containing leucine labelled with ¹⁴C appeared to be incorporated into the tumours without much release of free leucine, and to be more readily utilised than free leucine. A labelled tumour when transplanted released labelled amino-acids into the host's tissues.—D. Duncan.

2418

- SASSENATH, E. N. and GREENBERG, D. M. (with KEFFER, L. S. and SILLS, R. A.) Tumor host relationships. 1. Effects on free amino acid concentrations of certain tissues. *Cancer Res.*, 1954, **14**, 563-569. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

Amino-acids were estimated microbiologically and by ion exchange column chromatography in deproteinised filtrates of blood, liver and skeletal muscle from normal and tumour-bearing adult rats. The latter were killed 7 to 9 days after transplantation of Walker carcinoma 256, when the tumours weighed from 2 to 5 g.

No characteristic pattern of free amino-acid concentrations was found in tumour-bearing rats. The most evident changes, increases in alanine and glutamic acid and decrease in glycine, are

considered to be related to increased energy demands in the organism. The difficulties of the microbiological method are discussed.—D. Duncan.

2419

SEIBERT, F. B., SOTO-FIGUEROA, E., MILLER, E. E. and SEIBERT, M. V. Comparison of the amino acid composition of alcoholic extracts of neoplastic tissues with similar extracts of normal muscle. *Growth*, 1954, 18, 145-165. [Henry Phipps Inst., Univ. Pennsylvania, Philadelphia.]

Differences, both quantitative and qualitative, were found in the amino-acid composition of alcoholic extracts of rat sarcomas and normal skeletal muscle. Extracts from muscle of tumour-bearing rats and from rats that had had tumours treated and were now immune showed intermediate properties.—C. Warner.

2420

FRANCKE, C., HARDERS, C. L., VAN MULKEN, J. M. and ROBERT, W. N. Enige aspecten van de ijzerstofwisseling bij multipel myeloom, onderzocht met behulp van radio-actief ijzer. [Iron metabolism in multiple myeloma investigated with radio-active iron.] *Nederland. Tijdschr. Geneesk.*, 1954, 98, 3377-3383. [Int. Afd., Nebo-Ziekenhuis, The Hague.] English summary.

2421

HOCH-LIGETI, C. Effect of prolonged feeding of methyleholanthrene to rats kept on a low

protein diet. *Cancer Res.*, 1954, 14, 749-752. [Dept. Pathol., Med. Sch., Univ. Virginia, Charlottesville.]

Sixty male and 40 female rats were given a diet of vitamin-free casein 7, sugar 6.5, maize starch 56, cellulose 12, lard 6.5, vegetable oil 8, salt mixture 3 and cod liver oil 1 per cent., supplemented with α -tocopherol and vitamins of the B group. To the diet of 40 males and 20 females was added 10 mg. methyleholanthrene per 100 g. food; after 22 weeks 10 males and 10 females from this group were transferred to the basal diet without methyleholanthrene. After 50 weeks rats were killed at intervals and organs were removed for histological examination.

The average growth for all rats was 1 g. weekly. Mortality among rats receiving methyleholanthrene was very high during the first 4 months, when 12 males and 7 females died as compared with 1 female and 2 males in the control group; after this time mortality was low in both groups. There was no appreciable difference in lesions between rats given methyleholanthrene for 5 months and those given methyleholanthrene during the whole experiment. In the livers of rats on the basal diet fatty changes and cirrhosis developed; in rats which received methyleholanthrene the cirrhosis was more severe. Male rats were more prone to liver damage than females. Ulcers, squamous hyperlasia and papillomata developed in the stomachs of all the rats, but were more pronounced in those which received methyleholanthrene.—G. F. Garton.

See also Absts. 1881, 2065, 2133, 2169.

METABOLISM OF GROWTH, REPRODUCTION AND SENESCENCE

GROWTH

2422

WEGMAN, M. E. Weight at birth and survival of the newborn. *Pediatrics*, 1954, 14, 396-400. [Washington, D.C.]

These extracts from Shapiro and Unger, "Weight at birth and its effect on survival of the newborn in the United States, early 1950" (*Vital Statistics Spec. Reps., Selected Studies* 39 (1), July 23, 1954) include a table and graphs of the distribution of birthweights of white and non-white infants born in the United States in the first quarter of 1950, with the corresponding neonatal mortality rates. Although it has been shown (Abst. 1455, Vol. 13) that for given birthweight negro infants are more mature than white, the neonatal mortality rates for the lower birthweights, i.e., the premature infants, are similar, and for the higher birthweights the rate is higher for non-whites. The conclusion is that the latter do not receive the same care.

The data also demonstrate the poorer chance of survival of the "overweight" infant.

W. M. Deans.

2423

MIETTINEN, M. On triplets and quadruplets in Finland. *Acta paediat.*, 1954, 43, Suppl. 99, pp. 103; *Acta paediat.*, 1954, 43, 493-496. [Child. Clin., Univ. Turku.]

This detailed survey is based on 603 sets of triplets and 18 sets of quadruplets, out of 633 and 20 sets born in Finland between 1905 and 1952. Triplet births were significantly more frequent in rural areas than in towns; about 68 per cent. of the parents were farmers or farm workers, many of them living under poor social conditions. Heredity played a considerable part. Multiple births were associated with increasing age and parity. The stillbirth rate for triplets was 12.60 ± 0.8 per cent., between 4 and 5 times that for all births

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in Finland in the period. Of 791 triplet infants born between 1931 and 1952, 84.3 ± 1.3 per cent. had birthweights below 2500 g., and the lower the birthweight, the greater the mortality. During the last 50 years general infantile mortality in Finland has fallen from 12.28 ± 0.03 to 3.36 ± 0.04 per cent., but that of triplets has fallen much less and nearly half die in the first year. There was evidence of mental retardation in nearly 7 per cent. of 469 surviving triplets, but no connection with birthweight was found.—W. M. Deans.

2424

LANGLOIS, M., RICHARD, M. and IASELLO, E. Contribution à l'étude de la fluctuation pondérale des premiers jours chez le nouveau-né normal. [Fluctuations in weight of the normal newborn infant in the first days of life.] *Laval méd.*, 1954, 19, 479-496. [Maternity and Child Welfare Service, Laval Univ., Quebec.]

A survey was made from birth of 86 infants of multiparous mothers, in 1953. The children were classified according to sex and to diet, breast milk or pasteurised cow's milk, whole or skimmed. No relation was found between the mean daily intake of energy or liquids and the loss and recovery of weight in the first few days of life. It was concluded that fluctuations of weight in the first few days depend much more on changes in fluid content than on amount of fat deposited, and on prenatal or constitutional influences more than on diet.

E. M. Hume.

2425

WEBER, A. A. Signposts on the highway of growth. *Amer. J. Dis. Child.*, 1954, 88, 452-457. [Child. Hosp. Res. Found., Coll. Med., Univ. Cincinnati, Ohio.]

Simple mnemonics, based on data in 2 recent U.S. textbooks of paediatrics, are given for weight, height and head circumference at different ages up to 12 years, as well as a simple formula,

$$W = \frac{1}{10} H(\frac{1}{2} H - 23) + 48,$$

connecting weight in lb. with height in inches.

W. M. Deans.

2426

SAITO, K. and TSUJI, T. Birth weight and subsequent physical development (Summary). 1. *Bull. Inst. Pub. Health, Tokyo*, 1952, 2, No. 2, 1-2 (English). [Inst. Pub. Health, Tokyo.]

The weight up to the age of 6 years of 6544 children was analysed by age, sex and birthweight; for the last, 4 groups, 2.5, from 2.5 to 3.0, from 3.0 to 3.75, and 3.75 kg., were recognised. The weight relation between the groups at birth was maintained throughout.—E. M. Hume.

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2427

JORGE JANZ, G. Contribuição para o estudo do estado de nutrição da população de S. Tomé. [State of nutrition of the population of São Tomé.] 2. Pesos e alturas das crianças em idade escolar. [2. Weight and height of children of school age.] 3. O peso à nascença de crianças nascidas em S. Tomé. [3. Birth-weight of children born on São Tomé.] *An. Inst. Med. trop., Lisbon*, 1953, 10, 1515-1525; 1527-1533. English summary.

2. Measurements of height and weight were made on 920 children of São Tomé aged from 7 to 17 years, and regression equations were calculated showing the relations of weight to age and weight to height for black children and for those of mixed race of both sexes. The children of São Tomé were much inferior both in weight and height to what is regarded as normal in the white race, but similar to what is found in undernourished European children. There was no significant difference between the 4 groups considered in the average weights and heights.

3. A study was made of the birthweights of children of natives of São Tomé and of imported workers for the years 1949-1951. The average weight for boys was 2978 g. and for girls 2765 g., which gives an average weight for the 2 sexes of 2871 g. or 13 per cent. below the normal for European infants. Of the 625 infants studied 82.5 per cent. weighed at birth less than 3300 g. No difference was found between the children of natives of São Tomé and those of workers coming from Angola, Mozambique or Cape Verde.

M. B. Richards.

2428

SUTOW, W. W., TERASAKI, T. and OHWADA, K. Comparison of skeletal maturation with dental status in Japanese children. *Pediatrics*, 1954, 14, 327-333. [Dept. Paediat., Atomic Bomb Casualty Commission, Hiroshima.] Spanish summary.

Japanese children free from disease had X-ray photographs taken of their left hands and wrists and the numbers of the permanent teeth were recorded. There were 678 boys and 682 girls of ages from 6 to 14 years. The degree of skeletal maturation was assessed by the system of Greulich and Pyle ("Radiographic Atlas of Skeletal Development of the Hand and Wrist", Stanford Univ. Press, 1950) and the subjects were arranged in order of increasing maturity for each year of age. By dividing the series into 2 the categories designated as above or below average were obtained.

At each age girls had more permanent teeth than boys and children who were more advanced skeletally had more teeth than those less advanced.

For the sexes at individual ages consistent differences were not found. It is concluded that more mature skeletal development is associated with more mature dental status and that the data emphasise that investigations of this kind should not be limited to one or two age groups.

D. Harvey.

2429

ELLIS, F. G. and JOSEPH, J. Time appearance of the centres of ossification of the fibular epiphyses. *J. Anat.*, 1954, **88**, 533-536.

[Dept. Anat., Guy's Hosp. Med. Sch., London.]

The times of ossification of the epiphyses of the fibula were studied in the rabbit, guinea-pig, cat, pig and kangaroo. In all species the centre of ossification for the distal appears earlier than that for the proximal end. In this respect the human fibula, although different from other human long bones, agrees with the fibulae of other mammals. The pattern is not related to any set of mechanical conditions existing in the human skeleton.

D. Harvey.

2430

WIARDA, H. Über Wuchsformen bei Haustieren.

Eine Studie an Schweineskeletten. [Growth forms in domestic animals. A study of pig skeletons.] *Ztschr. Tierzücht. Züchtungsbiol.*, 1954, **63**, 335-380. [Inst. Haustierk., Christian Albrechts Univ., Kiel.]

Details of the measurements of the vertebrae, pelvis, thorax (individual ribs), large limb bones and skull bones are presented for 5 wild pigs and 28 purebred pigs of 7 different breeds. In spite of considerable variation, trends in order and rate of development were clear, and aberrant instances of disharmonic growth are held to be possible indicators of constitutional disorders, important in selection for breeding.—I. Leitch.

2431

BUCKNER, G. D., INSKO, W. M. (Jr.), HENRY, A. H. and WACHS, E. F. Comparison of average growth and ossification of 10 appendicular bones and sternebrae of New Hampshire and Rhode Island Red chickens at the 10th and 24th weeks. *Kentucky Agric. Exp. Stat. Bull.* No. 604, November 1953, pp. 14. [Lexington, Ky.]

See also Absts. 2560, 2618.

REPRODUCTION AND LACTATION: MAMMALS

2432

O'DWYER, E. M. The influence of stature on pelvic shape and the course of labour. *J. Obstet. Gynaecol. Brit. Empire*, 1954, **61**, 514-516 (with discussion 516). *Proc.* [Bearsden Mem. Hosp., London.]

2433

STOPPELMAN, M. R. H. Stoomnissen tijdens de zwangerschap en aangeboren afwijkingen. [Disorders in pregnancy and congenital malformations.] *Nederland. Tijdschr. Geneesk.*, 1954, **98**, 3641-3648. [Kinderclin., Univ. Amsterdam.] English summary.

A review.

2434

BURWELL, C. S. Circulatory adjustments to pregnancy. *Bull. Johns Hopkins Hosp.*, 1954, **95**, 115-129. [Dept. Med., Harvard Med. Sch., Boston, Mass.]

Some research is reported in this lecture and there is a review of recent literature.

Oxygen consumption, "under scrupulous basal conditions", amounts at a maximum to about 20 per cent. above the non-pregnant level; 70 to 80 per cent. of this increase is accounted for by the uterus and its contents, which consume about 5 to 7 ml. per kg. per min.

The heart rate rises to a maximum at about the thirtieth week of pregnancy and then declines towards term. At its height it is on the average about 10 beats per min. above non-pregnant levels. The systolic blood pressure remains relatively stable throughout pregnancy, but there is a slight fall in diastolic pressure. The maximum pulse pressure coincides with the time of maximum pulse rate.

There is a considerable increase in the cardiac output in pregnancy, amounting, at its maximum about the thirtieth week, to 40 to 50 per cent. above the non-pregnant level, after which it declines to term. The increase is not related to foetal weight or to the mother's total oxygen consumption, "it increases out of proportion to both". The maternal arterio-venous difference in oxygen saturation is therefore diminished. The main recipient of the increased cardiac output is the pregnant uterus and its contents. The uterine minute blood flow is about 500 ml. in women with a single foetus at term. There is no increased blood flow to the maternal liver, kidneys or brain, but a substantial increase in the flow to the hands has been demonstrated; this may play a part in heat elimination.

The blood volume rises in pregnancy until about the thirty-second week and then declines quite rapidly towards term, although the total body water continues to rise until the end of pregnancy. There is no substantial evidence where the increased blood volume is to be found. Much of it is in the uterine and placental circulation, but it is thought that the legs may store some, since the venous pressure in the legs of recumbent women is some 10 to 15 cm. water above normal. There may also be an increased pulmonary blood volume; the

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lung in pregnancy is in a relatively expiratory position and there is a reduced expiratory reserve volume although vital capacity is maintained. Some observations on the heart rate during labour are included.—F. E. Hytten.

2435

CAMPLING, J. D. and NIXON, D. A. **The inositol content of foetal blood and foetal fluids.** *J. Physiol.*, 1954, **126**, 71–80. [Dept. Physiol., St. Mary's Hosp. Med. Sch., London.]

Samples of human maternal and foetal blood and amniotic fluid were taken at parturition or during therapeutic abortion. Samples of allantoic fluid were also taken at several stages of pregnancy from sheep, cats, goats, rabbits and monkeys. The concentration of *meso*-inositol estimated microbiologically was unaltered by pregnancy; in foetal blood it was much greater, but bore no relation to that in maternal blood. The inositol concentration in blood from newborn kittens and rabbits fell to the maternal level in 14 days.

Amniotic fluid contained more inositol than maternal blood and less than foetal blood in man, sheep, monkey, cat and goat. Two of the 3 samples obtained during therapeutic abortion contained considerably more inositol than the foetal blood at normal parturition. Except in the sheep, the inositol concentration in the allantoic fluid was much greater than in foetal blood, especially in the rabbit.

Raising inositol in maternal blood did not significantly affect the concentration in the foetus, and raising the inositol concentration in the foetus only slightly affected that in the maternal blood of the ewe. Hence the placenta was considered impermeable to inositol transfer in one direction and in the other transfer was negligible. The substitution of a pump for the foetus and the circulation of maternal blood showed that inositol was not synthesised in the placenta.—A. Hepburn.

2436

HEYDE, W. Beitrag zum Glucuronsäurestoffwechsel in der Schwangerschaft und im Wochenbett. [Glucuronic acid metabolism in pregnancy and the puerperium.] *Arch. Gynäkol.*, 1954–55, **185**, 1–18. [Frauenklin., Univ. Hamburg, Eppendorf.]

During the second half of pregnancy urinary excretion of glucuronic acid is distinctly higher than at other times, with excretory peaks at intervals of 30 days. A further increase in excretion occurs for several days before, and ends 24 hr. after, parturition. The increased glucuronic acid excretion is probably connected with increased hormone excretion in the urine. After parturition, urinary excretion of glucuronic acid is frequently below normal. The glucuronic acid content of the

amniotic fluid was of the same order as that of the serum. Experiments are described on the effect of administering glucuronic acid intravenously or by mouth.—M. B. Richards.

2437

HEYDE, W. Das Verhalten der Serumpolysaccharide ante und post partum. [Behaviour of serum polysaccharides before and after parturition.] *Arch. Gynäkol.*, 1954–55, **185**, 128–139. [Frauenklin., Univ. Hamburg, Eppendorf.]

For 20 normal subjects the average content of protein-bound hexoses in the serum was 116, and of protein-bound glucosamine 103 mg. per cent. The former value is in accord with that of other authors, but the latter is considerably higher. The average value for total serum polysaccharides was 220 mg. per cent. Towards the end of pregnancy there was a distinct increase of both the separate fractions and the total polysaccharides of the serum. In the course of 96 hr. after parturition the total polysaccharides fell, rising again during the following days. The minimum was almost entirely due to a decrease of glucosamine, and the rise to an increase of protein-bound hexoses. Serum glucosamine was inversely proportional to glucuronic acid, but no relation was found between the latter and protein-bound hexoses in the serum.—M. B. Richards.

2438

VOCKE, W. Studien über den Methioningehalt des Harns bei Schwangerschaften und Toxikosen. [Studies of the methionine content of the urine in pregnancy and toxæmia.] *Arch. Gynäkol.*, 1954–55, **185**, 111–121. [Frauenklin., Univ. Greifswald.]

2439

PAGE, E. W., GLENDENING, M. B., DIGNAM, W. and HARPER, H. A. **The causes of histidinuria in normal pregnancy.** *Amer. J. Obstet. Gynecol.*, 1954, **68**, 110–118. [Dept. Obstet. Gynaecol., Univ. California Sch. Med., San Francisco.]

Plasma and urinary values and renal clearances were studied on 10 normal pregnant women at from 12 to 35 weeks of gestation, who received intravenous infusions of inulin and L-histidine at a constant rate. Control data were provided by repeating the procedure on the same patients 4 to 7 weeks after delivery. Histidine was estimated microbiologically.

In all 10 subjects, increased glomerular filtration rates for inulin, and therefore for water and amino-acids, were found during pregnancy. It is added, from the literature, that discrepant findings are due to the fact that the filtration rate returns almost to non-pregnant levels during the last lunar month of pregnancy. Histidine

clearances were relatively greater than glomerular filtration rates, pointing to diminished tubular re-absorption. Calculation from the data suggested the existence of a reduced rate of histidine metabolism during pregnancy.—A. M. Thomson.

2440

GOVAN, A. D. T. and MACGILLIVRAY, I. **Renal function and chloride metabolism in pre-eclamptic toxæmia.** *J. Obstet. Gynaecol. Brit. Empire*, 1954, **61**, 491-496. [Res. Dept., Royal Maternity Hosp., Glasgow.]

A short salt-loading test was made on 2 normal non-pregnant women and 15 pregnant women; 8 of the latter had fairly severe pre-eclampsia and 4 had hypertensive disease with renal insufficiency. After preliminary observation, 200 ml. of 5 per cent. NaCl were injected intravenously, and observations were continued for 3 hr. In normal pregnancy, urinary volumes were slightly and in pre-eclampsia considerably diminished; in chronic nephritis complicating pregnancy they were greatly raised. In all groups, salt injection caused a peak urinary output in the first hour. The total chloride excretion tended to run parallel with the urinary output curve. In toxæmic and nephritic patients the blood chloride clearances tended to run parallel with urinary volume, but in normal patients, both pregnant and non-pregnant, parallel with urinary chloride concentration. The latter was somewhat similar in all groups, reaching a peak in the second hour in all pregnant women, but still rising in the third hour in the non-pregnant. Allowing for "endogenous" levels of chloride excretion, 9 per cent. of the injected Cl was eliminated in 3 hr. in normal pregnancy, compared with 4.5 per cent. in pre-eclampsia and 30 per cent. in nephritis complicating pregnancy. The difficulty toxæmic patients have in eliminating water and chlorides, manifested by low urinary volume and low total Cl excretion, is considered to be due not to renal damage but to active re-absorption by the renal tubules, a phenomenon differing only in degree from that present in normal pregnancy. By contrast, interference with the re-absorptive mechanism in chronic nephritis results in relatively high excretion levels.—A. M. Thomson.

2441

BALDISSERA NORDIO, C. **Ricerche ematiche durante la gravidanza.** [**Haematology in pregnancy.**] *Zootec. Vet.*, 1954, **9**, 346-358. [Ist. Zootec. Gen., Staz. Sper. Zootec., Univ. Milan.]

A review.

2442

BRASSEUR, L. **Carbohydrate metabolism during pregnancy in the rabbit.** *J. Physiol.*, 1954, **126**, 22P-23P. [Med. Clin., Univ. Louvain.]

2443

BEATON, C. H., BEARE, J., RYU, M. H. and McHENRY, E. W. **Protein metabolism in the pregnant rat.** *J. Nutrition*, 1954, **54**, 291-304. [Dept. Pub. Health Nutrit., Univ. Toronto.]

During the first 2 weeks of pregnancy in rats there was a considerable increase in carcass moisture and a smaller increase in carcass fat, which accounted for most of the increase in total bodyweight; N retention was slightly greater than in non-pregnant controls. From about the 15th day of gestation there were marked increases in body, foetus and liver weights, a rapid fall in carcass fat, a rise followed by a fall in carcass N and continued water retention. N retention increased, and blood amino-N and urea formation and alanine-glutamate transamination in the liver decreased. At and after parturition there was a rise in blood urea, and the other values returned to normal.—C. Warner.

2444

NELSON, M. M. and EVANS, H. M. **Maintenance of pregnancy in the absence of dietary protein with estrone and progesterone.** *Endocrinology*, 1954, **55**, 543-549. [Inst. Exp. Biol., Univ. California, Berkeley.]

Female rats in groups of 10 to 14 received a protein-free diet from the day of mating. Different groups received daily from the third day subcutaneous injections of 0.5 µg. oestrone, 4 mg. progesterone, 0.5 µg. oestrone plus 4 mg. progesterone, or sesame oil alone, or no injection. They were killed 13 or 21 to 23 days after mating.

In protein-deficient rats not given hormones, red cells appeared after 9 to 10 days in the vaginal smear, indicating foetal resorption. All the rats killed on day 13 showed small implantation sites, but at the end of gestation sites were found in only 60 per cent. From 90 to 100 per cent. of foetuses were resorbed.

Oestrone was somewhat beneficial, foetal deaths began later and 20 or 30 per cent. of the rats examined contained living young. Progesterone maintained pregnancy in 70 or 80 per cent. of the 30 rats. The number of implantation sites was normal, but the average number of living young per litter was only 6. Progesterone with oestrone maintained pregnancy in all the 30 rats, and the number of living young per litter was nearly normal. These animals lost less bodyweight than other groups, but were oedematous. They did not eat more.

In a second experiment the best dose of oestrone was found to be 2 to 3 µg. daily, with which 70 to 80 per cent. of the rats had living young. Higher and lower levels were less valuable.

D. Duncan.

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2245

- CARTER, M. W., SMART, W. W. G. (Jr.) and MATRONE, G. **Effect of genistin on growth and reproduction of the mouse.** *J. Animal Sci.*, 1954, **13**, 1016-1017. *Proc. [N. Carolina Agric. Exp. Stat.]*

2446

- SCOTT, J. M. **The metabolism of iron in pregnant patients treated with massive drip infusions.** *J. Obstet. Gynaecol. Brit. Empire*, 1954, **61**, 641-645. [Res. Dept., Royal Maternity Hosp., Glasgow.]

Fe balance was studied in 6 anaemic patients in the last trimester of pregnancy, after treatment by massive drip infusion of Fe, each patient receiving the equivalent of 1 g. Fe intravenously over 8 hr. Three patients received a saccharated compound of ferrous Fe and the other 3 a ferric compound of similar type. During the 24 hr. after the infusion began the average urinary excretion of Fe was 1.1 per cent. with the ferric and 0.1 per cent. with the ferrous compound; none of the Fe was detected in the faeces. The average maximum serum Fe value in the ferrous salt group was 1.59 and in the ferric salt group 3.75 mg. per cent. Ferrous Fe was thus more readily taken up by the tissues than ferric. Food produced a rise in the serum Fe. It is emphasised that as reactions to drip infusion may be severe in some patients the method cannot be recommended for routine use.—G. F. Garton.

2447

- NYLANDER, G. **The placental transfer of intravenously administered high molecular ferric carbohydrate.** *Acta Soc. Med. upsalien.*, 1954, **59**, 372-382. [Dept. Histol., Univ. Upsala.]

The Fe preparation was Ferrigen (in U.S. called Astrafer), in which the active principle is a high-molecular ferric carbohydrate, with about 20 mg. elemental Fe per ml. Each of 51 rats received 1 ml. Ferrigen intravenously 24 hr. before being killed; they were in 5 groups, pregnant for 15, 17, 19, 20 and 21 days. The 83 controls at the same stages of pregnancy received no Fe injection.

In all rats the plasma Fe values were almost doubled 24 hr. after Ferrigen injection; the mean was 265 ± 13.1 μ g. per cent., irrespective of duration of pregnancy. All the Fe was protein-bound. Hydrolysable Fe in the liver was about 4 times the normal amount. The total and hydrolysable Fe of the foetus were increased above those of un-injected controls in the earlier stages, but only slightly in those at the end of gestation. The final Fe concentration in the foetus was simply reached earlier than usual. The placental membranes collected much Fe at all stages, and especially towards the end of pregnancy in rats given Ferrigen. In these animals the membranes con-

tained much hydrolysable Fe at all stages instead of only at the twentieth and twenty-first days.

D. Duncan.

2448

- NYLANDER, G. **Histochemically demonstrable iron in the placental organs of the rat after intravenous administration of a high molecular ferric carbohydrate.** *Acta Soc. Med. upsalien.*, 1954, **59**, 363-371. [Dept. Histol., Univ. Upsala.]

The same rats were used as in the preceding abstract. Foetal membranes from 10 of these Ferrigen-treated females were examined histologically and compared with those from untreated pregnant rats.

In the villous portion of the yolk sac and in the allantoic placenta there were numerous crystals of ferritin, more and larger from the rats which had received Ferrigen. Reichert's membrane in these animals also stained more intensely with Turnbull's blue, as did phagocytic cells of the allantoic placenta.

It is concluded that the placental barriers effectively prevented the ferric carbohydrate compound from reaching the foetus.—D. Duncan.

2449

- HYTTEN, F. E. **Clinical and chemical studies in human lactation. 8. Relationship of the age, physique, and nutritional status of the mother to the yield and composition of her milk.** *Brit. Med. J.*, 1954, **ii**, 844-845. [Dept. Midwifery, Univ. Aberdeen.]

The yield and composition of milk on the seventh day of lactation was studied in 155 primiparae. There was a highly significant negative correlation between milk yield and age and between milk yield and net weight change in pregnancy. Fat content was not related to either age or weight change. In general, women of good health and physique tended to have higher milk yield of higher fat content than women of poorer health and physique. Data from a diet survey of 55 of the women in the seventh month of pregnancy showed no relation between diet and yield or composition of milk.—F. C. Aitken.

2450

- MOHR, H. **Klinische Untersuchungen zur Steigerung der Laktation. [Clinical studies in stimulating lactation.]** *Deutsch. med. Wochenschr.*, 1954, **79**, 1513-1516. [Frauenklin., Univ. Tübingen.]

Since vitamin B₃ and Alyt, a proprietary extract of *Agnus castus* (*Vitex agnus-castus*), had been reported as increasing proliferation of the breast epithelium and secretion of milk, a trial was made in which, in all, 362 mothers were not

treated, 353 were given Alyt, 15 drops thrice daily before food, and 102 were given vitamin B₁, 1 tablet thrice daily [amount per tablet not stated]. Up to the time of discharge of the well mothers there was no apparent difference between the average milk yields of the groups, but of those with complications, who remained in hospital for 11 to 20 days, those with Alyt produced significantly more milk than the others and the difference increased with duration of stay in hospital. [Yield appears to have been assessed by test weighing of the babies.]—I. Leitch.

2451

FLUX, D. S. Note on variations in the udders of monozygotic cattle twins. *N.Z. J. Sci. Technol.* [A], 1954, 36, 287. [Dairy Res. Inst. (N.Z.), Palmerston North.]

In 6 pairs of identical twin heifers the yields of the 4 quarters of the udder were measured separately on 4 occasions during lactation. Statistically significant differences were found between twin pairs in the relative amounts of milk obtained from the front and rear quarters. The amounts of milk produced by the right and left sections of the udder did not differ significantly.

Post-mortem examination of the udders of a pair of twins of which one gave no milk from one front teat and the other none from either front teat showed that these teats had small sinuses which ended as blind sacs. It was concluded that the abnormality was inherited.—J. N. Aitken.

2452

HANCOCK, J., BRUMBY, P. J. and TURNER, C. W. Hormonal induction of lactation in identical twin dairy cattle. *N.Z. J. Sci. Technol.*, 1954, 36, 111-116. [Ruakura Animal Res. Stat., Dept. Agric., Hamilton, N.Z.]

Lactation was induced by hormones in one member of each of 7 pairs of monozygous heifers. Mammary growth was obtained by injecting 50.05 mg. progesterone and diethylstilboestrol, in the ratio 1000 : 1, daily for 60 days, followed by 75.075 mg. daily for 30 days and 100.1 mg. daily for 60 days. Induction of lactation was begun on the 30th day of the last period by injecting an additional 2 mg. diethylstilboestrol daily, increased to 4 mg. on the 40th and 8 mg. on the 50th day and continued until each animal's twin calved. Regular milking twice daily then began. The lactation fat-corrected milk yield of the treated animals ranged from 10.8 to 106.9 per cent. of that from their normally bred twins. The poor milk yield of 3 of the treated animals was due to genetic limitations. The other 4 heifers yielded "normal" amounts with lactation totals from 2404 to 4366 lb. fat-corrected milk.—J. L. Corbett.

2453

DONKER, J. D., KOSHI, J. H. and PETERSEN, W. E. The effects of hourly milking with the aid of intravenous injections of oxytocin. *J. Dairy Sci.*, 1954, 37, 1261-1268. [Dept. Dairy Husb., Univ. Minnesota.]

2454

SHAFFHAUSEN, D. D., JORDAN, R. M. and DRACY, A. E. The effect of relaxin upon milk ejection. 1. The let-down effect upon sheep. *J. Dairy Sci.*, 1954, 37, 1173-1175. [Dept. Animal Husb., S. Dakota Agric. Exp. Stat., Brookings.]

Ten ewes were hand-milked after the lambs had been removed for 12 hr. Immediately after this milking 500 guineapig units relaxin were injected intravenously and the ewes were milked again after 1 min. Milking was again repeated after 10 I.U. oxytocin were given intravenously. The first milking gave 39.1 per cent. of the milk, the second 43.5 and the third 17.4. Relaxin may have a contracting effect upon the alveoli as well as a relaxing effect upon the symphysis pubis.

J. C. Gill.

2455

SWANSON, E. W. The effect upon milk production and body weight of varying withdrawal periods after thyroactive supplement feeding. *J. Dairy Sci.*, 1954, 37, 1212-1219. [Dairy Dept., Univ. Tennessee, Knoxville.]

In experiments with 28 Holstein and Jersey cows the effects of different rates of withdrawal of a thyroid-active supplement on milk production were studied. Withdrawal of the material occupied 10, 15, 18, 25 or 30 days, after treatment for 14 weeks.

Withdrawal in 10 days resulted in a rapid drop in milk yield to below the expected normal. When withdrawal took 15 days or more the decline in milk yield was slower and yield did not fall below the expected normal. Treated cows lost weight, but rapidly recovered after cessation of treatment. Paunch girth showed that the increased body-weight gains were largely due to an increase in gastro-intestinal contents.

In 2 sets of identical twins, 1 of each pair treated and its mate used as control, body water estimated by the antipyrine method showed no effect of treatment.—J. N. Aitken.

2456

ASKONAS, B. A., CAMPBELL, P. N. and WORK, T. S. The biosynthesis of proteins. 2. Synthesis of milk proteins by the goat. *Biochem. J.*, 1954, 58, 326-331. [Nat Inst. Med. Res., Mill Hill, London, N.W.7.]

See also Abst. 705, Vol. 24.

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After injection of ^{35}S -methionine into the jugular vein of a lactating goat, maximum activity was found in the milk within 1.5 hr., about half the ^{35}S appearing in protein within 8 hr. The activity of the casein was at all times slightly higher than that of the whey proteins, possibly because the latter contained some low-activity blood protein. When ^{14}C -labelled glycine, valine and lysine were injected, the activities of these amino-acids isolated from casein, purified β -lactoglobulin E and crystalline β -lactoglobulin G were identical, suggesting that the N pool for the formation of casein and of lactoglobulin was identical and in equilibrium with circulating blood amino-acids. Serine isolated from the casein, and presumably formed from the labelled glycine, had a higher activity than that from the lactoglobulin.—C. Warner.

2457

BLACK, A. L. and KLEIBER, M. **Level of fixed carbon in amino acids of casein measured in the intact dairy cow.** *J. Biol. Chem.*, 1954, **210**, 895–902. [Univ. California Sch. Vet. Med., Davis.]

^{14}C -Labelled NaHCO_3 was injected intravenously into a cow which was then milked at intervals, and the radio-activity of amino-acids prepared from the casein of the milk was measured. High specific activity was first found in aspartic acid and persisted longest in glycine; alanine at 11 hr. showed the highest specific activity of all tests. From 4 to 8 per cent. of the carbon of aspartic acid, glutamic acid, serine, glycine, alanine and arginine was derived from blood CO_2 , about 1 per cent. of the C of proline, valine, methionine and lysine, and 0.1 to 0.6 per cent. of that of threonine, the leucines, tyrosine, phenylalanine and histidine.

C. Warner.

2458

KLEIBER, M., BLACK, A. L., BROWN, M. A., LUTCK, J., BAXTER, C. F. and TOLBERT, B. M. **Butyrate as a precursor of milk constituents in the intact dairy cow.** *J. Biol. Chem.*, 1954, **210**, 239–247. [Coll. Agric., Univ. California, Davis.]

Four lactating cows were injected with sodium butyrate- $1\text{-}^{14}\text{C}$ and $2\text{-}^{14}\text{C}$. The specific activity of the expired CO_2 was greatest after 10 and 30 min., respectively, and was greatest in the CO_2 derived from the carboxyl group, which was oxidised at a rate between those of the similar groups in acetate (Abst. 729, Vol. 23) and propionate (Abst. 778, Vol. 24).

About 6 and 22 per cent. of the $1\text{-}^{14}\text{C}$ and $2\text{-}^{14}\text{C}$ appeared in organic milk constituents, much less in fat than in lactose and casein. Acetate labelled in the 1 or 2 position produced the greatest activity in milk fat. This suggests that not much of the

transfer of C from butyrate to lactose takes place through acetate, and if β -oxidation is involved the 2-carbon units evidently favour carbohydrate over fat synthesis.

Data indicate that the transfer of the carboxyl carbon of butyrate to lactose, casein and milk fat was about 27, 18 and 8 per cent. by CO_2 fixation. The corresponding figures for $2\text{-}^{14}\text{C}$ were 15, 6 and 6.—A. Hepburn.

2459

PEETERS, G., COUSSENS, R. and SIERENS, G. **The detection of a ketoheptose sugar in colostrum and udder tissue from cows.** *Naturwissenschaften*, 1954, **41**, 428–429. [Dept. Physiol., Vet. Sch., Univ. Ghent.]

Extracts of colostrum, normal milk and udder tissue were compared by paper chromatography with standards of pure mammoheptulose and of juice expressed from fresh *Sedum spurium* and known to contain sedoheptulose. In normal milk no ketoheptose was detected, but sometimes in colostrum and often in udder tissue extracts there was a substance with the characters of sedoheptulose. The ketoheptose sugar, it is suggested, may be an intermediate product in the carbohydrate metabolism of the mammary gland.—D. Harvey.

2460

BRATLIE, O. **Undersøkelse av sinsekretet. [Studies of secretion during the dry period.]** *Tidsskr. norske Landbruk*, 1954, **61**, 292–298. [Hellerud Forsøksfjøs.] English summary.

The composition of the udder secretion from drying off to next calving in 8 cows is described.

See also Absts. 1638, 1639, 1765, 1904, 1943, 1969, 1970, 1993, 2021, 2047, 2071, 2320, 2341, 2355, 2477, 2550, 2553, 2601, 2621, 2631, 2634, 2689, 2697, 2788, 2798, 2799, 2810, 3113.

REPRODUCTION: BIRDS

2461

SMITH, A. H., WILSON, W. O. and BROWN, J. G. **Composition of eggs from individual hens maintained under controlled environments.** *Poultry Sci.*, 1954, **33**, 898–908. [Coll. Agric., Univ. California, Davis.]

Six hens in each of 2 experiments were given a practical laying ration with P contents of 0.8 and 1.0 per cent., respectively. Sunlight was excluded from all houses, and continuous artificial light was given. Eggs were collected twice daily and stored at 55° F. until analysed within 1 or 2 days. In trial 1, the hens were kept at temperatures of 60° F. for 26 days, then at 80° F. for 30 days, with acclimatisation periods of 34 and 33 days. In trial 2, the experimental conditions were 60° F. and 90° F. for 40-day periods, preceded by 50 days and no acclimatisation period, respectively.

The eggs of the experimental birds differed from accepted standards. The shells were relatively light and the whites relatively heavy. The levels of Na and K on water content basis were the same in the white and the yolk, which suggested that these elements were in solution; the Ca levels were similar in the white and the yolk on a dry fat-free basis, suggesting that Ca was protein-bound. The P levels of yolk and white were dissimilar on any basis; 8.7 per cent. of the total P was inorganic in the white and 4.7 per cent. in the yolk. A significant positive correlation was found between inorganic P of the yolk and laying rate. There was also a slight correlation between the level of P compounds in the white and laying rate, which indicated that the deposition of inorganic P in the white was intermittent. Level of P in the shell was not affected by the laying rate. A difference was found in the Na:K ratio of white and yolk, and its bearing on embryo growth is discussed. The composition of eggs varied much between birds, but individually was nearly constant. There was a suggestion that the age of the bird influenced the composition of the egg.

The rise in ambient temperature decreased both egg size and laying rate in direct proportion. The dry matter of the yolk decreased, that of the white increased. At higher temperatures the total P level of the white and the yolk rose, but the inorganic P level of the yolk fell. These changes in composition are also associated with a low laying rate. The high temperature increased the Na and K content of the yolk, especially the Na.

M. J. Head.

2462

SMITH, A. H., WINGET, C. M. and BLACKARD, J. R. The transfer of phosphorus to the hen's egg, under controlled environment, as traced with radiophosphorus (F^{32}). *Poultry Sci.*, 1954, **33**, 908-919. [Coll. Agric., Univ. California, Davis.]

The conditions of this experiment were the same as in the previous Abst. At the beginning of each experiment each hen received intramuscularly 180 to 350 μ C. of 32 P.

Less than 2 per cent. of the injected P appeared in the shell within 12 days unless an egg was laid soon after injection; 2 per cent. appeared in the shell of an egg laid 2 hr. after injection. The maximum amount of radio-activity always occurred in the first shell laid.

Less than 1 per cent. of the injected 32 P reached the white in the first 12 days and maximum activity was encountered in the second egg laid except when it was 3 or more days afterwards.

Of the injected dose 10.8 per cent. reached the yolk in the first 12 days and 4.2 per cent. in the next 12. Maximum activity was in the fourth or

fifth egg, that of inorganic P preceding that of organic P by 38 hr.

Kinetic analysis of the rate of 32 P transference indicated the existence of 2 major P pools, one renewed every 1.4 days and holding 18 per cent. of the total P, and the other renewed in 14 days holding 82 per cent.—M. J. Head.

2463

RANDLES, C. A. (JR.) A study of phosphate diffusion in the developing egg with radioactive phosphorus³². *Poultry Sci.*, 1954, **33**, 1077. *Proc.* [Oak Ridge Inst. Nuclear Studies, Ohio State Univ., Columbus.]

2464

CLEGG, R. E., HEIN, R. E., SUELTER, C. H. and McFARLAND, R. H. The distribution of radioactive phosphorus in the electrophoretic components of egg yolk proteins. *Poultry Sci.*, 1954, **33**, 1049. *Proc.* [Kansas State Coll., Manhattan.]

2465

TYLER, C. A further study of the effect of sulphanilamide on the metabolism of calcium and phosphorus in the laying hen. *J. Agric. Sci.*, 1954, **45**, 156-163. [Dept. Agric. Chem., Univ. Reading.]

As an extension of earlier work (Abst. 1208, Vol. 21) a calcium and phosphorus balance experiment was made with 6 pullets for 10 consecutive periods each of 8 days. In the second and third periods each bird received a daily supplement of either 0.036 or 0.072 g. sulphanilamide.

The sulphanilamide appeared to have no significant effect on the number of eggs laid by the birds either immediately or in the next 8 months. The daily ration contributed 2.75 g. Ca and 1.06 g. P, and in the preliminary period the birds were all in positive balance or equilibrium for both minerals. At the time of, and for 5 weeks after, receiving sulphanilamide Ca retention was reduced. During sulphanilamide feeding the eggs laid were thinner shelled so that the balance was little affected. Afterwards shell thickness returned rapidly to normal, so that for several weeks the birds were in negative Ca balance as a result of persisting impairment of retention.

Statistical analyses were made in an attempt to relate individual differences in Ca retention to the level of egg production, and to concurrent changes in P metabolism.—K. J. Carpenter.

2466

TYLER, C. and GEAKE, F. H. Studies on egg shells. 5. Some physical and chemical characteristics of the egg shells of five different types of

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pheasant. *J. Sci. Food Agric.*, 1954, **5**, 612-619. [Dept. Agric. Chem., Univ. Reading.]

Egg shells from 5 types of pheasants, 4 reared in captivity and the other trapped before laying, were examined for shell thickness, porosity coefficients, pore counts, membrane-, pore- and matrix-protein, citric acid, carbonate, Ca, Mg and P. There were considerable differences between the types, with the wild type usually at one or other end of the range. Equations relating shell weight to Ca content and carbonate to Ca content were similar to those from hen egg shells (Abst. 3494, Vol. 24) but the relation between shell thickness and weight per unit area was different.—A. Hepburn.

2467

RAMSAY, W. N. M. and CAMPBELL, E. A. Iron metabolism in the laying hen. *Biochem. J.*, 1954, **58**, 313-317. [Dept. Biochem., Univ. Edinburgh.]

Plasma Fe and Hb were estimated in samples of blood taken at intervals of about 3 weeks from pullets before laying and throughout a laying season. Plasma Fe rose from below 250 μg . per 100 ml., 10 days before laying, to become 500 and 900 μg . per 100 ml. during egg production. High plasma Fe values were significantly correlated with high values for total egg Fe.

From analyses of liver, spleen and kidney it was concluded that the increased Fe requirement during egg laying was provided by increased efficiency of absorption rather than by depletion of tissues.—R. Hill.

SENESCENCE

2468

LANSING, A. I. Senescence as a sequel to adolescence. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 9*, 1954, 24-38. [Sch. Med., Washington Univ., St. Louis, Mo.]

2469

BETHELL, F. H. Hemopoietic factors with reference to aging. *Nat. Vitamin Found., Inc.,*

N.Y., Nutrit. Symposium Ser. No. 9, 1954, 95-105. [Thomas Henry Stimpson Mem. Inst. Med. Res., Univ. Michigan, Ann Arbor.]

2470

SHOCK, N. W. Some physiological and biochemical aspects of aging. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 9*, 1954, 1-23. [Sect. Gerontol., Nat. Inst. Health, Baltimore, Md.]

2471

SHEA, J. A., JONES, M. L. and STARE, F. J. Nutritional aspects of aging. *Med. Clin. N. Amer.*, 1954, **38**, 1483-1492. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

2472

RAFSKY, H. A. Special nutritional problems of the aged. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 9*, 1954, 130-137. [Geriatric Inst., Home and Hosp. of the Daughters of Jacob, Bronx, N.Y.]

2473

INGLE, D. J. Endocrine stress and aging. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 9*, 1954, 120-129. [Ben May Lab. Cancer Res., Univ. Chicago, Ill.]

2474

DAVIDSON, C. S. Protein metabolism with particular reference to problems of aging. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 9*, 1954, 49-58. [Thorndike Mem. Lab., Boston City Hosp., Mass.]

2475

DEUEL, H. J. (Jr.) Fat metabolism with special reference to problems of aging. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 9*, 1954, 39-48. [Sch. Med., Univ. S. California, Los Angeles.]

EXPERIMENTAL STUDIES OF IMMUNITY AND MICRO-ORGANISMS

2476

FABIANI, G. and ORFILA, J. Action du régime lacté sur le paludisme expérimental de la souris blanche. [Effect of a milk diet on experimental malaria in the white mouse.] *C.R. Soc. Biol.*, 1954, **148**, 1239-1241.

Adult mice received a milk diet without added vitamins; 9 had fresh and 23 condensed cow's milk. After 3 to 5 days on the diet they were

inoculated with *Plasmodium berghei*, and the percentage of parasitised red cells was counted every second day.

The effect of the milk diet was irregular; in some mice there was little development of the parasites, in others an irregular fluctuation, in others again the parasites began after about 12 days to increase slowly but regularly, and these mice eventually died. The development of reticulocytosis also was

erratic and dissociated from that of the parasites, and in some animals there were large numbers of free reticulocytes when few parasites were present. Mice which survived the infection on milk diet were later returned to stock diet and re-inoculated; they developed a slight infection which was cured, thus demonstrating the persistence of immunity acquired in resisting the massive infection on milk diet.

The complex effect of the milk diet is discussed.
D. Duncan.

2477

BUYZE, H. G. Het verschil tussen moedermelk en koemelk ten aanzien van de Bifidusfactor. [Difference between human milk and cow's milk in respect of the bifidus factor.] *Voeding*, 1954, 15, 488-493. [Centraal Inst. Voeding-sonderzoek T.N.O., Utrecht.] English summary.

The recent work of György and his colleagues (Abst. 3509, Vol. 24), who isolated a group of oligo- or polysaccharides containing an acetylglucosamine group from breast milk, meconium, semen, tears and gastric mucus, and Tomarelli *et al.* (Abst. 3510, Vol. 24), who isolated from pig stomach mucus a similar compound with a stimulating effect on the growth of a pure culture of a mutant of *Lactobacillus bifidus* (var. *Penn.*) is reviewed. The activity of the compound from stomach is small compared with that of breast milk. In comment it is said that these results cannot fully explain the difference between human and cow's milk. The mutant used represents only a small part of the normal bifidus flora of breast-fed infants and the production of a complete, or near-complete, bifidus flora is not explained.

I. Leitch.

2478

HARTLES, R. L. and WASDELL, M. R. The metabolism of the oral flora. 4. The invertase activity of mixed human saliva. *Brit. Dent. J.*, 1954, 97, 231-235. [Dept. Biochem., Sch. Dent. Surg., Univ. Liverpool.]

2479

ÅGREN, G. Investigations of substances inhibiting or stimulating the growth of some lactobacilli. 4. The effect of some growth stimulating, heatstable proteins on lactobacilli cultivated on an improved medium. *Acta pathol. microbiol. scand.*, 1954, 35, 136-142. [Dept. Med. Microbiol., Inst. Chem., Univ. Uppsala.]

2480

PILCHER, H. L. and WILLIAMS, H. H. Microbiological evaluation of protein quality. 2. Studies of the responses of *Tetrahymena pyriformis* W to intact proteins. *J. Nutrition*,

1954, 53, 589-599. [Dept. Biochem. Nutrit., Cornell Univ., Ithaca, N.Y.]

A modification of the method described in Abst. 3922, Vol. 21 for measuring the growth response of *Tetrahymena pyriformis* W to different proteins is given. Two batches of casein, defatted whole egg, peanut flour and wheat gluten meal alone and supplemented with lysine were compared by this method; the order of rank was the same as when rats were used as test animals. The amino-acid content of the protozoön was estimated.—C. Warner.

2481

McCLURE, L. E., NEUMAN, R. E. and MCCOY, T. A. Amino acid metabolic studies. 6. Aspartic acid-lysine interrelations in *Streptococcus faecalis* (6057). *Arch. Biochem. Biophys.*, 1954, 53, 50-55. [Lab. Res. Div., Samuel Roberts Noble Foundation, Inc., Ardmore, Okla.]

2482

JACKSON, G. G., GABUZDA, G. J. and FINLAND, M. (with HIRSCHBERG, E. A., DE CARLI, L., WILCOX, C. and BRODERICK, M. K.) Effect of antibiotics on organisms used in certain microbiologic assays of essential nutrients. *J. Lab. Clin. Med.*, 1954, 44, 449-462. [Thorn-dike Mem. Lab., Boston City Hosp., Mass.]

This work was undertaken to find how far antibiotics may affect the results of microbiological estimation of amino-acids, folic acid, riboflavin, nicotinic acid, pyridoxine and citrovorum factor.

The sensitivity of assay organisms, *Streptococcus faecalis*, *Lactobacillus casei* (2 strains), *Lactobacillus delbrueckii*, *Leuconostoc citrovorum*, *Lactobacillus arabinosus* and *Saccharomyces carlsbergensis*, to 9 antibiotics was studied in heart infusion agar, brain-heart infusion broth and the defined media employed for the particular microbiological estimation for which each organism was used.

The antibacterial effects of penicillin, chlortetracycline and chloramphenicol were influenced by the medium less than those of the other antibiotics; the antibacterial titres of bacitracin and erythromycin were always much less in assay media than in meat infusion media; with streptomycin, neomycin, polymyxin and oxytetracycline results differed with the test organism.

Because antibiotic-containing materials submitted for microbiological assay may be autoclaved before assay, the effect of autoclaving at 15 lb. for 15 min. upon the antibacterial titres of the antibiotics was investigated. Autoclaving completely inactivated chlortetracycline and oxytetracycline below the level of 200 µg. per ml.; chloramphenicol was stable and remained bacteriostatic above 12.5 µg. per ml.

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Chlortetracycline, oxytetracycline or chloramphenicol, added before or after autoclaving, could not replace essential amino-acids for growth of *S. faecalis*, nor could they replace phenylalanine or tyrosine for *L. casei* or *L. delbrueckii*. Autoclaved chlortetracycline could not replace nicotinic acid, riboflavin, pyridoxine or citrovorum factor for the growth of the appropriate assay organisms.

Graded amounts of riboflavin, up to 0.1 µg. per ml. medium, were without effect upon the bacteriostatic titre of chlortetracycline towards *L. casei*. The presence of riboflavin, folic acid and citrovorum factor in the relatively high concentrations of 10 or 50 µg. per ml. assay medium did not alter the sensitivity of *L. casei* to chlortetracycline.

J. C. Appleby.

2483

EADIE, J. M. and OXFORD, A. E. A remarkable disintegrative effect of skatole upon certain rumen ciliate protozoa. *Nature*, 1954, 174, 973. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Anaerobic protozoa from the sheep's rumen, *Isotricha*, *Dasytricha* and *Ophryoscolex*, which could be kept active in buffer solution for several hours, were found not only to be killed by indole and skatole, as previously reported by Hogg and Elliott (*J. Biol. Chem.*, 1951, 192, 131) for *Tetrahymena pyriformis*, but, at near saturation point, to be rapidly and completely disintegrated with liberation of intracellular inclusions. Isatin and 2- and 7-methylindoles produced a similar though sometimes less rapid result; some indole derivatives related to tryptophan were of low toxicity and without disruptive effect. It appeared that toxicity was determined not only by molecular structure but also by physical properties.

It is concluded that toxic indole derivatives in the rumen, resulting from bacterial proteolysis there, may be expected to affect the protozoal population.—J. C. Appleby.

2484

BRYANT, M. P. and DOETSCH, R. N. A study of actively cellulolytic rod-shaped bacteria of the bovine rumen. *J. Dairy Sci.*, 1954, 37, 1176-1183. [Dairy Husb. Res. Branch, U.S. Dept. Agric., Beltsville, Md.]

Of Gram-negative cellulolytic rods isolated from rumen contents, 8 strains showing fundamental physiological agreement were selected for more detailed biochemical examination, including carbohydrate fermentation tests. A technique for preparing anaerobic cultures for estimation of end products is described.

No growth was obtained unless the authors' more usual Trypticase and yeast extract were supplanted by 20 per cent. rumen fluid. Only

glucose, cellobiose, cellulose and pectin were attacked by all strains. The end products of cellulose fermentation of the 2 strains with the widest morphological differences were closely comparable and were legitimate constituents of rumen liquor. The organisms were identified as *Bacteroides succinogenes*, although they had not all its fermentative powers. With glucose medium, the relations of one strain with temperature and reaction were studied, and some growth requirements were investigated. Substitution of bovine saliva, faeces extract, alfalfa meal extract, or a complex synthetic solution for rumen fluid failed to produce comparable growth of this strain. It is concluded that a hitherto unknown growth substance, stable to heat, acid, and alkali, is present in rumen fluid.—E. S. M. Mackay.

2485

MACKAY, E. S. M. and OXFORD, A. E. Some facultatively anaerobic gram-negative rods from the rumen of the calf and the sheep. *J. Gen. Microbiol.*, 1954, 11, 472-476. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The rumen contents of 12 calves aged 1½ to 15 weeks were collected at slaughter. Gram-negative rods were isolated by plating on a crystal violet medium and anaerobic incubation.

Numbers of coliform bacteria in individual calves ranged from none to 10⁶ per g. rumen contents. Of 39 isolates 34 were negative to the Voges Proskauer reaction and methyl red positive, and 5 were V.P. positive and M.R. negative. Capsulated *Aerobacter aerogenes* was not encountered; this organism was isolated readily from the rumen of a sheep fed on starch and concentrates, but not of sheep fed on hay.

From the older calves a urea-splitting Gram-negative rod was isolated on 9 occasions. This was not assigned to any known genus, but a description is given.—J. C. Appleby.

2486

BELASCO, I. J. Comparison of urea and protein meals as nitrogen sources for rumen micro-organisms. Urea utilization and cellulose digestion.

The production of volatile fatty acids. *J. Animal Sci.*, 1954, 13, 739-747; 748-757. [Polychem. Dept., E.I. du Pont de Nemours and Co., Wilmington, Del.]

In an artificial rumen the efficiency of urea as a source of N for cellulose digestion by rumen micro-organisms was compared with that of high-protein meals.

Urea alone (in the presence of starch), soya bean meals alone, and urea and soya bean meals in 1:1 mixtures were investigated at 93.5, 187 and 374 mg. N levels. This plan was repeated with maize

gluten meals, cottonseed meals and linseed meals replacing soya bean meals. Estimations of urea and ammonia provided an indication of the rate of urea utilisation, but a similar procedure was not applicable with the protein meals. The rate of cellulose digestion always proved a reliable indicator of N utilisation, and within limits the relation between N supply, N utilisation and cellulose breakdown was linear.

At equivalent N levels, and especially at the lower levels, urea gave better cellulose breakdown than did any protein meal, and it was more completely utilised in the urea-protein mixtures. Increasing amounts of urea from 1.3 per cent. to 35 per cent. protein equivalent levels, but not more, resulted in comparable increases in cellulose digestion. Detailed results are tabulated.

In similar tests volatile fatty acids were estimated by chromatographic technique, of which details are given. Urea as N source gave a consistent increase in propionic acid, presumably as a result of more active cellulose digestion. Higher production of butyric and possibly of valeric acid in the presence of protein meal supplements was attributed in part to protein degradation. The proportion of acetic acid did not vary significantly.

J. C. Appleby.

2487

STALLCUP, O. T. The release of ammonia nitrogen from urea, ammoniated molasses and soybean oil meal in the presence of rumen microorganisms. *J. Animal Sci.*, 1954, **13**, 1000. *Proc.* [Univ. Arkansas.]

2488

HALL, G., CHENG, E. W., HALE, W. H. and BURROUGHS, W. Chemical and enzymatic preparations of protein hydrolysates stimulatory to cellulose digestion by rumen microorganisms. *J. Animal Sci.*, 1954, **13**, 985-986. *Proc.* [Iowa State Coll.]

2489

BENTLEY, O. G., LEHMKUHL, A., JOHNSON, R. R. and MOXON, A. L. The stimulatory effect of certain fatty acids on *in vitro* cellulose digestion by rumen microorganisms. *J. Animal Sci.*, 1954, **13**, 1015. *Proc.* [Ohio Agric. Exp. Stat.]

2490

BROOKS, C. C., GARNER, G. B., GEHRKE, C. W., MUHRER, M. E. and PFANDER, W. H. The effect of added fat on the digestion of cellulose and protein by ovine rumen microorganisms. *J. Animal Sci.*, 1954, **13**, 758-764. [Univ. Missouri, Columbia.]

To a cellulose-containing medium in artificial rumens was added maize oil in amounts varying from 10 to 170 mg. per 25 ml., and these were inoculated with rumen fluid from a sheep on a high-cellulose diet. Cellulose breakdown, estimated after 40 hr. at 39° C., was significantly less than in control preparations, by 93.9 per cent. with 160 mg. oil.

The effect of fats on digestion of cellulose and protein *in vivo* was investigated in crossbred yearling wethers. From 32 to 64 g. maize oil or lard was added to about 1 kg. basal diet of casein and cottonseed hulls, and protein and cellulose were estimated in 4-day collections of faeces. Digestion of cellulose and protein was impaired, with some loss of appetite, particularly by maize oil. Addition of alfalfa ash to the diet prevented to some extent the inhibition of digestion by the fat. In the rumen, volatile fatty acid production was less in the presence of fats. The total number of rumen bacteria did not appear to be altered, but the flora became predominantly coccoid.

J. C. Appleby.

2491

GARNER, G. B., MUHRER, M. E., ELLIS, W. C. and PFANDER, W. H. Antibiotic-like substance and cellulose digestion stimulator found in fermented feeds and in rumen fluid. *Science*, 1954, **120**, 435-436. [Dept. Agric. Chem., Coll. Agric., Univ. Missouri, Columbia.]

Acid extracts of rumen digesta and of fermented feeds contained heat-stable factors that inhibited growth of *Micrococcus flavus*, *Pseudomonas aeruginosa* and *Aerobacter aerogenes*. This extract also increased cellulose digestion by mixed rumen organisms *in vitro*.—A. T. Phillipson.

2492

GARNER, G. B., MUHRER, M. E. and PFANDER, W. H. Rumen microorganism growth regulation factor(s) found in extracts of rumen contents and of some ruminant feeds. *J. Animal Sci.*, 1954, **13**, 983. *Proc.* [Univ. Missouri.]

2493

TYZNIK, W. J., BENTLEY, O. G., WEISER, H. H., SUTTON, T. S., MOXON, A. L. and others. The effect of various carbon substances on *in vitro* activity of sheep rumen microorganisms. *J. Animal Sci.*, 1954, **13**, 1002. *Proc.* [Ohio Agric. Exp. Stat.]

2494

CHENG, E. W. and BURROUGHS, W. *In vitro* metabolism of diethylstilbestrol in the bovine rumen. *J. Animal Sci.*, 1954, **13**, 1017. *Proc.* [Iowa State Coll.]

N.A. and R., April 1955

2495

SCHENDEL, H. E., BORG, A. F. and JOHNSON, B. C.
The effect of antibiotics on the intestinal and cecal microflora of baby pigs fed a "synthetic milk". *J. Animal Sci.*, 1954, **13**, 904-911. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Sixteen baby pigs were fed on "synthetic milk" with water-soluble vitamins added; half were given terramycin also, at the rate of 50 mg. per kg. dry matter of the feed. Growth rates were recorded.

When the pigs were killed after 5 weeks portions of the intestine were immediately isolated by ligaturing and contents of sections of the duodenum, jejunum, ileum and caecum were removed for bacteriological examination. Colony counts were made on beef liver infusion agar, malt agar, Rojosa's medium and deoxycholate agar. Mean peak counts for each specimen from 14 pigs showed that in the pigs given antibiotic the total count in each portion of the gut above the caecum was

about 10 times that in control pigs. These regions corresponded with those where, in the rat, highest concentrations of antibiotic were to be found by microbiological assay. There was no correlation between caecal counts and increased growth rates. From counts upon each medium it was concluded that the antibiotics produced no great qualitative change in the flora.

It was postulated that the increase in growth rates of animals given antibiotic might be related to a general increase in intestinal bacteria capable of synthesising nutrients.—J. C. Appleby.

2496

MASSON, M. J. **Microscopic studies of the gut flora of the hen with special reference to the breakdown of starches.** *10th World's Poultry Congr. Sect. Papers*, Edinburgh, 1954, 105-111. [Rowett Res. Inst., Bucksburn, Aberdeen-shire.]

See also Absts. 1985, 1986, 1998, 2018, 2019, 2060, 2095, 2487, 2490.

MISCELLANEOUS FEEDING EXPERIMENTS

2497

BIXBY, J. N., BOSCH, A. J., ELVEHJEM, C. A. and SWANSON, A. M. **Factors affecting the nutritive value of cow's milk.** *J. Agric. Food Chem.*, 1954, **2**, 978-982. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Groups of 6 weanling rats weighing 40 to 45 g., housed individually, were fed on stock diet or on diets of milk treated in different ways with added Fe 3, Cu 0.15 and Mn 0.15 mg. per 100 ml. After 6 weeks they were killed and liver fat was estimated.

On the milk diets growth as measured by average weekly weight gains was good, though not quite as good as on the stock diet. Pasteurisation or homogenisation of the milk had no effect, nor was there a seasonal effect. These results are contrary to those of Elvehjem and others before the war (Absts. 3821, Vol. 4; 2286, Vol. 6; 3156, Vol. 7; 1970, Vol. 8); the reason suggested is that milk produced now may be higher in nutritive value than formerly. Liver fat was higher in all milk-fed rats; the effect was slightly less with homogenised milk. Supplements of choline, folic acid, vitamin B₁₂, methionine, lysine, threonine or glycine had little or no effect on growth or liver fat; a mixture of the first 3 reduced liver fat slightly. Mg slightly reduced growth. Addition of 10 per cent. sucrose or dried skimmed milk low in lactose slightly reduced liver fat. Further experiments with skimmed milk enriched with homogenised cream showed that liver fat increased

with the butterfat content of the milk but that growth did not vary much. Additional heat treatment at 185° F., but not at 145° or 165° F., of pasteurised homogenised milk slightly reduced growth but did not affect liver fat. Very good growth and low liver fat values were obtained with dried whole milk, either dry or reconstituted, and canned milk sterilised by the high-temperature short-time process.

Experiments carried through 3 generations, in which females received mineralised milk raw or pasteurised at 143° F. for 30 min. and were mated with males on stock diet, showed that pasteurisation had no effect on reproduction and lactation; but young of second and third generation females grew less well on raw or pasteurised milk than those of first generation females.—W. M. Deans.

2498

APPANNA, T. C. and DEVADATTA, S. C. **The effect of prawn protein on the bone of mature rats.** *Proc. Indian Acad. Sci.*, 1954, **40**, 44-48. [Christian Med. Coll., Vellore.]

Six groups of 10 mature rats were given synthetic diets with prawn (*Parapaenopsis sculptilis*) pulp as the only source of protein other than the small amount of yeast supplied. It constituted 7.5, 10, 12.5, 15, 17.5 or 20 per cent. of the diet. Food intake and bodyweight were recorded and after 30 days the rats were killed. Length, dry fat-free weight and the ash, Ca and P contents of the humerus were estimated. Loss of weight

occurred and skeletal development was poorest in the group with the lowest amount of prawn pulp. With the 3 highest amounts mean weight increases and skeletal development were the same. The composition of the bone judged by its Ca : P ratio in the ash was not affected by the differences in protein level. [Throughout the paper the group with the lowest amount of prawn pulp is referred to as the 5 per cent. group.]—D. Harvey.

2499

WESTERMAN, B. D., OLIVER, B. and MAY, E. Improving the nutritive value of flour. 6. A comparison of the use of soya flour and wheat germ. *J. Nutrition*, 1954, 54, 225-236. [Dept. Foods Nutrit., Kansas Agric. Exp. Stat., Manhattan.]

For part 5 see Abst. 743, Vol. 23.

Albino rats at 24 days of age were given a vitamin-B-free diet for 10 to 14 days to deplete their reserves of these vitamins. They were divided into 8 groups of 10 equal as to sex and littermates. Seven groups were given diets of natural foods similar to those consumed by man. The cereal component which supplied 52 per cent. of the calories was enriched or non-enriched flour with or without supplements of 3 per cent. wheat germ or 3 per cent. soya flour. The eighth group was given stock diet. The rats were weighed weekly for 12 weeks; they were then mated and carried through 3 pregnancies and lactations. The young were used in a second generation growth trial and the first generation were killed and their muscle and liver tissue was analysed for vitamin B₁, riboflavin, nicotinic acid and pantothenic acid.

Soya flour or wheat germ added to unenriched or enriched flour significantly improved growth. There was no significant difference between the effects of these supplements except in the second generation tests with unenriched flour, when soya flour was more effective than wheat germ in promoting growth. Reproduction and lactation as judged by the numbers of young produced and weaned were best in the group given enriched flour with wheat germ and second best in the group given unenriched flour with soya flour.

Wheat germ added to unenriched flour resulted in significantly greater storage of vitamin B₁ in liver and muscle and greater storage of riboflavin in liver; soya flour significantly increased storage of riboflavin in liver.—F. C. Aitken.

2500

SURE, B. Relative nutritive values of proteins in whole wheat and whole rye and effect of amino acid supplements. *J. Agric. Food Chem.*, 1954, 2, 1108-1110. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

Whole rye flour was superior to whole wheat flour as sole protein source for rats, as measured by growth over 10 weeks and protein efficiency. The nutritive value of whole flour was increased by supplementation with lysine and threonine, that of whole rye flour by valine.—C. Warner.

2501

GREER, E. N. and GRINDLEY, G. G. The late maturing of winter wheat : an observation on the nutritive value of the grain. *J. Agric. Sci.*, 1954, 45, 125-128. [Res. Assoc. British Flour Millers, Cereals Res. Stat., St. Albans, Herts.]

Wheat grain was given as the sole source of protein to rats. Wheat containing more N as a result of application of fertiliser in the spring produced better growth than wheat not so fertilised. The ratio of growth rate to N intake suggested that the fertilised grain was not more acceptable, but had a greater nutritive value.

A. Hepburn.

2502

SUBRAHMANYAN, V., KRISHNAMURTHY, K., SWAMINATHAN, M., BHATIA, D. S. and RAGHUNATHA RAO, Y. K. Supplementary value of cottonseed flour to wheat and ragi diets. *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, 3, 225-226.

Good quality cottonseed kernels were extracted with alcohol, ground to flour and analysed. The results, including values for gossypol and vitamin B₁, are given. The extracted cottonseed flour was used at the 10 per cent. level to supplement poor vegetarian ragi or wheat diets in a rat growth experiment. The supplemented diets were both significantly better than the unsupplemented.

T. D. Bell.

2503

SUBRAHMANYAN, V., KUPPUSWAMY, S. and SWAMINATHAN, M. Possible influence of the quality of rice in determining the nutritive value of the poor rice diet. *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, 3, 272-276.

A brief review of the results of animal experiments on the nutritional value of rice diets is reported. It shows a great variation in growth-promoting values; rates from 1 to 10 g. per week in albino rats are recorded by different workers. It is suggested that the difference may be due to the chemical composition of the varieties of rice used, the degree of milling, different characteristics of the experimental animals, or seasonal and climatic differences. It was considered from available evidence that varietal differences in the rice were probably the most important. Further investigation on these lines, with a view to standardising a satisfactory rice diet, is called for.

T. D. Bell.

N.A. and R., April 1955

2504

KIRK, M. C. **Nutritive value of rice germ.** *J. Agric. Food Chem.*, 1954, **2**, 1179-1181. [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

Different methods for separation of rice germ from rice bran are outlined. Growth studies were made on groups of 6 male and 6 female rats and metabolism studies on groups of 24 animals. Four diets each contained 20 g. Cellu flour, 40 g. salt mixture, 40 g. vegetable fat, 10 g. maize oil plus vitamin mixture, 10 g. sucrose and biotin mixture and 10 g. sucrose and vitamin B complex mixture; the first diet also contained 870 g. milled rice, the second 756 g. milled rice, 50 g. rice germ and 64 g. cerelose, the third 382 g. rice germ and 488 g. cerelose and the fourth 603 g. rice germ and 267 g. cerelose. On these 4 diets bodyweight gains in 10 weeks were on the average 80, 103.8, 105 and 114 g.; the protein efficiency ratios of the diets, calculated from the gains in bodyweight per g. protein intake, were 1.76 ± 0.08 , 2.63 ± 0.11 , 2.59 ± 0.06 and 1.90 ± 0.10 . The biological value of the first diet was 61.4 ± 1.7 , and of the fourth diet 78.1 ± 1.3 .

The amino-acid content of rice germ was estimated microbiologically and results are compared with those published for milled rice. Figures are given for the content of B group vitamins, Ca, P, Fe and other constituents in rice germ.

G. F. Garton.

2505

KADKOL, S. B., SREENIVASAMURTHY, V. and SWAMINATHAN, M. **Nutritive value of the seeds of *Panicum miliare* (little millet).** *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, **3**, 247-248. [Div. Biochem. Nutrit.]

Whole and husked seeds of *Panicum miliare* (little millet) were analysed. A table of the results, with wheat for comparison, is presented. Except for carbohydrate, calculated by difference, in the husked millet, and ether extract and total minerals in both forms, the values for wheat were all higher.

The comparative values of husked little millet and whole wheat as sources of protein, vitamin B complex and minerals, except Ca, were investigated. [Details or results are not given.] Comparative nutritive values as the staple grain in a poor vegetarian diet were also investigated by the rat growth method. The diets for this are described and a table of results, which shows whole wheat to be greatly superior to husked little millet, is presented.—T. D. Bell.

2506

HIRWE, R. and MAGAR, N. G. **Effect of autoclaving on the nutritive value of pulses.** *Indian J. Med. Res.*, 1953, **41**, 191-200. [Inst. Sci., Bombay I.]

Vol. 25, No. 2

The growth of groups of 6 young albino rats was used to estimate the nutritive value of raw and autoclaved Bengal gram, dhal arhar, lentils, horse gram, black gram, green gram and field beans. The protein content of all the diets was 12 per cent.; the pulses were autoclaved at 15 lb. pressure for different periods. The diets were administered for 5 to 6 weeks, after which the animals were killed and the liver and kidneys were removed for estimation of protein and fat.

The nutritive value of the protein of Bengal gram, horse gram and field beans was improved by autoclaving, that of the other pulses was not. When methionine was added to raw pulses except dhal arhar and field beans the nutritive value was improved. There was no great difference in composition of livers from rats given the different diets.—G. F. Garton.

2507

MEYER, J. H. **The utilization of alfalfa and alfalfa fiber fractions by growing rats.** *J. Nutrition*, 1954, **54**, 237-247. [Dept. Animal Husb., Univ. California, Davis.]

The utilisation of alfalfa and its 3 fibre fractions, extracted alfalfa, holocellulose and lignin, was estimated by paired feeding, N balances and digestibility experiments with weanling rats fed on diets containing 10 and 35 per cent. protein.

Lignin did not produce weight gains or N retention and was slightly digested only when given with the low-protein ration. Holocellulose gave a small weight increase and N retention, but only with the low-protein ration; 8 to 14 per cent. holocellulose was apparently digested. With the low-protein ration alfalfa produced higher N retention than extracted alfalfa. In general weight gains closely followed N retention. With the high-protein rations alfalfa gave large increases in weight gain and extracted alfalfa gave only slight increases. N retentions were the same. This showed that extracted alfalfa was a valuable source of N, but not of energy; the soluble constituents were valuable for both. About 12 per cent. of the organic matter of extracted alfalfa was apparently digested, of soluble constituents from 69 to 75 per cent.—A. Hepburn.

2508

ROBERTS, R. S. **The nutritional properties of killed *Bacterium coli*.** *Brit. J. Nutrition*, 1954, **8**, 353-363. [Evans Biol. Inst., Runcorn, Cheshire.]

Cultures of *Bacterium coli* grown on an inorganic salt medium with glucose and sodium citrate were centrifuged and re-suspended in physiological saline and the cells were killed by heating at 80° C. for 1 hr. The bacteria were equivalent to fishmeal as a protein supplement for growth of

young rats receiving a basal diet of cereals and fish solubles. The optimum bacterial protein concentration was 1 to 2 per cent. A basal diet with 16.5 per cent. protein, 4 per cent. from *Bact. coli*, produced better growth in chicks than a mash with 18.3 per cent. protein containing fishmeal, liver meal, dried skimmed milk, dried whey and riboflavin. The promotion of growth by *Bact. coli* may be similar to that by antibiotics. Preparations of *Bact. coli* containing culture fluid were toxic.—A. Hepburn.

2509

HUBBELL, R. B. A comparison of two stock rations for albino rats. *J. Nutrition*, 1954, **53**, 429-438. [Connecticut Agric. Exp. Stat., New Haven.]

Mendel and Hubbell in 1935 (Abst. 4283, Vol. 5) reported growth and reproductive performance in the rat colony at the Connecticut Agricultural Experiment Station. The study which was begun in 1931 has been continued with rats on the stock regimen then described and with other rats on the Bills modification (Abst. 223, Vol. 1) of the Steenbock stock diet.

On the old stock diet the percentage of fertile matings and the percentage of young weaned declined gradually from 93 and 90 to about 80 and 82, but the weaning weights of the young increased slightly. On the Bills diet fertility declined only from 74.9 to 73.1 per cent., but the drop in percentage of young weaned, from 89.2 to 80.9, resembled that on the old stock diet. Weaning weights were better on the stock diet, but after weaning rats consistently became heavier on the Bills diet. The adult rats were heavier on the latter, but nursing females lost weight on it and maintained weight on the stock diet.

D. Duncan.

2510

MORAN, T., PACE, J. and HUTCHINSON, J. B. Palatability of the diet as a factor in the interpretation of rat-growth experiments. *Chem. and Indust.*, 1954, No. 44, 1354-1355. [Res. Assoc. Brit. Flour-Millers, Cereals Res. Stat., St. Albans, Herts.]

2511

TRIBE, D. E. The influence of exercise on the selection of food by rats. *Brit. J. Animal Behaviour*, 1954, **2**, 140-143. [Sch. Vet. Sci., Univ. Bristol.]

Three groups of 8 rats were supplied with maize starch, glucose and a basal diet. Walking for $1\frac{1}{2}$ or $\frac{3}{4}$ miles daily on an exercise wheel did not significantly affect the voluntary energy intake, but weight gain decreased as exercise increased.

A. Hepburn.

2512

UGALDE, F., EGAÑA, E. and FALAHA, F. Algunos aspectos del ayuno experimental: su recuperación por elección alimenticia libre. [Some aspects of experimental fasting: recuperation on a freely chosen diet.] *Rev. méd. Chile*, 1954, **82**, 386-394. [Inst. Med. Exp., Esc. Med., Univ. Chile.]

Of 160 adult rats subjected to complete fast, except for water, 110 were killed after $6\frac{1}{2}$ days and the rest were allowed to recuperate, with free choice of diet. Clinical recovery was rapid; the animals reached an average weight of 262 g. in 14 days, after the initial weight of 253 g. had fallen to 186 g. during fasting. The changes of bodyweight did not directly reflect the weight changes of the different organs. The weights of brain and heart were unaffected by fast and recuperation. The weights of lung, liver, spleen and kidney were considerably diminished below normal values by fasting, and the spleen remained somewhat below normal after recuperation, though the other 3 organs reached values above normal. The adrenals showed hypertrophy as the result of fasting, but normal weights in the recuperated animals. Data are given for the effect of fasting and recuperation on the alkali reserve, basal metabolism, urinary and blood pictures, and fat content of liver, with metabolic studies *in vitro* with Warburg's apparatus, and histopathological studies of liver and kidney. There was pronounced fatty infiltration of the liver after recuperation, and in the fasting kidney a degenerative lesion of the tubules.—M. B. Richards.

2513

TEITELBAUM, P. and STELLAR, E. Recovery from the failure to eat produced by hypothalamic lesions. *Science*, 1954, **120**, 894-895. [Dept. Psychol., Johns Hopkins Univ., Baltimore, Md.]

Rats with hypothalamic lesions refused to eat or drink, but after they had been maintained on fluid diet given by stomach tube for from 6 to 65 days they began to take water and then food voluntarily. Foods rich in fat, such as chocolate and evaporated milk, were accepted first.

D. Duncan.

2514

LEE, M. F., HENRY, J. P. and BALLINGER, E. R. Basic requirements for survival of mice in a sealed atmosphere. *J. Aviation Med.*, 1954, **25**, 399-406; 432. [Aero Med. Lab., Wright-Patterson Air Force Base, Ohio.]

With a view to the eventual possibility of studying the biological effect of prolonged removal of gravity in a rocket satellite of the earth, experiments were made to ascertain the requirements for survival of mice in a sealed atmosphere.

N.A. and R., April 1955

A bell jar apparatus, illustrated and described, was developed with a living space of 13×26 cm. in which a mouse could survive for 30 days if supplied with 72,000 c.c. oxygen, 1300 g. soda lime to absorb CO_2 and water, 150 ml. water, and 200 g. Purina chow, of which 120 g. was eaten and the rest scattered. The rate of growth of such mice was similar to that of mice kept under similar conditions except that the bell jar was left open, or in open cages.—W. M. Deans.

2515

VAN REEN, R. and PEARSON, P. B. **Nutritional studies with the white-throated wood rat (*Neotoma mexicana*)**. *Science*, 1954, **120**, 571-573. [McCollum-Pratt Inst., Johns Hopkins Univ., Baltimore, Md.]

The wood rat is indigenous to the arid southwestern United States and Mexico. A commercial stock diet for rats appeared to be adequate for their maintenance and growth, but a purified diet was not accepted. They did not reproduce under laboratory conditions. Excretion of riboflavin, nicotinic acid and pantothenic acid were studied in animals on the stock diet.

The rats are not expected to be widely useful for laboratory experiments.—D. Duncan.

2516

TERLIZZI, L. **Dieta proteica esclusiva prevalentemente vegetale e resistenza massima al nuoto, nel ratto albino. [A diet exclusively of protein, chiefly vegetable, and maximum resistance to swimming by the albino rat.] Dieta proteica esclusiva, animale o mista, e resistenza massima al nuoto, nel ratto albino. [A diet exclusively of protein, from animal or mixed sources, and maximum resistance to swimming by the albino rat.]** *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 23-25; 25-26. [Ist. Fisiol., Univ. Bari.]

Three male rats weighing from 90 to 100 g. were maintained on a diet consisting of 95 per cent. wheat gluten with salts and vitamins and 5 per cent. ovalbumin to supply amino-acids lacking from the wheat gluten. After 25, 30 and 35 days, respectively, they were made to swim carrying a 5-g. weight; exhaustion and death occurred in 42, 74 and 99 min.; for 3 rats fed normally the times were 161, 206 and 154 min.

The experiment was repeated with 3 rats fed normally and 3 maintained on a diet containing, per cent., casein 34, ox fibrin 53 and ovalbumin 13, with salts and vitamins. After 20, 25 and 30 days they were made to swim as described above and those on protein diet became exhausted in 123, 15 and 29 min., the times for the rats fed normally being 161, 144 and 144 min. When the

diet was of mixed animal and vegetable proteins, the times were 29, 89 and 120, with 161, 206 and 154 min. for normal rats.—E. M. Humc.

2517

PICCIONI, M. **Azione di taluni antibiotici sullo sviluppo ponderale e sulla utilizzazione della quota proteica nel ratto. [Action of some antibiotics on weight gain and utilisation of protein in the rat.]** *Quad. Nutrizione*, 1953, **13**, 20-28. [Ist. Chim. Biol., Univ. Bologna.] French, English and German summaries.

Rats received to appetite, from weaning at 30 days, the diet of Randoin and Causseret (Abst. 3159, Vol. 17), with green food twice weekly; antibiotics were given daily in aqueous suspensions from a pipette. Groups of 10 males received daily 2.5 mg. aureomycin or terramycin or 5 mg. streptomycin; groups of 10 females received the same or 2.5 mg. chloramphenicol or 3 mg. penicillin. Controls of each sex had no antibiotic. The experiment lasted until the rats were 150 days old. Bodyweights were recorded, and faecal analyses were made after 15 days and at the end of the experiment.

The greatest effects of antibiotics on growth were in the first 15 days, during which terramycin, streptomycin and aureomycin increased the weight gain in both sexes by about 20 per cent. Chloramphenicol and penicillin were less effective. After 120 days the mean weights of treated groups were not more than 6.2 per cent. above those of controls and the differences were not significant. The faecal analyses showed that after 15 days the utilisation of dietary protein was improved by all the antibiotics. The improvement was about 24 per cent. with terramycin, aureomycin and chloramphenicol, 16 per cent. with streptomycin and 21 per cent. with penicillin. At the end of the experiment the first 3 antibiotics still gave 20 per cent. better utilisation than in controls, but the improvement with streptomycin or penicillin was no longer significant.—D. Duncan.

2518

BERRY, M. E. and SCHUCK, C. **The effect of aureomycin on growth and protein utilization in the rat.** *J. Nutrition*, 1954, **54**, 271-284. [Dept. Foods Nutrit., Purdue Univ., Lafayette, Ind.]

Weanling rats were fed on diets containing casein, cottonseed meal or soya bean meal as sources of protein. Aureomycin at 10 mg. per 100 g. of a diet containing 15 per cent. protein as soya bean meal or cottonseed meal increased growth; when the diet contained 15 per cent. casein aureomycin was ineffective, but it increased growth on a diet with 9 per cent. casein. At 18 and 21 per cent. levels of cottonseed meal protein,

aureomycin increased weight gains by 34 and 19 per cent.

The addition of amino-acids to casein at the 9 per cent. level and soya bean and cottonseed meal proteins at the 15 per cent. level increased growth, which was further increased by aureomycin. This suggested that aureomycin acted in some other way besides making amino-acids available.

Aureomycin improved the apparent digestibility of cottonseed and soya bean meal proteins, but impaired utilisation followed. This was most pronounced with cottonseed meal.—A. Hepburn.

2519

FRENCH, C. E., URAM, J. A., INGRAM, R. H. and SWIFT, R. W. The effect of high levels of terramycin and streptomycin on longevity in the rat. *J. Nutrition*, 1954, **54**, 75-80. [Dept. Animal Nutrit., Pennsylvania State Univ., State College.]

Eighty-three male and 84 female rats were reared on a complete diet. At 11 months of age 51 males and 55 females received, during alternate months, either streptomycin sulphate or terramycin hydrochloride incorporated into the diet at 0.02 per cent.; 7 months later this was doubled. The other rats continued on the control diet throughout the experiment; food was given to appetite to all. About 10 rats of each sex from both groups were killed at intervals for histological study.

The addition of antibiotics to the diet decreased the average life span of both sexes by about 10 per cent. Neither beneficial nor deleterious effects were observed on the organs or on the incidence of chronic pneumonia.—G. F. Garton.

2520

REBER, E. F. and WILLIGAN, D. A. The effects of a chlorophyll derivative when included in a ration fed rats. 2. Reproduction, blood and tissue studies. *Amer. J. Vet. Res.*, 1954, **15**, 643-646. [Coll. Vet. Med., Univ. Illinois, Urbana.]

Rats were fed from weaning on a semi-synthetic diet and a group of 6 females received 1 per cent. of sodium potassium copper chlorophyllin in the diet. There was no adverse effect on growth, rate of conception or number of young born in the first litters of these females, but only 2 of the 6 litters survived to weaning at 21 days, and the mean weight of the young at this age was 30 g., against 40 g. in controls whose mothers received no chlorophyllin; after weaning the poor growth was partly compensated in 7 days of rapid gain. The young showed muscular weakness.

The rats given the chlorophyllin had significantly higher neutrophil counts and hence higher total white blood cell counts than controls. Poly-

chromasia and normoblasts were absent from blood smears of 4 of 5 animals given chlorophyllin.

The first generation young rats killed at 28 days of age after receiving the chlorophyllin had pale green, rough hair and greenish tissues. Some of the muscles were pale and showed selective degeneration and phagocytosis of fibres.—D. Duncan.

2521

FINK, H. Zur Kenntnis der alimentären Lebernekrose der Ratte. [Dietary liver necrosis in the rat.] *Hoppe-Seyler's Ztschr.*, 1954, **298**, 93-96. [Inst. Gärungswissensch., Univ. Cologne.]

The findings by Fink *et al.* (*Hoppe-Seyler's Ztschr.*, 1953, **294**, 123) that rye and wheat in small amounts retarded the onset of liver necrosis in rats on a mushroom diet (*Anst.* 2073, Vol. 24) suggested a trial of the effect of omitting these cereals, which provided 15 per cent. of the total protein, from a non-necrogenic diet based on dried skimmed milk.

In experiments with different batches of milk and about 170 rats in all, initial growth was rapid, as good as in rats on the milk diet with cereals and much better than in those on the mushroom diet, but in the end mortality from liver necrosis, which generally set in after from 30 to 100 days, was about 80 per cent. Possible causes are indicated and work to elucidate them is in progress.

Neither egg protein nor the protein of unicellular algae (*Scenedesmus obliquus*) produced liver necrosis within 30 to 100 days.

The findings with milk and cereals are fresh evidence in favour of this combination of proteins and hence of the use of skimmed milk in bread-making.—W. M. Deans.

2522

COBURN, A. F., GRAHAM, C. E. and HANINGER, J. The effect of egg yolk in diets on anaphylactic arthritis (passive Arthus phenomenon) in the guinea pig. *J. Exp. Med.*, 1954, **100**, 425-435. [Rheumatic Fever Res. Inst., Northwestern Univ. Med. Sch., Chicago, Ill.]

When egg yolk was added to the diet of pregnant guineapigs and to the diet of the offspring the young received a high degree of protection against anaphylactic arthritis. When egg yolk was given to weanling guineapigs for 3 to 5½ weeks a significant degree of protection was obtained also. The active material in egg yolk was in the alcohol-soluble fraction. The results are discussed in relation to the pathogenesis of rheumatic fever in children.—F. C. Aitken.

2523

BACHRUBER, T. E. and LALICH, J. J. Production of dissecting aneurysms in rats fed *Lathyrus odoratus*. *Science*, 1954, **120**, 712-713. [Dept. Pathol., Med. Sch., Univ. Wisconsin, Madison.]

2524

WAXLER, S. H. and ENGER, M. **Organ weights and obesity in mice.** *J. Nutrition*, 1954, **54**, 209-214. [Dept. Pharmacol., Stanford Univ. Sch. Med., San Francisco, Calif.]

Adult male mice were made obese by giving them a single injection of gold thioglucose and then allowing them unlimited food for 4 months. They weighed 46 to 55 g. and controls weighed 27 to 38 g. when they were killed, and separate organs were weighed wet, dry and defatted. On all 3 bases the liver, spleen, thymus and adrenals showed the greatest increases in obese animals; the increases were roughly proportional to the increase in bodyweight. The increases in kidney, testes and brain were negligible, those in heart, lung and femur somewhat greater.

In a group of mice made obese by the same method and then brought down to control weight by food restriction the organ weights were similar to those of controls and sometimes less.—D. Duncan.

2525

MARSHALL, N. B. and MAYER, J. **Energy balance in goldthioglucose obesity.** *Amer. J. Physiol.*, 1954, **178**, 271-274. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Gold thiomalate or sodium thioglucose when used to provide amounts of gold and thioglucose equivalent to those which, in the form of gold-thioglucose, gave rise to obesity in mice, produced no obesity. In metabolism studies the food intake by obese mice was 8.0 g. and by non-obese control animals 4.9 g. daily. Total activities in terms of revolutions of activity cages were 541 and 928 and basal oxygen consumption rates were equivalent to 11.5 and 8.5 Cal. daily for obese and control mice.

Feeding experiments were also made with 3 diets, carbohydrate-, fat- or protein-rich with 64, 75 and 69 per cent. of their energy derived from these respective nutrients. Over 19 days average gains on the first 2 diets were 2.0 and 6.6 g. per animal, but on the high-protein diet there was an average loss of 6.2 g. per animal.

The results are compared with those of an earlier study (Abst. 4535, Vol. 23) and are concluded to provide additional evidence of the multiple etiology of obesity.—D. Harvey.

2526

PAYNTER, K. J. and GRAINGER, R. M. **An investigation of the relation of nutrition to tooth morphology.** *J. Dent. Res.*, 1954, **33**, 680. *Proc.* [Div. Dent. Res., Fac. Dent., Univ. Toronto.]

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2527

STEPHAN, R. M. and HARRIS, M. R. **The development of caries in different strains of rats.** *J. Dent. Res.*, 1954, **33**, 687. *Proc.* [Nat. Inst. Dent. Res., Bethesda, Md.]

2528

DALDERUP, L. M. **Experimental caries in albino rats.** *Acta physiol. pharmacol. neerl.*, 1951-52, **2**, 290-291. [Netherlands Inst. Nutrit., Amsterdam.]

2529

BIXLER, D., MUEHLER, J. C. and SHAFER, W. G. **The effect of castration and desalivation on the endocrine glands, body weight, metabolism, and dental caries in the rat.** *J. Dent. Res.*, 1954, **33**, 648-649. *Proc.* [Dept. Chem., Univ. Indiana, Bloomington.]

2530

PALMER, H. B., LAFFER, N. C. and FABER, J. E. (Jr.) **The oral administration of Lactobacillus acidophilus into the Syrian hamster. 1. Oral lactobacilli population in relation to dental caries.** *J. Dent. Res.*, 1954, **33**, 679. *Proc.* [U.S. Air Force Sch. Aviation Med., Randolph Air Force Base, Randolph Field, Tex.]

2531

KLAPPER, C. E. and VOLKER, J. F. **The influence of selected sugars on the dental caries susceptibility of desalivated hamsters.** *J. Dent. Res.*, 1954, **33**, 666. *Proc.* [Sch. Dent., Univ. Alabama, Birmingham.]

2532

JOHANSEN, E. **Attempts to produce dental caries in the Syrian hamsters. Controlled topical applications of sucrose and acids.** *J. Dent. Res.*, 1954, **33**, 664. *Proc.* [Sch. Med. Dent., Univ. Rochester, N.Y.]

2533

FOLK, J. E. and McCURE, F. J. **Cariogenic effects of skim milk powder fractions and heat-processed whey powders.** *J. Dent. Res.*, 1954, **33**, 658. *Proc.* [Nat. Inst. Dent. Res., Bethesda, Md.]

2534

HEIN, J. W. **Effect of combination of urea and copper chlorophyll on experimental dental caries in the Syrian hamster.** *J. Dent. Res.*, 1954, **33**, 709. *Proc.* [Sch. Med. Dent., Univ. Rochester, N.Y.]

2535

SHAW, J. H. An effect of certain nutritionally inert materials on the incidence of experimental dental caries. *J. Nutrition*, 1954, **54**, 177-191. [Harvard Sch. Dent. Med., Boston, Mass.]

Data are reported from 5 experiments with cotton rats and desalinated white rats: (1) with 69 cotton rats of a strain susceptible to caries and given a caries-producing diet, No. 100, alone or with additions of agar or cellulose flour; (2) with 23 white rats given diet 100 alone or with cellulose flour; (3) with 55 white rats given diet 100 alone or with 20 per cent. polyvinyl acetate of low molecular weight in either of 2 forms (L-PVA); (4) with 38 white rats given diet 100 alone or with 5, 10 or 20 per cent. L-PVA; (5) with 46 rats given a similar

basal diet alone or with the same L-PVA, a comparable polyvinyl acetate of high molecular weight, the natural rubber derivative chicle, or arochem, an esterification polymer of glycerol, fatty acids and rosin. The numbers and extent of carious molars and lesions were recorded.

Experiments 1 and 2 showed that the increase in mastication occasioned by a simple increase in the quantity of the diet required by the rats to maintain their growth was without effect on the carious lesions. Experiments 3, 4 and 5 indicated that the L-PVA greatly reduced the incidence of caries and that the other materials in the fifth experiment did so also but to a slightly less extent. There was again no evidence that the amount of mastication affected the incidence of caries.

D. Harvey.

GENERAL METABOLISM AND FEEDING HABITS OF ANIMALS OTHER THAN MAMMALS AND BIRDS

2536

KHARIN, N. N. and TASHCHILIN, V. A. Pitanie utok i ikh vozmozhnoe vozdeistvie na formirovanie vodnykh biotenzozov. [The nutrition of ducks and their possible effect on the formation of aquatic biocoenoses.] *Zool. Zh.*, 1953, **32**, 1251-1258. [Dept. Zool., Novocherkassk Zoovet. Inst.]

The object of the investigation was to discover whether ducks on fishponds consumed some of the food essential to the fishes' development. The ducks' diet was analysed by means of a oesophageal fistula, the duck being allowed to forage for 15 to 25 min. daily over a period of 3 months.

From the amounts of different foods consumed it is concluded that when ducks are present in large numbers on fishponds, particularly shallow ones, they could have a depressing effect on *Daphnia* and similar organisms, which are important fish foods.—H. Scherbatoff.

2537

IRISAWA, H. and IRISAWA, A. F. Blood serum protein of the marine Elasmobranchii. *Science*, 1954, **120**, 849-851. [Dept. Physiol., Sch. Med., Univ. Hiroshima, Kure, Japan.]

Paper electrophoresis of serum proteins of skate and shark showed patterns different from those of other animals. The fastest component was not albumin, which is apparently absent.—A. Hepburn.

2538

ROBERTSON, J. D. The chemical composition of the blood of some aquatic chordates, including members of the Tunicata, Cyclostomata and

Osteichthyes. *J. Exp. Biol.*, 1954, **31**, 424-442. [Dept. Zool., Univ. Glasgow.]

Tunicates studied were the ascidian *Phallusia mammillata* and the thaliacean *Salpa maxima* in both its asexual solitary and its sexual chain form. The concentrations in plasma, expressed as a percentage of those in sea water, were for the ascidian Na 99.4, K 100.2, Ca 93.3, Mg 98.8, Cl 103.6 and SO₄ 52.5; for the 2 forms of thaliacean Na 100.3 and 100.8, K 112.9 and 114.3, Ca 95.9 and 95.0, Mg 94.9 and 95.4, Cl 102.4 and 102.5 and SO₄ 64.9 and 67.2.

The Cyclostomata studied were the hagfish, *Myxine glutinosa*, and the lamprey, *Lampetra fluviatilis*. In serum from 3 specimens of hagfish the mean amounts, in m. equiv. per kg. water, were Na 558, K 9.6, Ca 12.5, Mg 38.8, Cl 576, SO₄ 13.3, cations 619 and anions 602. In lamprey plasma corresponding values were 119.6, 3.21, 3.93, 4.21, 95.9, 5.44, 131.3 and 120.5.

The bony fish studied were the Roman conger, *Muraena helena*, and the freshwater whitefish, *Coregonus clupeoides*, for both of which plasma was analysed. In m. equiv. per kg. water values for the conger were Na 211.8, K 1.95, Ca 7.73, Mg 4.85, Cl 188.4, SO₄ 11.35, cations 228.4 and anions 217.4. In the *Coregonus* plasma corresponding values were 140.9, 3.81, 5.34, 3.38, 116.8, 4.58, 153.8 and 140.6.

The Tunicates, though without excretory tubules, show some ionic regulation, especially in the low SO₄ levels. The amount of protein is small, less than 1 g. per litre plasma. In the serum of the hagfish each ion is regulated, Na and PO₄ being higher and the others, especially SO₄ and Mg, lower than in sea water. The plasma of the fresh

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water lamprey resembles that of the teleost *Coregonus*. In the marine teleost *Muraena* the total concentrations of cations and anions are 31 and 30 per cent., respectively, of those in sea water; the concentrations of Na and Cl are much higher than in the freshwater teleost.

The evolutionary implications of the findings are discussed.—D. Harvey.

2539

POTTS, W. T. W. The inorganic composition of the blood of *Mytilus edulis* and *Anodonta cygnea*. *J. Exp. Biol.*, 1954, **31**, 376-385. [Dept. Zool., Univ. Cambridge.]

From analyses for Na, K, Ca, Mg, Cl, SO_4 and CO_2 in samples of blood of the marine mussel, *Mytilus edulis*, values of 11.54, 0.497, 0.505, 1.357, 20.78, 2.944 and 0.220 mg. per g. water, respectively, were obtained. Corresponding values for samples from the freshwater mussel, *Anodonta cygnea*, were 0.358, 0.019, 0.337, 0.00465, 0.415, 0.073 and 0.643 mg. *Mytilus* blood resembles sea water in composition, but the concentrations of Ca, K and CO_2 are higher than those in sea water, 0.445, 0.420 and 0.111 mg. per g., respectively.

Calculation of the ratios of the values for *Mytilus* to those for *Anodonta* blood showed that Ca and CO_2 concentrations in the 2 bloods were of the same order of magnitude and from consideration of the solubilities of the 2 crystalline forms of CaCO_3 , calcite and aragonite, it is concluded that in each species the blood is saturated with respect to aragonite.—D. Harvey.

2540

SILVERMAN, P. H. and LEVINSON, Z. H. Lipid requirements of the larva of the housefly *Musca vicina* (Macq.) reared under non-aseptic conditions. *Biochem. J.*, 1954, **58**, 291-294. [Med. Res. Labs., Med. Corps, Israel Defence Army.]

Batches of 20 to 25 eggs of the fly, each contained in 1 ml. of a suspension of bacteria (mainly *Bact. coli*) normally found in the gut of the insect, were incubated at 35°C. in wet media. The media consisted of (1) whole wheat bran (control), (2) lipid-free bran, (3) lipid-free bran plus the lipids extracted from bran, (4) lipid-free bran plus 1 per cent. yeast extract, (5) lipid-free bran plus 1 per cent. saponifiable bran lipids, (6) lipid-free bran plus 0.17 per cent. unsaponifiable matter of bran, and 8 more diets consisting of diet 4 plus 1 per cent. saponifiable wheat bran lipids or 0.17 per cent. of one of the following: unsaponifiable wheat bran lipids, wheat bran sterols, sitosterol, cholesteryl, cholesteryl acetate, cholest-4-en-3-one and cholestan-3-one. One test tube from the 7 used for each diet was opened for examination before the time of pupation; when pupation

occurred, on the fifth to seventh day, the remaining tubes were opened and the pupae were pooled for weighing. The number and average weight of larvae was noted daily; growth curves were constructed.

The only lipid required by the larvae was contained in the sterol fraction of the wheat bran diet and identified as sitosterol; the same biological activity was produced by cholesterol, cholesteryl acetate and cholest-4-en-3-one. Cholestan-3-one could not replace cholesterol and behaved as an inhibitor of growth and pupation.

The role of sitosterol in larval resistance to bacterial infection and in the promotion of growth and pupation is discussed.—G. A. Garton.

2541

LEVINSON, Z. H. and SILVERMAN, P. H. Studies on the lipids of *Musca vicina* (Macq.) during growth and metamorphosis. *Biochem. J.*, 1954, **58**, 294-297. [Med. Res. Labs., Med. Corps, Israel Defence Army.]

(See also previous abstract.)

The water and lipid content of batches of eggs, early and late third stage larvae, immature and mature pupae and the newly-emerged adult fly were estimated; similar studies were made on the puparia, media before rearing, media with bacteria after rearing larvae and media after culturing only bacterial flora.

The lipid content of *M. vicina* rose in 7 days from 2.5 µg. in the egg to 1225 µg. in the late third stage larva; within 24 hr. of the onset of pupation it fell to 880 µg. The 2-day-old pupa contained 714 µg. lipid of which, 48 hr. later, 294 µg. was recovered from the emergent fly and 22 µg. from the puparium. No appreciable change occurred in the saponification number (216.8 to 219.1) of the lipid during larval growth and pupation; the saponification number (225.0) of the newly emerged fly suggests that it contains a significantly higher proportion of shorter-chain fatty acids. Throughout growth and metamorphosis the amounts of sterols and unsaponifiable lipids (4 to 5 per cent. of total lipids) remained relatively constant. As judged by iodine value the fatty acids of the wheat bran diet are laid down during larval growth in their unsaturated state, saturation or decomposition into shorter-chain acids beginning with the onset of pupation.—G. A. Garton.

2542

NOLAND, J. L. Sterol metabolism in insects. 2. Inhibition of cholesterol utilization by structural analogs. *Arch. Biochem. Biophys.*, 1954, **52**, 323-330. [Med. Labs., Army Chem. Centre, Md.]

For the previous study see Abst. 5061, Vol. 24. Growth response of nymphs of the cockroach

Blatella germanica was measured by the average weight of each diet group at 30 days of age or by the average age at which maturation occurred. The insects were fed on diets containing 0.05 per cent. cholesterol and 1 per cent. of each of a series of 31 cholesterol derivatives.

Thiocholesteryl acetate, cholesteryl chloride, cholesteryl methoxide and thiocholesterol were potent inhibitors of growth; weak inhibitors included Δ^2 -cholestene, cholesteryl alkyl phosphonate, cholesteryl thiocyanate and cholesterylamine. It is suggested that inhibition of cholesterol utilisation may be due to a competitive inhibition of cholesterol esterase during cholesterol absorption.—G. A. Garton.

2543

NEWTON, C. J. Effects of starvation on composition of Japanese beetle larvae (*Popillia japonica* Newman). *Physiol. Zool.*, 1954, 27, 248-258. [Dept. Biol., Fordham Univ.]

2544

HOUSE, H. L. Nutritional studies with *Pseudosarcophaga affinis* (Fall.), a dipterous parasite

of the spruce budworm, *Choristoneura fumiferana* (Clem.). 1. A chemically defined medium and aseptic-culture technique. 2. Effects of eleven vitamins on growth. 3. Effects of nineteen amino acids on growth. 4. Effects of ribonucleic acid, glutathione, dextrose, a salt mixture, cholesterol, and fats. *Canad. J. Zool.*, 1954, 32, 331-341; 342-350; 351-357; 358-365. [Entomol. Lab., Belleville, Ont.]

2545

MERCER, E. H. A note on the digestion of wool by clothes-moth larvae. *Biochem. biophys. Acta*, 1954, 15, 293-295. [Chester Beatty Res. Inst., London.]

2546

SAXENA, K. N. Feeding habits and physiology of digestion of certain leafhoppers Homoptera: Jassidae. *Experientia*, 1954, 10, 383-384. [Dept. Zool., Univ. Delhi.]

See also Absts. 1868, 1871, 1927, 2064.

5. HUMAN DIET IN RELATION TO HEALTH AND DISEASE

DIET

REQUIREMENTS

2547

Recommended dietary allowances for Australia. *Med. J. Austral.*, 1954, 113-114.

Energy allowances are based on the theoretical requirements of reference adults. The reference adults live in the warm temperate zone at a mean external annual temperature of 18° C. and their daily activity follows a typical Australian pattern. Allowances of vitamin B₁, and nicotinic acid are 0.5 mg. and 5.0 mg. per 1000 Cal., respectively. Daily protein allowances are 1 g. per kg. body-weight for adults, 1.5 to 3.0 g. per kg. for children and young adolescents and 3.5 g. per kg. for infants. Precise allowances of Fe are not considered to be justifiable. Ca allowances are 0.8 g. per day for adults, 1.5 and 2.0 g. for pregnant and lactating women, 0.6 to 1.0 g. for infants and 1.0 to 1.4 g. for children and young adolescents. Allowances of vitamin A, 5000 I.U. for adults and adolescents, 3000 for children, 6000 and 8000, respectively, for pregnant and lactating women, are based on the assumption that one-third is derived from preformed vitamin A and two-thirds from carotene. The vitamin A allowance of 1500 I.U. for infants is supposed to be derived entirely from preformed vitamin A. Allowances of ascorbic

acid are 30 mg. daily for adults, infants and children, 50 mg. for adolescents, 80 and 100 mg., respectively, for pregnant and lactating women. Recommendations for riboflavin are 1.6 mg. for adult men, 1.4 for women, increased to 1.8 and 2.0 during pregnancy and lactation, 0.9 to 1.7 for infants and children and 1.8 for adolescents. An allowance of 400 I.U. vitamin D is recommended for pregnant and lactating women and for all young people.

F. C. Aitken.

2548

LIENDO COLL, P. and BENGIOA, J. M. Necesidades calóricas de la población venezolana. [Energy requirements of the population of Venezuela.] *Arch. venezol. Nutrición*, 1954, 5, 39-59. [Inst. Nac. Nutrición.] English and German summaries.

A study was made of the energy requirement of the Venezuelan people, on the basis of FAO recommendations (see p. 517, Vol. 20). Taking climate into account it was found to be 2136 Cal. per person daily. For the purposes of the study the weights of a man and a woman of 25 years of age were taken as 60 and 50 kg., respectively. These data were obtained from preliminary findings in a survey in Venezuela of more than 30,000 adults. From studies of energy consumption

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based on retail purchases an allowance of 15 per cent. is made, which brings the gross daily requirement to approximately 2460 Cal.—M. B. Richards.
See also Absts. 2224, 2225, 2568, 2597.

FEEDING OF INFANTS AND CHILDREN

2549

GOLDBLOOM, A. The evolution of the concepts of infant feeding. *Arch. Dis. Childhood*, 1954, 29, 385-390. [Dept. Paediat., McGill Univ., Montreal.]

2550

HYTTEN, F. E. Clinical and chemical studies in human lactation. 9. Breast-feeding in hospital. *Brit. Med. J.*, 1954, ii, 1447-1452. [Dept. Midwifery, Univ. Aberdeen.]

For Parts 7 and 8 see Absts. 983 and 2449 Vol. 25.

Of 6456 women delivered of a single infant which survived the lying-in period, 84.5 per cent. left hospital fully breast feeding. The most important single cause of failure of infants to leave hospital fully breast-fed was poor lactation, 39.4 per cent. of all failures. Separation of the mother and baby in hospital, usually because of prematurity, refusal of the mother to breast feed and anatomically poor development of nipples accounted for 16.6, 14.7 and 10.5 per cent., respectively, of failures. Other causes with their incidences were: sore and cracked nipples 6 per cent.; the baby being a poor feeder 5.6 per cent.; serious disease of the mother 5.8 per cent., and engorgement of breasts and mastitis 1.4 per cent.

The results were analysed in terms of parity, age, height, physical grade, social class, type of delivery and occurrence of pre-eclamptic toxæmia. There was a highly significant negative correlation between maternal age and success in breast feeding in hospital, and a highly significant positive correlation between physical grade and breast feeding performance. The performance of tall women was better than that of small women. Operative delivery and moderate or severe eclampsia were associated with poor performance.

F. C. Aitken.

2551

CAMPBELL, W. A. B. and CHEESEMAN, E. A. Breast feeding in Co. Armagh and Belfast: an attempted comparison. *Med. Officer*, 1954, 92, 251-252. [Royal Maternity Hosp., Belfast.]

The incidence of breast feeding among 138 infants born in 3 areas in County Armagh was lower at all ages, though not always significantly so, than in 500 infants born in Belfast during the same quarter (Abst. 5077, Vol. 24), and this was

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still true when group differences in age of mother, parity, type of antenatal care and place of confinement were allowed for.—W. M. Deans.

2552

KALLIALA, H., HALLMAN, N. and TUUTERI, L. Amningsfrekvensen i Helsingfors under de senaste åren. [Frequency of breast feeding in Helsinki in recent years.] *Nord. Med.*, 1954, 52, 1579-1582. [Barnklin., Univ. Helsinki.] English summary.

This analysis was prepared from records collected by public health nurses in welfare centres. The frequency and duration of breast feeding have declined in comparison with earlier data. In detail, frequency of suckling for 4 months or more rises with age of mother but not with parity; it is not related to help in the home or to outside work but shows some inverse relation to crowding, in terms of persons per room. The main cause of the decline is thought to be the belief that breast feeding is not practised in "advanced" countries such as the United States.—I. Leitch.

2553

DOUGLAS, J. W. B. Birth-weight and the history of breast-feeding. *Lancet*, 1954, 267, 685-688. [Dept. Pub. Health, Univ. Edinburgh.]

The conclusion drawn in this paper was reached incidentally during the "long-term study of child health" which is an extension of the 1946 maternity survey. Data for breast feeding in that investigation were reported in Abst. 4050, Vol. 20. During their later visits after 2 years to the survey children health visitors obtained data on the length of breast feeding and birthweights for these original children and for subsequent children born to the same mothers.

The proportion of babies whose birthweight was less than 6 pounds, born to multiparae, is inversely related to the length of time their previous babies were breast fed. This relationship was found within maternal social class and age groups and was independent of the birth order of the child, its sex, the birthweight of the previous child or the interval between births.

No reason for the finding is suggested.

F. E. Hytten.

2554

SALBER, E. and BRADSHAW, E. The effect of birth weight and time of first feed on the weight of Bantu babies in the first 10 days of life. *Human Biol.*, 1954, 26, 156-171. [Inst. Family Community Health, Durban.]

Of 598 infants for whom records have already been published (see Abst. 910, Vol. 24) birthweights of 596 and time of first feed for 577 were known. Daily weight changes were recorded. They were

grouped as light, 5 lb. 8 oz. to 6 lb. 7 oz., average, 6 lb. 8 oz. to 7 lb. 15 oz., or heavy, above 8 lb. at birth, and as early, middle or late feeders according as first feeding was within 1 hr. of birth, from 1 to 6 hr. or more than 6 hr. after birth.

Heavier babies lost more weight than lighter and generally for a longer period. At time of discharge from hospital those with heavy birth-weights remained heaviest. The time of first feeding had a greater effect on progress than had birthweight. Of firstborn babies, late feeding girls and middle feeding boys lost less weight and middle feeders of both sexes returned to birthweight sooner than those in other groups. Of subsequent infants, middle feeding girls and early feeding boys had smallest losses and returned to birthweight soonest.

The evidence was that subsequent babies could be fed earlier than firstborn and boys earlier than girls. Except for firstborn girls, results were best when infants were fed within 6 hr. of birth.

D. Harvey.

2555

HYTTEN, F. E. and MACQUEEN, I. A. G. **Artificial feeding and energy requirements of young infants.** *Lancet*, 1954, 267, 836-839. [Dept. Midwifery, Univ. Aberdeen.]

Mothers using national dried milk for feeding infants are supplied with a measuring scoop and directed to level off a scoopful of powder with a knife. Analyses of feeds made in the laboratory according to the instructions on quantity which are printed on the labels showed that with both half-cream and full-cream milk the theoretical energy requirements of infants were not met. If the scoop was tightly packed with powder, feeds from full-cream milk but not from half-cream milk met the theoretical energy requirements.

One hundred samples of feeds made at home by mothers were analysed. Of these 73 were made of national dried milk. The infants were classified according to general health and well-being and the competence of the mothers was graded subjectively. Sixty-nine infants were receiving less than their theoretical requirement of 120 Cal. per kg. expected bodyweight and 49 were receiving less than 100 Cal. Babies on the higher energy intakes were healthier and gained more weight than those on low energy intakes. There was a considerable degree of underfeeding in all competence groups.

It is suggested that the instructions issued to mothers for the preparation of artificial milk mixtures should be revised and that, if partly skimmed dried milk is required for the special use of premature or sick babies, it should be available only on prescription.—F. C. Aitken.

2556

WICHERT, K. H. Ernährung von Frühgeborenen mit evaporierter, homogenisierter Milch. [Feeding premature infants with evaporated homogenised milk.] *Monatsschr. Kinderheilk.*, 1954, 102, 295-299. [Altona Kinderkrankenhaus von 1859, Hamburg.]

As supplement to breast milk, a buttermilk preparation or a mixture of evaporated homogenised milk with 5 per cent. sugar was given to alternate premature infants, 40 having evaporated milk and 39 buttermilk. The results are grouped according to birthweight; the average daily weight gain was 23.6 g. with evaporated milk and 21.0 g. with buttermilk. Both were well tolerated and no significant difference was found between the groups in the number of digestive disturbances or infections. The evaporated milk mixture was easy to prepare and less expensive than the buttermilk preparation. Wider trials of evaporated homogenised milk for premature infants are advocated.—A. M. Copping.

2557

PERES, E. Kondensmilch (evaporierter Milch) als Säuglingsnahrung. [Condensed (evaporated) milk as food for infants.] *Münch. med. Wochenschr.*, 1954, 96, 920-922. [Kinderabt., Marienhosp., Düsseldorf.]

Unsweetened evaporated milk (Libby), diluted to equal whole milk, two-thirds milk or half milk, was used for feeding 54 infants with digestive or other illness and 17 premature infants. For all of them the milk proved highly satisfactory. Its wider use for infants is recommended.

A. M. Copping.

2558

VIGNEC, A. J. and JULIA, J. F. **Honey in infant feeding.** *Amer. J. Dis. Child.*, 1954, 88, 443-451. [Dept. Paediat., New York Foundling Hosp.]

In an institution 3 groups of infants under 4 months, 387 in all, were fed on isocaloric mixtures of evaporated milk and water with 5 per cent. of light clover honey, Dextri-Maltose No. 1, or Karo [not described].

Most infants readily took the feeds with honey. Gains in weight and length were as good as with Dextri-Maltose and better than with Karo. For Hb value and red cell count, honey was better than Karo but not quite so good as Dextri-Maltose. For incidence of non-specific gastro-enteritis and other feeding problems, honey and Dextri-Maltose were much the same, and superior to Karo.

It is concluded that honey has a definite place in infant feeding.—W. M. Deans.

N.A. and R., April 1955.

2559

LAPIN, J. H. Common errors in infant feeding. *J. Pediat.*, 1954, **45**, 583-589. [Bronx, N.Y.]

2560

WIDDOWSON, E. M. and McCANCE, R. A. Studies on the nutritive value of bread and on the effect of variations in the extraction rate of flour on the growth of undernourished children. *Med. Res. Council. Spec. Rep. Ser.* No. 287, 1954, pp. viii + 137. H.M.S.O., London. Price 8s. 6d. net.

The subjects of the experiment were orphanage children, 169 at Duisburg and 141 at Vohwinkel. At Duisburg they were divided into 5 closely matched groups. They were given all of the non-cereal portion of the German rations to which they were entitled and each group had unlimited amounts of bread baked from one of 5 experimental flours: 100, 85 or 70 per cent. extraction; or 70 per cent. extraction enriched with vitamin B₁, riboflavin, nicotinic acid and Fe to one of 2 levels, those in 100 per cent. and in 85 per cent. extraction flour. All 5 flours contained added Ca. These experimental breads provided over 70 per cent. of the total energy. At Vohwinkel 3 flours were tested, 100 or 70 per cent. extraction and 70 per cent. enriched to 100 per cent. levels. Here unlimited amounts of fat, sugar and jam were allowed with the flour so that the children obtained 35 per cent. of their energy from flour and 35 per cent. from the other supplements. In this orphanage the flour was baked into bread, cake and biscuits. All children in the experiment were given vitamin A, D and C tablets daily. The experiment lasted 1 year; at Duisburg 105 children completed the year and at Vohwinkel 55. They were weighed and measured every fortnight and examined clinically every 3 months. Studies of intakes and excretions of N, minerals and vitamins of the B complex were made at intervals on some of the children.

From an analysis of the results of the experiment no difference could be detected between the nutritive value of the different breads and all the children did remarkably well on the diets.

In a supplementary 6-month experiment the daily addition of 500 ml. whole milk reconstituted from dried milk to the Duisburg experimental diet with 85 per cent. extraction flour did not improve growth rate over that of control children given an equicaloric supplement of biscuit made of flour, sugar and margarine and a drink of orange juice.

The nutritive values of the 100 and 70 per cent. extraction flours were compared in rat and pig feeding trials. Diets were similar to those consumed by the children. When rats were given the diets from 8 weeks of age the flours were equally good as measured by growth; when the

diets were given from weaning the wholemeal flour was superior to the white. When 11-week-old pigs were given these flours in diets of the Vohwinkel type wholemeal flour produced slightly more rapid gains in weight than did white flour. This difference was not evident when the diet was of the Duisburg type with 75 per cent. of the energy from flour.

A statistical analysis of the height and weight data and detailed reports on metabolism studies, skeletal development and dental caries in the children are given in appendixes.—F. C. Aitken.

2561

SUBRAHMANYAN, V., REDDY, S. K., MOORJANI, M. N., SUR, G., DORAISWAMY, T. R., SANKARAN, A. N., BHATIA, D. S. and SWAMINATHAN, M. Supplementary value of vegetable-milk curds in the diet of children. *Brit. J. Nutrition*, 1954, **8**, 348-352. [Central Food Technol. Res. Inst., Mysore.]

The preparation from groundnut kernels is described of a product which, when mixed with a small amount of buttermilk, sets to form a curd much the same as does cow's milk. It is fortified with minerals and vitamins. The composition of the final product is given in terms of 14 nutrients and compared with that of cow's milk curd.

Forty-two girls aged between 4 and 11 years and living in a boarding home were the subjects of experiment; half received 12 oz. daily of the vegetable curd and half were kept as controls and given sweetened pudding to provide an equivalent amount of energy. Height, weight, Hb, red cell count and nutritional deficiency score were studied over 6 months. Changes which, statistically, were highly significant were found to have occurred in growth and in the nutritional score in favour of those girls who ate the vegetable-milk curd.

D. Harvey.

2562

SUBRAHMANYAN, V., SWAMINATHAN, M., BHATIA, D. S., BAINS, G. S., SUR, G., BHAGWAN, R. K., DORAISWAMY, T. R., ANANDASWAMY, B. and SANKARAN, A. N. Effect of replacing rice in the diet by composite *jowar* (*Sorghum vulgare*) vermicelli on the health and nutritional status of children. *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, **3**, 245-247.

The preparation of a vermicelli type of food containing *Sorghum vulgare*, wheat and tapioca flours in the proportion of 2:1:1 is briefly described. The effects were studied of replacing rice by an equal amount of it in the diet of 21 children in a boarding home, with the same number of children as control subjects. The experiment lasted for 8 weeks and data for changes in height, weight and nutritional status are tabulated. The average increases in weight were 1.53 and

0.45 lb. for the experimental and control groups, respectively; the difference was highly significant. There was also evidence of improvement in nutritional status in favour of the experimental group.

D. Harvey.

2563

SUBRAHMANYAN, V., DORAISWAMY, T. R., SWAMINATHAN, M. and SANKARAN, A. N. **Large-scale feeding experiments with Mysore flour in distress areas of Madras State.** *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, **3**, 267-269.

Mysore flour is a mixture of 3 parts tapioca flour and 1 part groundnut flour (see Abst. 5086, Vol. 24). A large-scale feeding experiment was made to find to what extent this readily available food could replace cereals in the normal poor vegetarian diet in Madras. The experiment was made at 5 centres. The experimental diet is described, and a brief survey of the normal diet is reported. A table is given of the composition of experimental and normal gruels issued at the centres and shows that the experimental gruel was superior in energy, protein, vitamin B₁ and nicotinic acid.

At first, presumably because of prejudice, attendance at the centres fell considerably when the Mysore flour was introduced, but by the end of the experiment, which lasted 3½ months, attendance was nearly doubled and the Mysore gruel was relished. Measurements of height and weight of 181 children aged from 4 to 12 years were taken at one centre; they showed growth to be satisfactory on the experimental gruel.—T. D. Bell.

See also Absts. 1715, 1762, 2753, 2801.

DIETARY SURVEYS AND INDIVIDUAL STUDIES

2564

TRULSON, M. F. **Assessment of dietary study methods. 1. Comparison of methods for obtaining data for clinical work.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 991-995. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston.]

Thirty-seven children aged 7 to 12, attending rheumatic fever clinics in Chicago, were studied (1) by 7-day diet records kept by the children themselves, (2) by detailed diet histories, and (3) by 24-hr. dietary recalls. In general, methods 1 and 2 gave results showing closest similarity, but the findings were by no means consistent when different foods or nutrients were considered. The data of Huenemann and Turner (Abst. 2536, Vol. 12) were used to show that the results of weighed surveys and diet histories are inconsistent.

A. M. Thomson.

2565

THOMAS, R. U., FOX, H. M., KELLY, H. J., MOYER, E. Z. and MACY, I. G. **Rapid method for**

qualitative appraisal of food intakes of groups. Procedure and reliability. *J. Amer. Dietetic Assoc.*, 1954, **30**, 865-871. [Res. Lab., Child. Fund Michigan, Detroit.]

Diet patterns obtained mainly from pregnant women by the 7-day record or 24-hr. recall method were assessed in relation to an ideal dietary pattern designed to provide approximately the allowances of nutrients recommended by the U.S. National Research Council. The numbers of servings of important foods or food groups in the actual and reference diets were used to obtain scores which could be compared. The reliability of the scoring system was evaluated by comparison with laboratory analyses of diets, calculation of nutritive values from food composition tables, and diet ratings obtained from another laboratory. It is concluded that the qualitative assessments served to classify women into groups roughly according to their nutritional status.—A. M. Thomson.

2566

BEAL, V. A. **Nutritional intake of children. 2. Calcium, phosphorus and iron.** *J. Nutrition*, 1954, **53**, 499-510. [Child Res. Council, Denver, Colo.]

For part 1 see Abst. 1003, Vol. 24.

Data on the intake of Ca, P and Fe from 795 diet histories on 26 boys and 32 girls in the first 5 years of life are presented.

Ca intake increased rapidly in the first 6 months of life and less so between 6 and 9 months; it then fell steadily to reach its lowest level between 2 and 3 years, when the median for Ca intake was 0.75 g. and for milk intake 16 oz. This was followed by an increase and at 5 years the median intake was about 1 g. Ca. Between 6 and 15 months there was a sex difference in Ca intake, that of boys being the higher.

P intake, being less closely linked with milk consumption, showed less striking changes than Ca intake. It increased during the first year, then showed a pattern intermediate between those of protein and of Ca between 2 and 3 years and increased again between 3 and 4 years.

Fe intake increased greatly during the first year because of the high Fe content of commercial infant cereals and fell as these were replaced in the diet. After 3 years it again increased but between 2½ and 5 years of age more than three-quarters of the children studied had intakes below U.S. National Research Council recommended amounts.—G. F. Garton.

2567

BABCOCK, M. J., CHURCH, H. N. and GATES, L. O. **Nutritional status of industrial workers. 1. Dietary, blood, and physical findings.** *Milbank Mem. Fund Quarterly*, 1954, **32**, 323-342.

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[New Jersey Agric. Exp. Stat., Rutgers Univ., New Brunswick.]

The subjects were 610 male industrial workers in New Jersey; the investigation was part of a more extensive study (see Absts. 3430, Vol. 23, 2265, Vol. 24, 2619, Vol. 25). The data were grouped in a variety of ways according to weight, general appearance of the subject, activity at work, income and educational levels, religion, ethnic group, diet, blood chemistry, a clinical examination and an overall rating of vitamin status. The diet study by the interview method was, for 318 men, supplemented by a 7-day record. Blood constituents studied were vitamin A, carotene, ascorbic acid and Hb and the clinical examination was of eyes, skin, lips, gums and tongue, thyroid gland and neurological signs. The overall vitamin rating was based on the 3 recordings of diet, blood constituents and clinical examination. All inquiries were made during the winter months.

Most of the men were under 40 years of age and 35, 48 and 17 per cent., respectively, were very active, active and sedentary at work. Weekly incomes per adult unit ranged from between \$5 and \$9 to between \$55 and \$64. American and Slavic groups accounted for 71 per cent. of the population.

Average energy intake in Cal. was 2988 for sedentary, 2915 for active and 3259 for very active subjects and the overall mean 3053 Cal. For the 318 who kept 7-day records corresponding figures were 2709, 2739, 2785 and 2746 Cal. The difference by the 2 methods persisted when the data for those studied by both methods were considered; it was thought to have been caused by a tendency to overestimation at the interviews and underestimation in the recording. The evidence was that about a quarter of the men were having less than their needs of Ca, P, vitamin B₁, riboflavin and ascorbic acid, a finding that could be attributed to their having too little milk and vegetables and fruit and too much unenriched bread and pastries, sweetened beverages and sweets. The parts played by education, age and income are to be the subject of a later communication.—D. Harvey.

2568

RODAHL, K. **Nutritional requirements in cold climates.** *J. Nutrition*, 1954, 53, 575-588. [Arctic Aeromed. Lab., Fairbanks, Alaska.]

Total daily food intake was measured during the 4 seasons from 1950 to 1952 in Alaska for 36 young infantrymen or airmen on ordinary duties and, for comparison, for 16 adult male Eskimos. Medical examinations and some laboratory tests were made for signs of deficiency.

The average daily energy intake was 3000 Cal. for the air force and 3200 for the infantry group; the average energy expenditure for the 4 seasons

was, on the basis of time activity data, 2800 Cal. daily. No appreciable weight change occurred and the subjects remained in excellent health. For the Eskimos, who came from 4 different localities in Alaska, the average daily energy intake was 3100 Cal.; this maintained bodyweight. Daily energy expenditure was 2700 Cal. throughout the year. In composition the diet of the troops in Alaska was not significantly different from that of U.S. troops stationed in temperate or tropical climates, but the air force group tended to eat more fat in the winter. The consumption of mineral salts was higher than the allowances recommended for temperate climates. There was no evidence of increase in vitamin requirements in Arctic climates.

It is concluded that the energy needs of normal men engaged in such activities under these climatic conditions are 3000 to 3500 Cal. per man daily at any season of the year.—G. F. Garton.

2569

FERGUSON, T. and PETTIGREW, M. G. **A study of 388 families living in old slum houses. A study of 718 slum families rehoused for upwards of ten years.** *Glasgow Med. J.*, 1954, 35, 169-182; 183-201. [Dept. Pub. Health, Univ. Glasgow.]

These were 2 simultaneous and complementary investigations intended to provide broad comparisons of the effects of rehousing, for periods of between 10 and 27 years, on the standard of living of an urban population. The inquiries were intensive and data were collected depicting the size and structure of the families, the state of their health, and condition of their homes and their economic circumstances.

On conditions likely to affect their nutrition it was not possible to obtain information on total income but there were made available data which could be relied on to give an estimate of the amount of housekeeping money. This tended, in general, to increase with the number of persons in the household, but not necessarily in proportion. For the 366 and 646 families in the respective groups which gave information households in which the amount was under 60s. numbered 31 in the first group, 23 with 1 person, 6 with 2 and 1 each with 4 and 6 persons; in the second group they numbered 55, 40 with 1 person, 9 with 2 and 3 each with 3 and 5 persons in the household.

For much smaller numbers of families in the groups, 80 and 174, respectively, information was available on the amount spent on food. Families with 4 to 6 persons numbered 50 and 94 and, of these, 13 and 16 spent less than 15s. per head per week on food. In the first group there were 12 families with 6 persons for which average expenditure was 14s. 4d. and in the second 20 families

with 8 persons and average expenditure 15s. 6d. per week. Irrespective of the size of the families none of the means for amounts spent per head per week was below 12s. 8½d., the average per head for a family of 5 quoted by Schulz (Abst. 2161, Vol. 23) as the cost at the time of a "human needs" dietary.

The average amounts spent on food appeared to be not unsatisfactory but, of both groups, it was said that the information was provided by the women who were probably the most intelligent and provident and that it threw no light on the kind of food being bought. The rehoused families were without doubt in a substantially better environment than were the slum families, but the general conclusion regarding their feeding habits was that they showed no improvement. "It is abundantly clear that many rehoused slum families require a great deal of help and encouragement to make the transition from the slums to a new life."—D. Harvey.

2570

BUREMA, L. De voeding in Nederland van de Middeleeuwen tot de Twintigste Eeuw. [Diet in the Netherlands from the middle ages to the twentieth century.] Thesis, Univ. Amsterdam, 1953, pp. 330. [Lab. Physiol. Chem., Univ. Amsterdam.] English summary.

This elaborate 300-page thesis has five main headings: the middle ages, the 16th, 17th, 18th and 19th centuries. It is illustrated with reproductions of paintings by old masters, mostly representing meals or distribution of food. The author, in his search for information about nutrition in the Netherlands before 1900 has read through an immense amount of literature, descriptions of travels and voyages, annual reports, stories and poems, historical and medical books and periodicals, accounts of institutions and private families. His references are given at the foot of the relevant pages, not listed together at the end of the thesis. There is a ten-page Dutch summary and a translation into English of this summary.

In the middle ages agriculture was already partly organised on a three-field rotation with barley, wheat, oats and rye as crops. For grain Holland was both store and market for other countries. Pigs were most widely kept; dairying was established; the market gardens of the monks and the gentry were already famed abroad. Fishing was well developed and herrings were cured as early as 1100. Poultry were so widely kept as to serve at times as currency for tax payments, and bees provided most of the sugar to be had. The habit of burning salt peat for salt was forbidden in 1515, a peculiar sort of soil erosion.

From there, century by century, the development of agriculture is traced and food habits are described. There is a recurrent history of famine caused by floods or other disasters, or by war. There are frequent mentions of dentists and remedies for toothache; scurvy and night-blindness were common in the 15th century and scurvy at least continued well into the 19th. In the 16th century urolithiasis and rickets were common. In the 17th and 18th century wealth and poverty increased side by side. Lithiasis was common in all classes, attributed by the author to deficiency of vitamin A. Beriberi in the Dutch East Indies was described for the first time in 1611.

There is some information on infant feeding from 1473 and on infant mortality. Cod liver oil was used to treat rickets in 1822.

There is here a great wealth of interesting material which could have made absorbing reading if it had been well presented. Unfortunately the presentation is confused and the tale full of repetitions, unresolved contradictions and omissions. Too much perhaps is made also of the deficient diet and sufferings of the common man and not enough of his achievements between 1400 and 1900.—M. Eddison.

2571

BOUCHE, A. Enquête sur les budgets familiaux par carnets de comptes annuels à Marseille (2). (octobre 1951-septembre 1952). [Study of family budgets in Marseilles by questionnaire on annual expenditure 2. (October 1951-September 1952).] Bull. Inst. nat. Hyg., Paris, 1954, 9, 772-815. [Sect. Nutrit., Inst. Nat. Hyg., Marseilles.]

For part 1 see Abst. 5106, Vol. 24.

Nearly three-quarters of this section relates to food; it consists of an elaborate analysis of monthly variations in expenditure on different foods in households of 3 social classes and a study of the relation between food expenditure and income for 51 families which stated their income. For foods other than the meat, fish and eggs group the rise of expenditure with income flattened at the income level of 50,000 fr. per month. At this level, too, expenditure on different foods as a percentage of income began to fall. The results are analysed also in terms of income per head and income per consumption unit.—W. M. Deans.

2572

ŠNAJDER, K. Ishrana i njen uticaj na biološku snagu stanovništva u Autonomnoj Kosovometohijskoj Oblasti. [Nutrition and its influence on the life of inhabitants of the Autonomous District of Kosovo-Metohija.] Zborn. Rad., Srpska Akad. Nauka, 1954, 28 (Inst. Nutrit.,

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No. 2), pp. 42. [Inst. Nutrit., Serb. Acad. Sci., Belgrade.] French summary.

Diet surveys were made in 60 families, 29 Serbian and 31 Siptar. The energy intake ranged from 774 to 5142, mean 1919, Cal. per person daily; the average daily intakes per head were 50.8 g. total protein with 15.8 g. from animal sources, 36.6 g. fat and 336.7 g. carbohydrate supplying, respectively, 11, 17 and 72 per cent. of the energy. Of the families 7 per cent. had daily intakes below 1000 Cal. and, at the other extreme, 5 per cent. had more than 3000 Cal. per head.

For 56 of the families studied the population density was high, the area of cultivable land being 0.47 ha. (1.16 acre) per person; for 2562 families in other communes it was 0.44 ha. (1.09 acre). Except for wheat, between 60 and 75 per cent. of the food produced went for home consumption. The effects of these conditions on family size were, however, small. In 74 Serbian families the average number of persons was 6.95 and in 37 Siptar 8.76.

Growth of children in the district was studied by measurements of 239 boys and 60 girls. Boys were on the average 2.9 kg. lighter and 3.2 cm. shorter and girls 2.5 kg. lighter and 1.4 cm. shorter than the standard for Serbian children. For children it was also found that the admission rate to hospital was 22 per cent. higher and dispensary attendances 40 per cent. more frequent than for the whole of Yugoslavia. Among the provinces Kosovo-Metohija was second highest in its infant mortality rate.

Overcrowding was high and lighting of homes poor. Among 659 children with nutritional disorders rickets, with an incidence of 23.6 per cent., followed closely on pellagra in frequency. Although the district is situated in latitude between 42° and 43° N., local conditions of living are such as to maintain this high incidence of rickets.

The data are presented in 30 tables. [From summary.]—D. Harvey.

2573

MOSER, A. M. Use of food by farm families in the tobacco farming area of South Carolina. *S. Carolina Agric. Exp. Stat. Bull.* No. 402, March 1953, pp. 61.

An earlier report (see Abst. 4915, Vol. 23) dealt with a tobacco-growing as one of 3 farming areas studied in the South; it referred to both Virginia and South Carolina. The differences in food habits known to exist in these States prompted the present analysis of the data for South Carolina by themselves.

There were 149 families, white and negro, of average size 6.41 persons. In 27 of these, intakes of 9 nutrients were found to be satisfactory when compared with U.S. National Research Council

recommendations. For food the average quantities, in 11 groups, eaten in these households were taken as standards; the mean for all families exceeded that average for dried legumes only, equalled it for fats and oils and fell short of it for the other 9 food groups.

The percentages of families which were receiving less than 2/3 of the amounts of individual nutrients were, for vitamin B₁ 0, Fe and nicotinic acid 1, energy 2, protein 3, riboflavin 19, vitamin A 36, calcium 40 and vitamin C 42. Use of enriched wheat flour, bread and maize meal ensured supplies of vitamin B₁, Fe and nicotinic acid. The outstanding need was for greater use of milk throughout the year and for greater production and preservation of vegetables and fruit for use in winter months.

Data are fully tabulated.—D. Harvey.

2574

WHITE, H. S., COLLAZOS, C., C., WHITE, P. L., HUENEMANN, R. L., BENITES, R., CASTELLANOS, A., BRAVO, Y., MOSCOSO, I. I., and DIESEL-DORFF, A. Dietary surveys in Peru. 2. Yurimaguas, a jungle town on the Hualaga River. *J. Amer. Dietetic Assoc.*, 1954, 30, 856-864. [Dept. Nutrit., Minist. Pub. Health, Lima, Peru.]

For Part 1 see Abst. 2269, Vol. 24.

Two diet surveys were made, one at the end of the rainy season, the other at the end of the dry season. Thirty-eight families were surveyed in the first and 33 of these repeated in the second survey. The method of study was the one-week weighing and inventory record. During the first survey 30 adolescents and 23 adult women, some pregnant or lactating, were examined for nutritional state. The diet studies showed that the nutrients in most inadequate supply were Ca, riboflavin and vitamin B₁. In typical diets plantains (*Musa paradisiaca*) contributed more than 70 per cent. of vitamin A, about one-third of ascorbic acid, vitamin B₁, riboflavin and total energy, about 15 per cent. of nicotinic acid and about 10 per cent. of Fe and protein. Cooking losses were not considered in the calculation of nutrient intakes, but a study in one home indicated a loss in cooked plantains of 50 per cent. or more of carotene and ascorbic acid.

The study of nutritional state showed that almost everyone had intestinal parasites and that anaemia was widespread.

Dental caries was common, muscular development was frequently poor and signs possibly related to nutritional deficiencies were common. The high incidence of those possibly related to vitamin A deficiency was surprising in view of the very high estimated intake of vitamin A. It is

suggested that plantain carotene may not have the equivalence of 1670 I.U. vitamin A per mg., the figure which was used in making the calculations of intake.—F. C. Aitken.

2575

STRACUSS, W., SHATAN-HERZBERG, M. and BORTEN.

E. Nutritional survey in Israel. Second interim report—surveys of 1951 and 1952-3. Dept. Hyg., Hebrew Univ., Jerusalem, 1954, pp. 41.

A diet survey was made in 1952-53 of 124 families in Tel-Aviv and 60 in Jerusalem. Records were made by investigators who were allocated about 7 families and who visited them twice daily for 30 days. Hb was estimated also in 3187 persons and weights and heights were taken for 1508 adults and 742 children. This interim report gives comparisons with the earlier survey.

At the time of the second survey a number of foods were still rationed. Data for energy and 9 nutrients are fully tabulated with special reference to size of family and to the communities, Ashkenazim, Mizrahim, Sephardim and Yemenites, to which the families belonged. The outstanding change since 1950 was the considerable increase which had occurred in the amount of bread used; average amounts were 250 and 380 g. per person daily. This change was responsible for increases in intakes of total protein and Fe and, to some extent, of Ca and riboflavin. A decrease in meat consumption probably accounted for the smaller amount of nicotinic acid. Differences in vitamins A and C were seasonal, the earlier survey having been in summer, the later in winter. The need for both encouraging the drinking of milk and cheapening it is emphasised, and doubt is expressed about the advisability of importing wheat for bread instead of using locally grown cereals and potatoes.

The blood data, Hb estimations and red cell counts, showed that the levels in the Israeli population were lower than in England during the war and that it was among immigrant men and women and among housewives that the degree of anaemia was greatest. A difference in favour of the Jerusalem when compared with the Tel-Aviv families could not be explained. There was a downward gradient in Hb parallel with social status and with intake of animal protein.

Weight and height data are given in summary tables for the adults in the 4 communities and graphically for age for the children. Some values for serum protein are also included.

D. Harvey.

2576

CORCKHILL, N. L. Seasonal dietary change in a Sudan desert community. *J. Trop. Med. Hyg.*, 1954, 57, 257-269. [Sudan Med. Serv.]

Descriptions are given of the inhabitants of Abu Deleig in Northern Sudan, the conditions under which they live and the foods which they use. Pyralgia, a burning sensation of the extremities with associated pain in the epigastrium, has already been described. (See Absts. 1721, 2772, Vol. 4; 2596, 5700, Vol. 20.)

Diet studies were made in 1945 and 1946 of 5 families at 3 different seasons, after the peak period of heat, in the season of plenty and in the cold season when green foods, meat and milk are least plentiful. Calculations of dietary intakes were made also from data collected in 1933 for 16 women with severe pyralgia, 33 men in whom it was less severe and 34 men with no sign.

It is concluded that the syndrome is caused by the seasonal change which occurs in the ratio of animal to total protein in the diet; it appeared when the ratio was 1:20 but was not seen when the ratio was 1:10 or less. There is evidence too that an increase in the amount of millet beer drunk will reduce the incidence of the disease.

D. Harvey.

2577

DE MEIRA, M. T. V. Contribuição para o conhecimento do estado de nutrição da população de Cabo Verde. Resultados, comentários, dum inquérito realizado na Ilha do Sal, em 1949. [State of nutrition of the people of Cape Verde. Results, discussed, of the survey made on Salt Island in 1949.] *An. Inst. Med. trop., Lisbon*, 1953, 10, 1199-1232. *Proc. English summary.*

In a study of the state of nutrition of the population of Salt Island nearly 200 children between the ages of 5 and 15 years were weighed and measured and diet surveys were made in 5 native families. From the measurements of height and weight regression equations were calculated. The graphs deviate somewhat from normal by showing a gradual inversion of the values for the 2 sexes. From the age of about 8 years the boys are slightly inferior to the girls, probably because the latter live under greater social protection.

The diet survey table gives the following averages for the daily consumption per head: Cal. 2416; carbohydrates 489.3, fats 34.8, animal protein, 5.0, vegetable protein 63.1 g., Ca 193, P 1277, Fe 21.9 mg., vitamin A 1843 I.U., vitamins B, 2.1, riboflavin 0.9, nicotinic acid 8.2, vitamin C 2.5 mg. and vitamin D 95 I.U. The obvious defects of the diet are readily explainable. According to the diet sheets all families ate maize, beans, sugar, coffee and salt; 3 families ate fish. Other additions in some families were olive oil, onion, lard, rice, and wheat bread. In no case was there mention of such foods as milk, eggs, meat, potato, butter, cheese or any kind of fruit. Normally the diet would include more animal protein since

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stormy weather during the week of the inquiry accounted for the small consumption of fish. The deficiency of protective foods will always exist.

M. B. Richards.

2578

FRANÇA, C. S. Contribuição para o estudo do estado de nutrição da população de S. Tomé. 1. Inquéritos alimentares em aldeamentos indígenas. [State of nutrition of the population of São Tomé. 1. Diet surveys in native settlements.] *An. Inst. Med. trop., Lisbon*, 1953, 10, 1447-1458. English summary.

A three-day dietary survey was made on 15 families distributed in 3 groups in São Tomé, the groups varying in social grade and economic resources. Daily consumption per unit is tabulated for each group for calories, carbohydrates, fats, protein, animal and vegetable, Ca, P, Fe, vitamin A, vitamin B₁, riboflavin, nicotinic acid and vitamin C. It is concluded that, in general, not enough food was eaten. Protein was below requirement and, in one group, animal protein especially was deficient. Minerals were low, in particular Ca, with a large deviation from normal of the Ca:P ratio. Of the vitamins, only for vitamin A, provided by the palm oil in the diet, was the requirement approached. The diet of all groups was based on maize flour, bananas, dried fish and rice, but in the highest income group, where deficiencies were less marked, there was frequent reference to the consumption of bread, butter, coffee, sugar, condensed milk and fresh fish. The degree of deficiency differed from group to group according to habits, education, resources, locality and its proximity to a centre of population, but lack of purchasing power was the basic cause. Interrogation showed that there was a desire for such foods as eggs, milk, butter, cheese, fresh fish, meat and fruit, if only more money were available to purchase them.—M. B. Richards.

2579

RODRIGUES, F. C. A alimentação do indígena de Vilanculos. [Diet of the indigenous inhabitants of Vilanculos.] *An. Inst. Med. trop., Lisbon*, 1953, 10, 1129-1155. *Proc.* English summary.

The diet of the natives of Vilanculos in Mozambique is based on cereal flours, maize, sorghum and pearl millet. The cereals are very finely ground, with complete removal of bran and loss of minerals, proteins and vitamins. Beans and other legumes are eaten and green vegetables and fruits are used especially in periods of scarcity. Cassava and sweet potato are poor in protein but the latter provides considerable amounts of vitamins B₁ and B₂; groundnuts are a source of high quality protein. Consumption of meat is

irregular and scanty, supplies being obtained by hunting. Although the natives possess domestic fowls, these, because of certain prejudices and taboos, are not used for food, but are sold in order to purchase alcoholic drinks. On the coast fish are eaten, though not in large amounts, and molluscs and crustaceans as well, the latter being the chief source of animal protein. In certain regions snakes, lizards and turtles are eaten and, in the interior of the country, the larvae of insects. Water is scarce but alcoholic liquors abound, not only European wines bought when means permit, but also all kinds of drinks prepared from local fruits. In periods of scarcity consumption of such drinks increases, and the natives live almost exclusively on herbs and wild fruits and are in a state of almost permanent intoxication. The diet is obviously monotonous, unbalanced, too bulky, poor in animal products such as eggs and dairy produce and therefore, deficient in proteins and fats of animal origin. It is much the same for all ages, and there is, as a result, a high rate of infant mortality.

Measures recommended for improving the conditions are: an educative campaign to demonstrate the necessity for quality and balance of dietary components rather than for quantity and to combat primitive prejudices against the use of certain foods: campaigns for the improvement of agricultural methods and against alcoholism: the construction of granaries, wells and reservoirs: and the establishment of the natives, at present scattered over enormous areas, in settlements in the more fertile areas, where they would have better natural conditions, and better medical attention could be ensured.—M. B. Richards.

2580

DO AMARAL, R. F. and DA COSTA SARAIVA, A. S. P. A propósito da constituição física e da alimentação dos indígenas da Delegacia de Saúde de Nampula. [Physical condition and diet of indigenous inhabitants of the health district of Nampula.] *An. Inst. Med. trop., Lisbon*, 1953, 10, 1331-1344. *Proc.* English summary.

An investigation was made of 729 natives between the ages of 20 and 50 years in the District of Nampula, Mozambique, to assess their state of nutrition, physical development and robustness. Measurements were made of height, weight, chest circumference and expansion, vital capacity, Hb and Pignet's index, as well as observations on the presence of adipose tissue and signs of riboflavin deficiency. The results showed that the subjects were short in stature, of good somatic constitution, but of low weight, in spite of having their ribs well covered with adipose tissue. Twenty-one per cent. were anaemic and 84.7 per cent. showed signs of riboflavin deficiency, in the form of glossitis and

cheilitis. It was concluded that diets had insufficient amounts of fats and of foods containing vitamin B₂, and that the adipose tissue came from the carbohydrates.

An outline is given of the foods available; these contain all the components necessary for a good diet, but in their ignorance of dietary requirements the people are content merely to satisfy their hunger. This ignorance must be removed by propaganda, but at the same time they must be enabled to obtain a suitable diet at low cost. The means suggested are more intensive culture of groundnuts and cottonseed for oil, and the introduction of the soya bean. Ten per cent. soya meal could be added to flours. The official schedules of diets issued to employers of labourers are not perfect, and suggestions are made for their improvement. The employers should provide supplements of bananas and food yeast and should see that the workers have 3 well balanced meals in the day. In this way they will improve the health of their employees and increase their output; in the end they will have cheaper labour.

M. B. Richards.

2581

ARAÚJO DE FREITAS, J. Trabalhadores indígenas de Angola, sua alimentação, doenças predominantes e algumas medidas profiláticas adoptadas. [*Indigenous workers in Angola, their diet, common diseases and some of the preventive measures used.*] *An. Inst. Med. trop., Lisbon*, 1953, 10, 1157-1184. *Proc. English summary.*

The recent development of agriculture and industry in Angola has led to a large increase in the number of native labourers, who are now estimated to number about 300,000. These labourers are for the most part natives with poor physical constitution and a low standard of living, and beneficial effects have already resulted from their employment by private companies, which provide regular food and medical attention. In the smaller companies with 50 to 150 employees, the employer can obtain sufficient of the foods indispensable for a varied and well-balanced ration and there is, as a rule, no deficiency. This applies in general to the coffee and palm-oil industries. In the larger companies with 1000 or more workers and far from the coast, particularly those in the sisal industry, the employer may be unable to obtain sufficient supplies of essential foods, and there is frequently shortage of fresh foods and animal products. In these larger concerns there is evidence of protein and vitamin deficiency, in some cases clinically well defined. There is urgent need for study of the diets of the native labourers in different districts of Angola, and for classification of the nutritional diseases among them.

Predominant diseases are those endemic in Angola, such as malaria, acute affections of the respiratory tract, and diarrhoea and dysentery. Smallpox has almost disappeared as the result of vaccination campaigns, and sleeping sickness, already much reduced, will be eradicated within a few years. Of the imported diseases tuberculosis is regarded as the most serious, and immunisation, as practised by some companies, should be made compulsory.—M. B. Richards.

2582

SARMENTO, A. Alimentação dos Huambos. [*Diet of the Huambos.*] *An. Inst. Med. trop., Lisbon*, 1953, 10, 1113-1127. *Proc. English summary.*

The diet of the Huambos, one of the most important tribes of Angola, is predominantly vegetarian. It is based chiefly on maize and cassava flour, with sweet potato and leaves of cassava, bean or wild pumpkin. Fruits are appreciated, but are not abundant and their season is short. Meat obtained by hunting is scanty, but river fish are relatively plentiful from August to October. Meat and fish are usually dried and cooked as required; they are enjoyed, especially by the old, when slightly putrefied. For seasoning the people use salt, when they have the means to buy it, but sometimes they use the roasted and ground seeds of water melon, or sesame. Infants are normally breast fed, but not according to any time schedule, and they may continue to suckle up to 3 years of age, although they are given maize gruel from the age of a month. From birth onwards they are regularly given chissangua, a fermented drink prepared from maize flour and wild roots, and in spite of intensive propaganda against it, the custom continues. There is no special diet for the sick, but generally they are given a gruel of fine maize or cassava flour, and chissangua. A description is given of the meals and the different methods of preparation, the cooking utensils, the preservation of foods, mostly by sun-drying, and the primitive method of storage. Tobacco is grown, and is smoked habitually by both men and women.—M. B. Richards.

2583

DOS SANTOS BRÍGIDO, A. and GONCALVES, F. T. Apontamentos sobre o estado de nutrição de um grupo de crinaças macaenses. [*State of nutrition of a group of Macao children.*] *An. Inst. Med. trop., Lisbon*, 1953, 10, 1325-1329. *Proc. English summary.*

The diet of the people of Macao consists chiefly of decorticated rice with small quantities of salted fish and vegetables; it is almost devoid of meat and fruits. There is deficiency of proteins and vitamins. A study of the nutritional state of 95

Macao children between the ages of 6 and 17 years gave clinical evidence of nutritional deficiency in most. Eighty-five and 87 per cent. showed morbid changes in the buccal mucosa and tongue, respectively. Forty-two per cent. had bleeding gums, 11 per cent. oedema of the limbs, and 15 per cent. dental caries. The Hb values were almost always below normal. Heights and weights were inferior to those of children in other countries and there was retardation of sexual development in 10.5 per cent. of the children examined.

M. B. Richards.

2584

INDIAN STATISTICAL INSTITUTE. The national sample survey. 3. Tables with notes on the third round August-November 1951. *Sankhyā, Indian J. Statistics*, 1954, 14, 86-168.

The third round of the Survey differed from the first and second rounds (see Abst. 5111, Vol. 24) by extending to urban areas. The Survey included in all 13,500 households and the present report concerns consumer expenditure data collected from 6770 of them, 5080 scattered over 905 villages, 1180 in 49 towns and 510 in the 4 cities Calcutta, Bombay, Delhi and Madras. Of the 55 complete tables which are published 2 show the distribution of the sample blocks in towns according to size and the geographical distribution of the sample villages over the 6 population zones. Of the remaining 53 tables 37 refer either in whole or in part to foods consumed by the population. They show the total amounts and consumption value of these and the quantities and their value obtained by purchase or in exchange for goods and services. Similar data are given for individual foods per household and per head for the villages grouped according to population zones and for the urban areas.

Seven small tables summarise the findings and show some comparisons with the earlier rounds. In villages, towns and cities, respectively, total expenditure per person per month was 15.88, 17.27 and 25.29 R., 66, 55 and 46 per cent. of total expenditure. In the rural areas mean consumption value per household per week for all items was 28.62 R., of which 19.08 R. referred to food items, 10.65 R. being the value of the amounts of these received in kind. For urban areas corresponding values were 37.12, 19.92 and 3.36 R. per week.

Facsimile reproductions show examples of the types of field schedule used in this very extensive investigation.—D. Harvey.

2585

PACHECO DE FIGUEIREDO, J. M. Contribuição para o estudo do problema de alimentação na Vol. 25, No. 2

India Portuguesa e a sua influencia sobre a saúde. [Problem of diet in Portuguese India and its effect on health.] *An. Inst. Med. Trop., Lisbon*, 1953, 10, 1233-1317. *Proc. [Esc. Med., Goa.] English summary.*

In a study of the nutrition of the population of Goa, 4 types of diets of schoolchildren aged from 9 to 10 years, and 14 diets of the working classes were studied. Of the children's diets all were insufficient in protein, and in quantity. In the diets of the adults the amount of protein was usually within normal limits, but as the protein was almost all of vegetable origin, the utilisation was poor. As in the children's diets, fat was deficient in both quantity and quality. One of the gravest defects of all the diets was their lack of Ca and the imbalance of the Ca:P ratio. All diets were deficient in Fe. In the children's diets vitamins A, B₁ and C were only one-third to one-half of the requirement, and there was scarcely any vitamin B₂. In the adults' diets vitamins A, B₂ and C were present in insignificant amounts, and only vitamin B₁ approached the indispensable minimum. The fundamental errors of the Goanese diets are the deficiencies of Ca, Fe and vitamins.

A survey is given of the incidence of deficiency diseases. In Goa infant mortality in 1951 reached 12 per cent. Examination of 673 schoolchildren showed that more than half suffered from hyperkeratosis, phrynodema, angular stomatitis or tongue fissures. A condition that must be considered is the incidence of intestinal parasites, which affect two-thirds of the population of Goa.

M. B. Richards.

2586

SHIGETOMO, A. [On the investigation of food in the endemic area of Kaschin-Beck's diseases.] *Shikoku Acta Med.*, 1954, 5, No. 3, 1-6. [Dept. Int. Med., Manchuria Med. Coll.] In Japanese: English summary.

Diet surveys lasting 5 days were made in 15 households in an area of Manchuria where Kaschin-Beck's disease, a disorder characterised by shortening of the long bones, is endemic. Five Chinese families in which it occurred and 5 Chinese, 3 Korean and 2 Japanese families from which it was absent were studied. Data for the intakes of energy and 9 nutrients are tabulated. No difference was found between the diets of the 2 groups of Chinese: their consumption of vegetables and of animal foods was low and their energy intake was probably also low. Intake of vitamin A, almost entirely as carotene, was ample in the Korean but in Chinese and Japanese families it was low. In all families the Ca intake was small, between 186 and 765 mg. per head, and that of Fe large, from 74 to 263 mg. per head daily. (From summary).—D. Harvey.

2587

- OWENS, L. and WHITE, G. S. Observations on food acceptance during mental illness. *J. Amer. Dietetic Assoc.*, 1954, **30**, 1110-1114. [Dept. Mental Hyg., State of California, Sacramento.]

Average plate waste per head per day in 3 dining rooms serving 200 chronically ill male schizophrenic patients was recorded for 18 months during which special efforts were made to make food more palatable and attractively served. The dining room with cafeteria service showed consistently less waste than the 2 with family type service. Change from family type to cafeteria service in one dining room reduced plate waste. The lowest average plate waste of 6 oz. per head per day was obtained when cafeteria service with a selective menu was available. The highest average waste was 24 oz. in a dining room with family type service. This was reduced by improvement in food palatability.—F. C. Aitken.

GENERAL STUDIES: DIET PLANNING: EDUCATION

2588

- DAVIDSON, C. S. Recent advances in nutrition and metabolism. 1. Review of the literature on general nutrition and protein and mineral metabolism, 1952. *Arch. Int. Med.*, 1954, **94**, 460-476. [Thorndike Mem. Lab., Second and Fourth Med. Serv. (Harvard), Boston City Hosp., Mass.]

2589

- LOREE, M. R. and MACKENSEN, K. R. Evaluative processes in home economics. 1. Foods and nutrition. *Louisiana State Univ. Agric. Exp. Stat., Bull.* No. 481, June, 1953, pp. 80.

2590

- LAMB, M. W., ADAMS, V. J. and GODFREY, J. Food preferences of college women. *J. Amer. Dietetic Assoc.*, 1954, **30**, 1120-1125. [Div. Home Econ., Texas Technol. Coll., Lubbock.]

2591

- EDWARDS, C. H., MCSWAIN, H. and HAIRE, S. Odd dietary practices of women. *J. Amer. Dietetic Assoc.*, 1954, **30**, 976-981. [Dept. Foods Nutrit., Sch. Home Econ., Tuskegee Inst., Tuskegee Institute, Ala.]

The subjects of the study were selected at random from negro women who had given birth to babies between 1949 and 1951. Data relating to diet habits during pregnancy and in normal periods were obtained by questionnaire or interview from 211 women. Questionnaires were issued also to health agencies and health workers. Food

taboos and cravings for food and unusual substances such as clay and starch were common both in pregnancy and at other times. The findings are discussed.—F. C. Aitken.

2592

- TRANT, H. Food taboos in East Africa. *Lancet*, 1954, **267**, 703-705. [E. African Med. Survey.]

Some tribal taboos are described. The main danger of these is in their effects on the nutrition of women and especially of pregnant women. Although in urban areas observance may be dwindling, the urgent need is for intensive propaganda against them among the rural population, still so large a proportion of the total in East Africa.—D. Harvey.

2593

- ROSE, M. Le plankton alimant. [Plankton as food.] *Ann. Nutrit. Alimentation*, 1954, **8**, 589-644. [Fac. Sci., Algiers.]

2594

- PETERS, F. E. Bibliography of the nutritional aspects of the coconut. *S. Pacific Comm. Tech. Paper*. No. 58, April 1954, pp. v + 35. Price 2s. net. [Noumea, New Caledonia.]

2595

- GOSSEWEILER, J. Plantas espontâneas e cultivadas pelos indígenas para efeitos de alimentação. [Plants, wild and cultivated by the natives for use as food.] *An. Inst. Med. trop., Lisbon*, 1953, **10**, 1583-1603. *Proc. [Serv. Agric., Angola.]* English summary.

About 90 plants, indigenous or exotic, used as foods in Angola are listed. The botanical name is given, along with a brief description of the plant, its native names, its distribution throughout the province, and an indication of the parts used as foods by the colonists or natives. If the plants are not indigenous, their place of origin is given, with the date of their introduction to Angola.

M. B. Richards.

2596

- ROBERTS, L. J. A basic food pattern for Puerto Rico. *J. Amer. Dietetic Assoc.*, 1954, **30**, 1097-1100. [Dept. Home Econ., Univ. Puerto Rico, Rio Piedras.]

2597

- BURKE, B. S. Diet during pregnancy. *Amer. J. Clin. Nutrit.*, 1954, **2**, 425-428. [Dept. Maternal and Child Health, Harvard Sch. Pub. Health, Boston, Mass.]

The daily dietary allowances for the last trimester of pregnancy, as recommended by the U.S.

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National Research Council, are tabulated and a meal plan and sample menu are given to show how the necessary nutrients can be supplied in simple daily meals.—F. C. Aitken.

2598

HUTCHINSON, R. C. **Effect of gastric contents on mental concentration and production rate.** *J. Appl. Physiol.*, 1954, 7, 143-147. [Food Serv. Sect., Dept. Labour Nat. Serv., Melbourne.]

Office workers given a light test meal, 5 oz. sandwiches and 7 oz. fruit cordial, towards the end of the morning or afternoon, gave better results in a paper test requiring concentration than did workers not given this meal. Typists gave better results in a concentration test after a lunch containing 9 to 12 oz. solid food than after soup and bread only or after 15 or 18 oz. solid food. Trainee typists anxious to give good results in the tests were not affected by the size of the meal.

It is suggested that mid-morning snacks may increase ability to concentrate, but a large meal taken at any time during the working day may decrease production.—D. Duncan.

2599

MACY, I. G. and MACK, H. C. **Implications of nutrition in the life cycle of women.** *Amer. J. Obstet. Gynecol.*, 1954, 68, 131-150. [Res. Lab., Child. Fund Michigan, Detroit.]

A review with 70 references.

2600

JOSEY, W. E. **The role of nutrition in the management of pregnancy: a review of recent studies.** *Amer. J. Clin. Nutr.*, 1954, 2, 303-315. [University Hosp., Augusta, Ga.] Spanish summary.

2601

ACOSTA-SISON, H. and VILLANUEVA, J. **Nutrition of women during pregnancy with Philippine food material.** *J. Philippine Med. Assoc.*, 1954, 30, 151-169. [Dept. Obstet., Univ. Philippines.]

Diets composed entirely of foods produced in the Philippines, with the exception of butter, canned milk and flour, were given in hospital to 47 poor Filipino women for from 1 to 5½ months of their pregnancy. Menus are given to illustrate the diets provided and to show their nutritional adequacy. Two tables give details of weight gains during pregnancy, birthweights of the infants, and results of blood and urine analyses. The optimum weight gain was found to be from 3 to 4 lb. a month, and mothers with such increase

produced infants of average birthweight 3500 g. Mothers with higher or lower weight gains produced infants smaller than average. Most women had low red cell counts and low Hb values on admission, and the blood picture improved on the controlled diet. The study demonstrated the possibility of achieving satisfactory nutrition for pregnant women on diets suited to their tastes and means.

A. M. Copping.

2602

VIGLIANI, E. C. **Problemi di alimentazione per i lavoratori esposti all'azione di sostanze tossiche. [Feeding of workers exposed to the action of toxic substances.]** *Med. del. Lavoro*, 1954, 45, 423-430. [Clin. Lavoro L. Devoto, Univ. Milan.] English summary.

All workers exposed to toxic substances should be well fed, but the use of any special diet should not be allowed to give rise to a false sense of security. No diet is considered to have a specific value against any particular poison. Milk has no specific action against lead. Workers with benzene or aromatic amines should have foods containing proteins rich in sulphur amino-acids. In work with chloroform, carbon tetrachloride or tetrachloroethane, high reserves of glycogen in the liver should be maintained; that is, the diet should be rich in carbohydrate and liver-protecting amino-acids. The diet for workers with trinitrotoluene should be like the last and also poor in fat. Alcohol is considered undesirable for workers with toxic substances, particularly calcium cyanide and nitroglycerine, but methanol poisoning may be partly counteracted by ethanol and pectin. Workers should not expose themselves to CO immediately after a meal. Workers with penicillin should be given B vitamins to combat liability to blacktongue.

E. M. Hume.

2603

NELSON, E. M. **The philosophy of food fortification.** *J. Amer. Dietetic Assoc.*, 1954, 30, 984-986. [Div. Nutr., Food and Drug Admin., Washington, D.C.]

2604

RODRÍGUEZ CABRERA, J. H., BENGUA, J. M., LIENDO COLL, P. and JAFFÉ, W. G. **Enriquecimiento de alimentos como programa de Salud Pública. [Enrichment of foods as a public health measure.]** *Arch. venezol. Nutrición*, 1954, 5, 5-38. [Inst. Nac. Nutrición.] English and German summaries.

2605

HIPSLEY, E. H. **Nutrient additives to bread.** *Med. J. Austral.*, 1954, 45-51. [Nutrit. Sect.,

Austral. Inst. Anat., Commonwealth Dept. Health, Canberra.]

United Kingdom and United States policies with regard to flour enrichment are outlined and the possible role of enriched bread in improving the diet and nutritional state of the Australian people is indicated. In Australia the National

Health and Medical Research Council has recommended enrichment of white flour according to the United States pattern and, in goitre areas, the use of iodised salt in the baking of bread.

F. C. Aitken.

See also Absts. 1760, 1832, 1914, 2472.

FOOD ECONOMICS AND STATISTICS

2606

STRAUB, J. and SCHOUTRA, A. De waarde van calorieën en eiwit, in geld uitgedrukt, de "voedselgeldswaarde". [The value of calories and protein, expressed in money; the "diet money value".] *Voeding*, 1954, 15, 210-218. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.] English summary.

Money value is computed from the chemical composition of the food on the assumption that 50 Cal., 1 g. animal protein and 2 g. plant protein are worth 1 cent. The values are set out for 55 common foods and the relation of money value to cost is shown in a diagram.—I. Leitch.

2607

JAPPÉ, W. G. Intento de comparacion de los valores economicos y nutricionales de algunas cosechas. [Relative money and nutritional values of some food crops.] *Arch. venezol. Nutricion*, 1954, 5, 89-93. [Inst. Nac. Nutricion.] English and German summaries.

The economist evaluates a food product by its price and the agronomist by its weight, but there is no such simple basis for the nutritionist to work on. The food value of several crops has been compared in the following way. The net yield per hectare is calculated by subtracting from the gross yield the normal losses during refinement, transport and selection of the edible portion. The energy value and contents of protein, Ca, P, Fe and several vitamins are estimated and each is divided by the value of the daily requirement of an adult man. For example, a hectare of rice with a net yield of 945 kg. and a protein content of 8 per cent. gives a total of 75.6 kg. protein; if the daily protein requirement of an adult man is 70 g., the crop of rice provides 1080 daily protein rations. This method is applied for each food constituent to rice, black beans, maize, potatoes, pawpaw, plantains, yuca and tomatoes. It demonstrates well the imbalance of nutrients in each crop, which must be considered in the evaluation, as must differences between the biological value or utilisation of components from different sources.—D. Duncan.

2608

WILCOX, W. W. Methods of increasing domestic consumption of farm products. *J. Farm Econ.*, 1954, 36, 509-512. [Library of Congress, U.S.]

This paper confines itself to ordinary commercial methods of dealing with the present excess agricultural production in the U.S. by increased domestic consumption, with special reference to livestock products; among the measures suggested are expansion of the school lunch programme and industrial canteen facilities, improved packaging and marketing and increased publicity for the nutritive value and uses of livestock products. Their importance in U.S. agricultural economy is shown by the facts that in 1952 livestock and livestock products provided 42 per cent. of farm income in cash, compared with 8 per cent. each for food grains and cotton; and of farm land in 1950, 72 per cent. was used to support livestock, quite apart from some 400 million acres of range land, compared with 6 per cent. for food grains and 2 per cent. for cotton. Nevertheless, since consumption per head has shown percentage increases since 1940 as follows: beef 41, veal 29, chicken 64, turkey 41, eggs 28, milk 6, cheese 19, ice-cream 52, with decreases only in lamb 28, pork 12 and butter 49 per cent., it is considered that a shift from cotton and food grains to the production of soil-building forage crops and the use of some food grains for livestock feeding are desirable.

W. M. Deans.

2609

NORDIN, J. A., JUDGE, G. G. and WAHBY, O. Application of econometric procedures to the demands for agricultural products. *Iowa Agric. Exp. Stat. Res. Bull.* No. 410, July 1954, 979-1035. [Dept. Econ.]

The first half of this study consists of a mathematical discussion of the problem of predicting retail demand by the method of least squares or by simultaneous equations methods.

In the second half, the theory is applied to U.S. demand for (1) pork, beef and poultry meat, (2) eggs. For the meats, a simultaneous equations method was considered more satisfactory and yielded the following tentative predictions: a 1

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per cent. rise in the price of pork will bring a 0.91 per cent. fall in the quantity of pork retailed, and a 1 per cent. rise in disposable personal income will bring a 0.76 per cent. rise in the quantity of pork retailed. The corresponding figures for beef were 0.77, 0.65 per cent., and for poultry meat 0.68, 0.53 per cent. The effects of changes in relative prices are also discussed and it is considered that such changes are less likely to affect consumption of poultry meat than that of either pork or beef. For eggs, the least squares method seemed preferable, and the corresponding figures were 0.55, 0.41 per cent.—W. M. Deans.

2610

PHILLIPS, T. L. **Income levels and meat consumption in Australia.** *Quart. Rev. Agric. Econ.*, 1954, 7, 123-128.

In Australia, falling wool prices lead to an increased supply of mutton and also, through a decline in general income level, to an increased demand for it. This is brought out by a table of returns from wool and mutton, sheep numbers and mutton production for the years 1927 to 1952, war years omitted. Another table gives consumption per head and wholesale price per lb. of mutton, lamb and beef, along with national income per head (that of 1928-29 taken as 100) for the same period; the data are also shown graphically. The average long-term meat consumption pattern is, approximately, beef and veal 60, mutton and lamb 32 and other meat 8 per cent. In 1928-29 the quantities consumed per head in lb. were beef 115, mutton 56, lamb 12 but by 1932-33 (national income per head 66) they were 93, 74, 14. In 1938-39 (national income per head 93) they were 132, 62, 14 and in 1952-53 (national income per head 344), 118, 48, 29. So far as changes in price are concerned, beef shows a time lag compared with mutton.—W. M. Deans.

2611

VIITA, P. **Maatalous Suomen kansantulolaskelmissa. [Agriculture in the computation of the national income in Finland.]** *Maataloust. Aikakausk.*, 1954, 26, 121-129. [Central Statistical Office, Helsinki.] English summary.

A table is given showing the position of agriculture in the Finnish national economy between 1926 and 1952. Until 1939 agricultural production followed general economic development, but since then it has been at a relatively lower level than in other industries. [From summary.]

D. Harvey.

2612

Fox, F. W. **Agricultural foundations of nutrition.**

8. Dairy produce, with special reference to fresh milk. 9. Sea-foods. 10. Vegetables. *S. African Med. J.*, 1954, 28, 770-773; 897-

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899; 1019-1022. [S. African Inst. Med. Res., Johannesburg.]

For Parts 6 and 7 see Abst. 1127, Vol. 25.

8. In South Africa the demand for liquid milk is low: in 1951-52 consumption, as percentage of the total produced for sale, was as fresh milk 41, butter 45, cheese 8 and condensed or dried milk 6. The milk cow population is between 0.8 and 0.9 million. Information on yield is scanty; there is evidence which suggests that it is about 1.1 gal. per cow daily. Data collected in 1937 showed that, for Europeans, with rising income consumption of milk and butter rose, that of meat and cheese was affected little and that of condensed milk fell. To produce an increase of consumption only a reduction of price is likely to be effective.

Problems in connection with feeding which are discussed are those of increasing pasture and reducing dependence on concentrates; others related to the siting of farms near towns where land and labour are expensive, to the acceleration of transport and the cutting of its cost and to the reduction of losses from disease in herds are also mentioned. Experience in Port Elizabeth in the use of sterilised milk suggests this may be an important development.

9. The rapid growth of the fishing industry in South Africa is traced in tables showing total catches and data from the related canning, fish-meal and marine oil industries. Hake liver oil is a cheap source of vitamin A and in the experience of some gold-mining companies there is evidence that the African's prejudice against fish may be overcome. The results of small-scale investigations on the use of fishmeal in diet scales for Africans have also been encouraging.

10. Between 1937 and 1950 the total area planted in all kinds of vegetables, including potatoes, nearly doubled; the percentage increase was least for sweet potatoes, 26 and greatest for onions, 179. Regarding scales of 8 vegetables in the 8 principal municipal markets information was that increases over 12 years ranged from 45 per cent. for green beans to 195 per cent. for cauliflowers. In a consideration of problems of transport the long distances that some vegetables are carried require consideration, e.g., 90 per cent. of its tomato supplies had travelled 1300 miles to Cape Town and green peas had gone between 200 and 500 miles to the markets of 4 important cities.

More detailed reference is made to the growing of potatoes; a substantial reduction in their price is thought to be possible only if production is rendered less precarious and if fluctuations in the returns to growers are reduced.—D. Harvey.

2613

SZCZYGIŁŁ, A. and SZCZKÓWNA, J. **Postulaty żywieniowców w zakresie norm spożywcia**

warzyw i owoców. [Some nutritional claims with regard to the production and consumption of fruits and vegetables.] *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 221-226. [Dział. Hig. Żywności PZH.] Russian and English summaries.

In a review the national consumption of fruits and vegetables is given and compared with the norms suggested by the Polish Department of Food and Hygiene in 1950, and with the current or planned consumption of these products in other countries. The variety of fruits and vegetables should be increased and supplies to the market made regular.

In addition, the desirable annual consumption per head of individual fruits and vegetables during the next 5 years is outlined. (From summary.)

T. D. Bell.

2614

REED, R. H. and CREEK, C. R. **Family consumption of certain fresh vegetables in Honolulu.** *Hawaii Agric. Exp. Stat., Agric. Econ. Bull.* No 5, June 1953, pp. 22.

During the month of October 1951 810 households chosen at random in the city of Honolulu were visited. The vegetables eaten were cabbage, tomatoes, lettuce, carrots, cucumbers and sweet potatoes and the average amounts used per head in that order were 1.37, 1.34, 0.83, 0.80, 0.42 and 0.27 lb. The consumption of all vegetables except cabbage increased as family size increased; for cabbage, the cheapest vegetable, consumption decreased as family income increased. Racial differences in rates of consumption were statistically significant only for tomatoes, cabbage and lettuce. In general there was a preference for medium size in the vegetables and for firmness in cabbages and lettuces. For carrots, imported supplies were preferred to those grown on the island, but for the other types the opposite was true. Good quality and attractiveness of display often prompted purchases which had not earlier been in mind.—G. F. Garton.

2615

BENGOA, J. M., GONZÁLEZ, M. and CARILLO, A. S. **Hojas de balance de alimentos en Venezuela en 1951.** [Food balance sheet for Venezuela in 1951.] *Arch. venezol. Nutricion*, 1954, 5,

95-111. [Inst. Nac. Nutrición.] English and German summaries.

The Instituto Nacional de Nutrición has prepared a balance sheet for production, expenditure and consumption of food in 1951. This takes into account total production and changes in reserves, imports and exports, animal feedingstuffs, cereals, manufactures, waste, gross and net quantities of foods available, and estimated mean consumption per head of population by the year and day.

The population numbered about 5,050,000. The estimated daily diet provided 2372 Cal. per head, 64.1 g. protein, 44.7 g. fat, and by difference, 428.3 g. carbohydrate. Cereals accounted for 36.85 per cent. of the total calories and foods of animal origin for 13.54 per cent. [but the diagram on p. 103 shows 21.13 per cent.]. Of the total protein consumed 41.03 per cent. was of animal origin.

Energy intake was 90 Cal. per day higher than in 1950, but protein consumption was the same.

D. Duncan.

2616

BENGOA, J. M. (with FERNÁNDEZ, J. and ROJAS, V.) **Variaciones de los costos de alimentación en Caracas en los últimos veinte años.** [Change in the cost of food in Caracas in the last twenty years.] *Arch. venezol. Nutricion*, 1954, 5, 113-131. [Inst. Nac. Nutrición.] English and German summaries.

The costs in 1933 and 1952 were compared for 5 diets, poor, minimum, intermediate, optimum and luxury. The poor diet provided daily 1832 Cal. and 57 g. protein, 9 g. of animal origin, and represents the food of an important proportion of the population of Caracas. The luxury diet provided 3256 Cal. and 151 g. protein with a high proportion of animal protein; the other diets lay between these extremes.

The cost per person and day was for the poorest diet 0.45 bolivar (B) in 1933, 0.86 B in 1952; for the intermediate diet 1.23 and 2.22, and for the luxury diet 3.26 and 5.65. The increase was from 67 to 91 per cent. for different diets. Of the poor diet, 1.00 B would buy 4166 Cal. in 1933 and 2130 Cal. in 1952; the same sum would buy 126 g. protein in 1933 and 66 g. in 1952.

The increase in costs of different nutrients and of the different types of diet has been uniform.

D. Duncan.

DIET IN ETIOLOGY OF DISEASE

METHODS OF ASSESSING STATE OF HEALTH

2617

CORRENTI, V. **Lo spessore del pannicolo adiposo sottocutaneo in eutrofici e distrofici dei primi 30 mesi di vita. 2. Risultati delle misurazioni del pannicolo adiposo sottocutaneo in bam-**

bini eutrofici del primo anno di vita (1). [Significance of the subcutaneous fat layer in well-nourished and dystrophic infants during the first 30 months of life. 2. Results of measurement of subcutaneous fat in eutrophic infants during the first year of life. 1.] *Quadr.*

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Nutrizione, 1953, 13, 61-76. [Clin. Paediat., Univ. Rome.]

For part 1 see Abst. 2566, Vol. 21.

The infants, 18 boys and 8 girls, were healthy and were from 3 to 14 months old. The subcutaneous fat was measured in 8 sites on the body and the measurements were repeated 31 days later. The results are presented statistically. The mean thickness of fat was greatest in the gluteal region and then, in descending order, on femoral, umbilical, lumbo-abdominal, scapular, mammary and anterior brachial sites and the back of the hand. An index, I.M.I.A.S., derived from values for all 8 sites, was positively correlated with bodyweight, and it is considered that it might be a useful guide to the state of nutrition.—D. Duncan.

2618

ACHESON, R. M. **Method of assessing skeletal maturity from radiographs. A report from the Oxford Child Health Survey.** *J. Anat.*, 1954, 88, 498-508. [Social Med. Unit, Univ. Oxford.]

The disadvantages inherent in the inspection technique which is commonly used for the rapid assessment of maturation are indicated. To overcome them a system is suggested which is based on the awarding of scores according to the stage of development of bones. On the assumptions that (1) the hand and knee should be treated separately, (2) scores for round bone and epiphyseal ossifications may legitimately be added together, and (3) suitable corrections should be applied so that in the end the graph for skeletal maturity in units against age in years shall be linear, the system has been applied to measure the development of hands and knees in a group of 97 healthy British children between 6 months and 5 years of age (see Title 812, Vol. 23 and Ryle, "Changing Disciplines", Oxford Univ. Press, 1948). Mean scores for age and sex at half-yearly intervals are given. The possibility is visualised of applying the system to any part of the body and of expressing skeletal maturity as a percentage of normal.—D. Harvey.

2619

BABCOCK, M. J., CLAYTON, M. M., FOSTER, W. D., LOJIKIN, M. E., TUCKER, R. E., VANLANDINGHAM, A. H. and YOUNG, C. M. **Cooperative nutritional status studies in the northeast region. 6. Correlations.** *W. Virginia Agric. Exp. Stat. Bull.* No. 361T, June 1953, pp. 48. [Morgantown, W. Va.]

For earlier references to this series see Abst. 2265, Vol. 24.

Data from six districts for 1559 subjects were examined for the existence of associations between 4 blood constituents, 7 dietary nutrients and 22 physical signs. The statistical methods employed are outlined.

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Simple correlation coefficients between blood constituents and related dietary nutrients showed that at nearly all stations the associations were significant for Hb with dietary protein, Hb with dietary Fe, blood vitamin A with blood carotene and blood ascorbic acid with dietary ascorbic acid. There was, in addition, a tendency for some other associations to be significant, but this may have been due to the occurrence in high concentrations of more than one nutrient in a single type of food e.g. carotene and vitamin C together in green leafy vegetables.

Physical signs were recorded only in descriptive terms and further statistical procedures were used to measure the association of these with either blood constituents or dietary nutrients or both, but in no case could the presence of a physical sign be accurately predicted from any combination of blood constituents and dietary levels that was tested.

It is suggested that findings in studies based on cross-sections of a population should be confirmed by longitudinal studies of the same population.

D. Harvey.

See also Abst. 2567.

GENERAL STUDIES

2620

MAYER, A. J. and MARKS, R. V. **Differentials in infant mortality by race, economic level and cause of death, for Detroit: 1940 and 1950.** *Human Biol.*, 1954, 26, 143-155. [Wayne Univ., Detroit.]

2621

BAIRD, D., WALKER, J. and THOMSON, A. M. **The causes and prevention of stillbirths and first week deaths. 3. A classification of deaths by clinical cause: the effect of age, parity and length of gestation on death rates by cause.** *J. Obstet. Gynaecol. Brit. Empire*, 1954, 61, 433-448. [Dept. Midwifery, Univ. Aberdeen.]

For Parts 1 and 2 see Absts. 2767, Vol. 22 and 3439, Vol. 23.

A detailed description is given of the method of classification applied to 1008 obstetric deaths (stillbirths and first week deaths). About one-third of the deaths were unexplained and of these about 60 per cent. were associated with prematurity of unknown cause. In the remaining cases death was due to injury at birth, pregnancy toxæmia, antepartum haemorrhage, foetal deformity, maternal disease and other causes. From a study of the effect of age and parity on the different causes of death it is suggested that the ageing process, especially in primiparae, is associated with a decline of reproductive efficiency. The natural rise with age in obstetric death rate is masked by

the use of caesarean section, especially in primiparae over 25 years, and by the tendency for the advantages of youth to be outweighed by the ill effects of poor growth and poor general health in primiparae under 20 and multiparae under 25 years. The underlying cause of death in the mature, cause unknown, group, in prolonged pregnancies appears to be a failing oxygen supply, and this cause, combined with a rising incidence of difficult labour, brings about an increase in traumatic deaths after term.

A higher level of health among mothers and reproduction at more favourable ages would be required in addition to good obstetric care to achieve the lowest possible obstetric death rate.

F. C. Aitken.

2622

GRIFFITHS, J. **Child health in Johannesburg.** *Med. Officer.* 1954, 92, 199-204. [City Health Dept.]

This article includes tables and graphs giving the birthrate and infant mortality rate for European, native, Coloured and Asiatic sections of the population of Johannesburg, and birthweight, parity, breast feeding percentage and incidence of infections for European, Coloured and Asiatic infants attending child welfare clinics, all for the year July 1950 to June 1951.

Infant mortality per 1000 live births was: Europeans 27.44, Asiatics 48.54, Coloured 80.51, natives 243.76, but there is reason to believe that the last figure is artificially high. The lower the mortality, the higher the percentage of deaths very early in life. Prematurity was the commonest cause of death among Europeans and Asiatics, diarrhoea among Coloured and native; respiratory disorders were also a frequent cause among natives. The last two, it is suggested, are associated with malnutrition.

Among clinic babies, Coloured and Asiatics tended to be lighter at birth than Europeans. Gross malnutrition was seen in 10 per cent. of Coloured, 11 per cent. of Asiatics and 0.7 per cent. of Europeans; half of the Asiatic and 11 per cent. of the Coloured malnourished infants had florid rickets. In the first 3 months complete breast feeding was considerably more frequent in the non-white races, but it fell away thereafter so that at 6 months the incidence was a little over 20 per cent. in all 3 races, probably because more of the non-white mothers had to go out to work. Infections tended to be commoner among Coloured and Asiatics but most of the differences were not statistically significant.—W. M. Deans.

2623

PLATT, B. S. **The malnourished community. Care of mothers and children as a first step towards**

improved feeding. *Lancet*, 1954, 267, 929-930; 931. [Dept. Human Nutr., Univ. London.]

The part that maternal and child welfare work among unsophisticated peoples may play in their social and economic development is considered with special emphasis on the needs for restraint in the introduction of innovations and for ensuring that, as far as possible, changes should be in agreement with the customs of the community.

D. Harvey.

2624

HILBER, H. and MENTZ, B. **Schwangeren-Ernährung und Gesundheitszustand der Säuglinge. [Diet in pregnancy and the health of the infant.]** *Münch. med. Wochenschr.*, 1954, 96, 1027-1031. [Kinderkrankenhaus, Schwabing, Munich.]

The importance of adequate provision of protein, energy, Ca, P, Fe and vitamins for pregnant and lactating women is discussed with reference to the incidence of stillbirths and the health of surviving infants. A survey in Munich and Bavaria showed that there was frequently a deficiency of Ca, P and Fe in the diet of pregnant women and that only 40 per cent. had a satisfactory intake of protein. When improvements in nutrition could be effected both mother and infant showed the benefit. More modern methods of instruction in dietary principles are advocated for antenatal clinics.—A. M. Copping.

2625

VAVICH, M. G., KEMMERER, A. R. and HIRSCH, J. S. **The nutritional status of Papago Indian children.** *J. Nutrition*, 1954, 54, 121-132. [Dept. Nutr., Coll. Agric., Univ. Arizona, Tucson.]

Of the 115 children studied, 48 attended schools of the U.S. Indian Service and 67 attended private schools. Ages ranged from 11 to 16 years. Children in the Indian Service schools received a midday meal which supplied on the average daily 636 Cal., 22 g. protein, 172 mg. Ca, 48 mg. Fe, 3.8 mg. nicotinic acid, 0.42 mg. vitamin B₁, 0.53 mg. riboflavin, 57 mg. ascorbic acid and 2466 I.U. vitamin A. The noon lunch in the private schools was limited and not well planned, often of bread, water and potatoes. Such information as could be obtained about home diet suggested that it consisted mainly of beans, sugar and syrup, coffee, lard or fat pork, tortillas made of maize or wheat, small amounts of native foods such as mesquite beans, buds and fruit of cholla, fruits of prickly pear and saguaro cactus, with some wild greens in season. Very little animal protein was eaten.

Differences in height and weight between the 2 groups were not significant. Children attending Indian Service schools had significantly more

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vitamin A potency and ascorbic acid in the blood, and hyperkeratosis and gingivitis were less frequent than in children attending private schools. There was no significant difference in serum riboflavin values between the groups. The incidence of asymptomatic stomatitis was slightly higher in the Indian Service schools. Only a few signs of nicotinic acid deficiency were noted. Average values for serum cholesterol were within the low normal range, for serum glucose and protein within the normal range, and not significantly different between the groups. Hb, red cell count, white cell count, haematocrit and sedimentation rate did not differ significantly between the groups. In both groups the Hb value was within the low normal range. Girls from the private schools showed poorer bone calcification than girls from the Indian Service schools.

The differences between the groups were attributed to the differences in quality of the school lunches.—F. C. Aitken.

2626

Nutrition in Latin America and south and east Asia. *Chron. World Health Organiz.*, 1954, 8, 317-322.

A summary of discussions, particularly on protein malnutrition and endemic goitre, at two joint FAO/WHO conferences at Bandung and Caracas (see Vol. 24, pp. 484 and 995).

D. Harvey.

2627

HUEBEMANN, R. L. and COLLAZOS, C., C. (with BENTNES, R., BRAVO DE RUEDA, Y., CASTELLANOS, A., DIESELDORFF, A. and MOSCOSO, I.) **Nutrition and care of young children in Peru. 3. Yurimaguas, a jungle town.** *J. Amer. Dietetic Assoc.*, 1954, 30, 1101-1109.

For Parts 1 and 2 see Abst. 1090, Vol. 25.

Concurrently with a family diet study a study was made of the diet, nutritional state and care of 18 children under 3 years of age. All children under 1 year were wholly or partly breast fed. The diets of weaned children were low in Ca, riboflavin, vitamin B₁ and protein. No child was entirely free of signs possibly related to nutritional deficiency, but these signs could not be correlated with dietary intakes. Children were below the average height and weight of Peruvian coastal children of the same race and nationality. There were indications that parasitic infestation was common.—F. C. Aitken.

2628

DELGADO, J. A. DE B. A. **Incidência e condições de desenvolvimento das doenças edêmicas na área sanitária de Tete e causas das doenças da nutrição. [Incidence and conditions of development of endemic disease in the sanitary**

area of Tete and causes of nutritional disease.]

An. Inst. Med. trop., Lisbon, 1953, 10, 1779-1792. English summary.

Tropical diseases abound in the region of Tete in Mozambique. The numbers of cases are given for the 5 years from 1947 to 1951 of such diseases as malaria, amoebic dysentery, ankylostomiasis, tropical ulcer, leprosy, venereal disease and schistosomiasis. The causes of the nutritional diseases in Tete are directly related to the severity of the climate with its excessive heat and scarcity of rain, the poverty of the soil, and the indiscriminate use of alcohol. The diet of the people is based on carbohydrate-rich foods such as millet and maize flours, is insufficient, and deficient in vitamins B₁, C, D and in nicotinic acid.

M. B. Richards.

2629

JORGE JANZ, G., PINTO, G. L. and FRANÇA, C. S. **Contribuição para o estudo do estado de nutrição da população de S. Tomé. Sobre o estado de nutrição dos servigais em S. Tomé. [State of nutrition of the population of São Tomé. State of nutrition of rationed labourers of São Tomé.]** *An. Inst. Med. trop., Lisbon*, 1953, 10, 1459-1513. English summary.

A nutritional survey was made on 100 farm labourers in São Tomé, who were given a diet in accordance with regulations. The investigation included a detailed clinical examination, haematological tests, biochemical examinations of blood and urine, and a study of the prescribed dietary schedule. Consideration of all the clinical and laboratory data indicated that the group studied was in a state of malnutrition, as evidenced by the frequency of anaemia and of dental caries, and of the occurrence of signs of vitamin deficiency such as follicular hyperkeratosis, xerosis of the skin, tongue lesions and low excretion of riboflavin and vitamin B₁. Possible reasons for the lack of correlation between the observed state of malnutrition and the consumption of a ration which is largely in accordance with the usual requirements are discussed.—M. B. Richards.

2630

BERVOETS, W. P. **Étude sur l'état de nutrition d'un groupe d'enfants indigènes. [Study of the nutritional state of a group of native children.]** *Ann. Soc. belg. Méd. trop.*, 1953, 33, 545-552. Flemish summary.

Assessment of nutritional status for Africans is made especially difficult by the complicated mixture of the races and the lack of standards. The serum proteins were estimated before and after administration for 3 months of milk powder to provide the equivalent of 750 ml. milk daily. Blood and urine tests and tests of liver function were used to eliminate children with actual disease.

Fifty-five boys, aged from 10 to 15 years, were investigated. The values for serum proteins of Wolfson *et al.* (*Amer. J. Clin. Pathol.*, 1948, 18, 723) were taken as normal. Before the distribution of milk, the percentage of children having subnormal values was for total protein 67.2, albumin 100.0, and globulin 20.0; for the last many had values above normal. After distribution of milk, the percentages with subnormal values was reduced to 3.6 for total protein, 78.1 for albumin, and 1.8 for globulin. Thus, the globulin values were less reduced and recovered more completely than those for albumin. The sedimentation rate also was improved.

E. M. Hume.

2631

DOS SANTOS REIS, C. M. Alimentação da mãe indígena e aleitamento. [*Diet of the indigenous [Mozambique] mother and lactation.*] *An. Inst. Med. trop., Lisbon*, 1953, 10, 1345-1437. *Proc.* English summary.

The problem of malnutrition among native infants in Mozambique is very serious. The infants are almost exclusively breast fed, and the high incidence of nutritional disorders and malnutrition suggested an investigation of the diet of the mothers in relation to the quantity and quality of their milk. It is shown that the native woman's diet, which might be sufficient in terms of energy for lactation under conditions of moderate physical activity, is insufficient in view of the hard work that she has to do. In addition it is ill balanced, with excess of carbohydrates and little fat and protein, and is deficient and ill balanced in vitamins and minerals. Milk is scant and of poor quality, and the average daily weight gain of infants is 24 g.—M. B. Richards.

2632

LAURIE, W. Survey before service. Observations on relation between agriculture, parasite load, and nutrition on a tropical African island. *Lancet*, 1954, 267, 801-802. [*East African Med. Survey.*]

Because of alarming reports a medical survey was made of 3677 of the population of 17,000 people living on Ukara Island in Lake Victoria at a population density of 600 per sq. mile. Greying of the hair was seen in 11.2 per cent. of men and in 3.6 per cent. of women, but its nutritional significance is in doubt (see Osborne, *Abst.* 1156, Vol. 25). Cheilosis was found in 19.2 and 9.6 per cent. of men and women. The spleen was enlarged in 36 per cent. and the liver in 3 per cent. of the population. The incidences of hydrocele among men and of bancroftian infection in both sexes were high. Laboratory data showed that of 790 persons only 5 were free from intestinal parasites.

In spite of these infections the mean weight: height ratio for Wakara was 1.95, third highest among 31 tribes for which data are available.

A system of agriculture has been evolved under which full use is made of farmyard and green manures, adequate precautions are taken against soil erosion and a system of rotation of cropping is maintained. The density of population is 3 times that on the neighbouring mainland. The lesson is pointed of the value of surveying fully the population's ecological status before spending large sums of money on schemes for controlling disease.—D. Harvey.

2633

SOEHARTO, R. Letter from Indonesia. *New Engl. J. Med.*, 1954, 251, 339-342. [*Djakarta.*]

A general practitioner in Djakarta gives a short description of the Indonesian Republic, its history, economy and facilities for medical education. The country still imports rice and its main nutritional problem is the provision of protein. The people, most of whom are Moslems, do not like milk or milk products; dried or salted fish are their main sources of protein. The death rate from liver cirrhosis among those over 18 years of age is thought to be 4.29 per cent. of total deaths.

D. Harvey.

2634

MILLIS, J. A study of growth in the first year of life of Southern Indian infants born in Singapore. The influence of nutrition on the growth rate of Southern Indian infants born in Singapore. *J. Pediat.*, 1954, 45, 692-696; 697-706. [*Dept. Social Med., Univ. Malaya.*]

Means and 10th, 50th and 90th percentiles are tabulated for weight in oz. at 4-week intervals from birth to 12 months of 50 male and 56 female infants born in hospital in Singapore in the summer and autumn of 1951 to poor South Indian parents, mostly Tamils. Mean lengths in inches at birth 24, 36 and 48 weeks are also given. Mean weights of male infants are plotted along with results of the author for poor Chinese in Singapore (*Med. J. Austral.*, 1954, 1, 283), of Vickers and Stuart for Americans of northern European stock in Boston (*Abst.* 467, Vol. 13) and of Clements for Australians (*Abst.* 2179, Vol. 3). At birth the sexes were alike with mean birthweight of 6.3 lb. and mean birth length of 18.8 in., but by the end of the year the males were significantly heavier and longer. Indian infants were lighter than Chinese infants throughout, and in the second 6 months both Asian groups fell behind the white groups. Further study would be required to ascertain whether the differences are racial or environmental in origin, or both.

The second paper reports information on feeding and environment collected during the same

survey. At 12 weeks 41 per cent. of the Indian infants were wholly and 64 per cent. partly breast fed and 20 per cent. were still partly breast fed at one year; these figures are lower than those for Chinese infants in Singapore. The commonest reason for weaning was failure of lactation and it is suggested that this was partly due to the poor diet, low in protein, Ca and vitamins, of the Indian mothers and to food taboos and staying indoors during the first month after delivery. Artificial feeding was on dried or sweetened condensed milk; liquid cow's milk was too scarce and dear. Feeding on demand was usual until the child was given a mixed diet. Cereals, usually rice porridge, were not begun early, nor were fruit, vegetables or animal protein foods, and the amounts of the last were very small. Breast feeding favoured weight gains during the first 6 months but at the end of the year there was no significant difference. Infants breast fed for more than 24 weeks had a higher medical grading at 1 year and fewer infections than others. Differences in housing standards within the group had no demonstrable effect, but the generally low standard of living and hygiene was considered likely to have a detrimental effect on the health and progress of the whole group of infants.—W. M. Deans.

2635

IGETA, M. [Study of physical changes in recruits from the time of enrollment to the initial training.] *Jap. Safety Forces Med. J.*, 1954, 1, No. 6, 13-18. [Camp Shibata.] In Japanese: English summary.

Recruits were examined on enlistment and at the end of their initial training. Physique was measured by the method of Pignet and Bornharardt, and was rated poor, satisfactory or fine.

On enlistment there were 70 recruits rating poor and 58 fine. Of the 70 poor, 46 improved to satisfactory or fine by the end of training. Of the 58 fine, only 5 deteriorated to satisfactory, and of those 3 had contracted diseases.

Humeral circumference measured at the end of training agreed with the rating of physique.

Hospital admissions were highest among poor ratings and lowest among fine. All recruits excused duties for sickness were in the poor rating group.

The food intake of all personnel was considered adequate in energy. [From summary.]

T. D. Bell.

2636

KONSTAM, P. G. Peptic ulceration in Southern Nigeria. *Lancet*, 1954, 267, 1039-1040. [Dept Surg., Univ. Coll., Ibadan, Nigeria.]

Twenty cases of proved peptic ulcer were seen in 9 months in Adeyo Hospital in Southern Nigeria, where cassava and yams are the staple

foods; in Northern Nigeria, where millets are common, the condition is relatively rare. It is thought unlikely that its occurrence is attributable to deficiency of any particular nutrient, but lack of vitamin B₁ may, at times, have an influence. The similarity is indicated between conditions in Southern Nigeria and those in Southern India as described by Orr and Rao (Abst. 3698, Vol. 9) and by Dogra (Absts. 3063 and 3694, Vol. 10).

D. Harvey.

2637

BLUMENTHAL, C. J. Blindness and malnutrition in the Eastern Cape Province. *S. African Med. J.*, 1954, 28, 967-971. [E. London.]

The incidence of malnutritional keratoconjunctivitis as defined by the author (see Abst. 887, Vol. 20) has been further studied. Among 1192 consecutive out-patients at Frere Hospital Eye Clinic the numbers of cases in the age groups 1 to 5, 5 to 15, 15 to 30, 30 to 50 and over 50 years were 57, 58, 29, 11 and 2. The condition is considered to differ from keratomalacia and to have its origin in damage caused to the mesodermal tissues of the eye by malnutrition after weaning and especially between 2 and 5 years of age. Such damage may not be visible to the naked eye. Flies, germs and dirt are discounted as its cause and are regarded only as incidentals.—D. Harvey.

2638

NICOL, D. Excess conjunctival tissue and follicular hyperkeratosis. *J. Trop. Med. Hyg.*, 1954, 57, 225-226. [Univ. Coll., Ibadan.]

In a pilot survey in Western Nigeria excess conjunctival tissue became more common with ageing and occurred more frequently among males than among females. The cause may be general irritation by dust and sunlight as suggested by Jelliffe *et al.* (Abst. 3562, Vol. 24); it is unlikely to be exposure to smoke, since women usually spend more time indoors than do men. In the same survey follicular hyperkeratosis was found to be more frequent in females than in males and in pregnant than in non-pregnant women. Oestrogens may in some way be involved in its appearance.

D. Harvey.

2639

MILLETTO, G. Le cancer du foie en milieu tropical. [Cancer of the liver in the tropics.] *Méd. trop.*, 1954, 14, 302-317. [Corps de Santé Colonial.]

Statistics are quoted to show the high frequency of primary cancer of the liver among native populations of tropical countries, from 22 to 51 per cent. of all cancers in India, Java and S. Africa, compared with its rarity in temperate countries, from 1 to 2.5 per cent. of all cancers in Europe and the United States, and also among white people living in the tropics. In America, the incidence of liver cancer is low in white and coloured people alike.

Among native Africans the disease affects men more often than women and is less frequent in urbanised communities than in those living a traditional African life.

No support was found for a theory connecting liver cancer with parasitic infestation. There is evidence that the malignant condition in the tropics is usually developed from a previous state of liver cirrhosis, a sequence which is rare in temperate countries. Research along these lines is considered to be most promising of useful results.

H. Chick.

2640

OKUSHI, I. Changes of the heart muscle due to chronic fluorosis. 1. Electrocardiogram and heart X-ray picture made in inhabitants of high-fluorine zone. *Shikoku Acta Med.*, 1954, 5, No. 3, 55-61. [Dept. Int. Med., Sch. Med., Univ. Tokushima.] Japanese summary.

Thirty-five persons, 25 children and 10 adults, were examined from a village where well water contained F, between 1.0 and 4.8 p.p.m., and 4 adults whose drinking water contained 6, 8.5, 8.5 and 13 p.p.m. Myocardial damage was detected electrocardiographically and cardiac dilatation by X-ray photography in a greater proportion of them than in other populations. It is suggested that the changes are due to the high intake of F and not, as considered by Okinaka (*Jap. Med. J.*, 1951, No. 1405, p. 3) to an endocrine disturbance.—D. Harvey.

2641

WALTERS, J. H. Uncommon endemic diseases of the Persian Gulf area. *Trans. Roy. Soc. Trop. Med. Hyg.*, 1954, 48, 385-394. [W. African Counc. Med. Res. Labs., Lagos, Nigeria.]

Nine persons showing skeletal fluorosis were seen, of whom 8 came from one area where water in the surface wells contained 8 p.p.m. F. In 4 of them who underwent full clinical examination neurological changes were found. It is suggested that the cause of these may have been toxic degeneration of sensory and pyramidal cells rather than compression of the spinal cord as was thought by Short *et al.* in similar studies (Abst. 5607, Vol. 7).—D. Harvey.

See also Absts. 2221, 2292, 2572, 2574, 2581, 2583, 2585.

DEFICIENCY DISEASES

General

2642

COHN, H., GOLDNER, M. G. and RABINER, A. M. Neurological manifestations in nutritional impairment. *Amer. J. Digest. Dis.*, 1954, 21, 281-286. [Dept. Med., Jewish Chronic Dis. Hosp., Brooklyn, N.Y.]

Nutritional neurological syndromes may resemble primary neurological disturbances. Three such cases are described. One simulated a localised spinal cord lesion, another multiple sclerosis and the third syringomyelia. A fourth case is described to illustrate the occurrence of severe nutrition impairment unaccompanied by neurological signs.—F. C. Aitken.

2643

ANT, M. The nutritional factor in depressive states. *Amer. J. Digest. Dis.*, 1954, 21, 261-266. [Brooklyn, N.Y.]

The role of nutritional deficiency in the etiology of psychosomatic disease is discussed. The beneficial effects are reported of treatment with a parenteral preparation of glutathione and enzymes of the respiratory cycle in 45 patients with neuroses, psychoses or borderline states.—F. C. Aitken.

2644

MACDOUGALL, L. G. Kwashiorkor syndrome in a 3-months-old African infant. *Brit. Med. J.*, 1954, ii, 1150. [Colonial Med. Serv., Kenya.]

A case report.

2645

DEAN, R. F. A. and SCHWARTZ, R. The effects of protein deficiency in young children. *Courrier Internat. Child. Centre*, 1954, 4, 293-316. [Med. Res. Counc. Group Res. Infantile Malnutrit., Mulago Hosp., Kampala, Uganda.] French and Spanish summaries.

A review with appendix giving methods of serum analysis used.

2646

FUHRMANN, G. Das Kwashiorkor-Syndrom. [The kwashiorkor syndrome.] *Ztschr. Tropenmed. Parasitol.*, 1954, 5, 362-375. [Bernhard Nocht-Inst. Schiffs Tropenkrankh., Hamburg.] English summary.

A comprehensive review.

2647

DE MAEYER, E. M. Traitement diététique du kwashiorkor. [Dietary treatment of kwashiorkor.] *Ann. Soc. belg. Méd. trop.*, 1954, 34, 139-154. [Inst. Recherche Sci. Afrique Centrale, Kivu, Lwiro, Belgian Congo.]

Full details are given of a dietary regime for hospital treatment of severe kwashiorkor. In the early stage, lasting 4 or 5 days, only milk reconstituted from dried skimmed milk was given. In the second stage, which followed when pancreatic enzyme activity was thought to have been sufficiently restored and which lasted for from 8 to 15 days, carbohydrate foods such as cooked rice, banana flour or fresh bananas were included. In

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the final stage, lasting at least a month, the diet was generous, providing about 150 Cal. per kg. bodyweight, and included whole milk, palm oil, sugar, meat and fish, with Fe and vitamin supplements.—H. Chick.

2648

WELBOURN, H. F. **Signs of malnutrition among Baganda children attending child welfare clinics.** *East African Med. J.*, 1954, **31**, 332-336. [Child Welfare Clins., Mengo District, Uganda.]

Among some hundreds of children, aged from 1 week to 3 years, attending a Kampala child welfare clinic definite signs of malnutrition were noticeable only in those older than 6 months, the onset coinciding generally with the time of weaning. In about one-half of the children the hair had in varying degree lost its tight curl and black colour. Soft golden-brown hair was seen in 10 cases of frank kwashiorkor. Oedema was always associated with other signs of the disease, but the characteristic skin changes were seen only in a few very severe cases. Dry or cracked skin was frequent and is attributed to deficiency of vitamin A. The apathetic and docile manner of most children is thought to be due often to kwashiorkor.

One case only of rickets was seen, in a boy 2 years old, who ate an unusual quantity of imported cereals including oatmeal, and whose mother went out daily to work and often left him indoors.

H. Chick.

2649

KIRK, J. E. **Blood and urine vitamin levels in the aged.** *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser. No. 9*, 1954, 73-94. [Sch. Med., Washington Univ., St. Louis, Mo.]

Vitamin A

2650

SEN, K. **Keratomalacia: causes, diagnosis, treatment and prevention.** *J. Indian Med. Assoc.*, 1954, **24**, 17-20. [Dept. Ophthalmic Surg., Calcutta Med. Coll.]

2651

AGARWAL, L. P. and ADHAULIA, H. N. **Role of vitamin A in the healing of corneal ulcers.** *Ophthalmologica*, 1954, **128**, 6-14. [Dept. Ophthalmol., Med. Coll., Agra.] German and French summaries.

Superficial wounds were made on the cornea of 3 rabbits, and deep wounds on the cornea of 3 others. To 2 in each group an intramuscular injection of 10,000 I.U. vitamin A was given daily till the wound had healed. Vitamin A in the blood rose in those given the vitamin. In superficial and deep wounds, respectively, healing occurred in 2 and 2, and in 4 and 6 days for the 4 given vitamin

A, and in 4 and 8 days for the 2 not given vitamin A. The scar left by the deeper wounds was less dense when vitamin A was given.

Human subjects with corneal ulcers were given the hospital routine treatment and in addition 32 were given 300,000 I.U. vitamin A by intramuscular injection on the first and third day in hospital, and after that 100,000 I.U. daily till the ulcer healed. Thirty others received routine treatment only. The mean healing time in days for those given and not given vitamin A, respectively, was for non-sloughing ulcers 8.5 (11 subjects) and 10.7 (4), for sloughing ulcers 15.7 (15) and 25.0 (20), and for hypopyon ulcers 15.8 (6) and 20.1 (6). The density of the scar was less with vitamin A. Vitamin A was estimated in the blood and was considered to be somewhat low in the patients with sloughing and hypopyon ulcers.

See Abst. 2683, Vol. 25.—E. M. Hume.

2652

RUSHTON, W. A. H. and CAMPBELL, F. W. **Measurement of rhodopsin in the living human eye.** *Nature*, 1954, **174**, 1096-1097. [Dept. Physiol., Univ. Cambridge.]

A photocell system was developed with which the sensitivity of scotopic vision in man was measured by finding the rate of bleaching of rhodopsin in light of different colours. Use of the apparatus permitted direct estimation of the level of rhodopsin under different conditions. Preliminary studies seemed to show that unless bright photopic illumination was used there was no appreciable change in the density of retinal rhodopsin. Changes in visual sensitivity could not thus be due to an alteration in the chance of a quantum being absorbed but rather to a change in the efficacy of the quantum when it was absorbed.

A. M. Copping.

2653

JAMES, W. H. and HOLLINGER, M. E. **The utilization of carotene. 2. From sweet potatoes by young human adults.** *J. Nutrition*, 1954, **54**, 65-74. [Dept. Agric. Chem., Louisiana Agric. Exp. Stat., Louisiana State Univ., Baton Rouge.]

Carotene was estimated by a colorimetric method after purification by chemical and chromatographic procedures, the latter involving filtration through Ca(OH)₂ in the faeces of 8 healthy subjects, 5 men and 3 women, aged from 18 to 28 years. During the first month of the experiment the subjects were given diets low in carotene and vitamin A but adequate in other respects. In the second month they were given similar diets supplemented daily with 60 g. sweet potato, which provided 3500 µg. carotene. Both periods were divided into three sub-periods of 9 days each when the subjects were given daily (1) 150 g. fresh meat

and 12 g. milk solids; (2) 150 g. fresh lean meat and 120 g. milk solids, and (3) 300 g. fresh lean meat without milk solids.

During each of the sub-periods when the depleting diets alone were eaten the faecal carotene was on the average about 2 μ g. per g. faeces. In the period with the supplement the amount of carotene found in the faeces during the last 6 days of sub-periods 1, 2 and 3 was, respectively, 55.9 ± 3.6 , 57.6 ± 2.3 and 48.9 ± 3.2 per cent. of the 6-day intake of carotene. The average percentage for the total of 216 subject-days was 53.8 ± 1.6 . It is suggested that the comparatively wide difference between the percentages for sub-periods 2 and 3 may depend on the different influence of the proteins supplied by the milk solids and by the lean meat. Such an explanation is supported by experiments on rats in which the protein was supplied by lactalbumin, casein or zein (Abst. 1713, Vol. 24).—I. M. Sharman.

2654

DITLESEN, E. M. L. and STØA, K. F. **Vitamin A and carotenoid levels in blood serum with special reference to values observed in diseases of the liver.** *Scand. J. Clin. Lab. Invest.*, 1954, 6, 210-216. [Biochem. Lab., University Hosp., Bergen.]

Vitamin A was estimated by the SbCl_3 reaction, and carotenoids by their yellow colour, in the blood serum of 228 normal and diseased human subjects. For 100 normal subjects the range in μ g. per 100 ml. was from 15 to 45 for vitamin A and from 50 to 200 for carotenoids. The averages for the 2 substances, respectively, were in men 29.6 and 91.5, and in women 25.9 and 102.5, and in both together 27.7 and 97. In 18 chronic alcoholics the average vitamin A value of 30.8 was about the same as for normal subjects, but the value of 57.8 for carotenoids was low. In 12 subjects with febrile diseases the average value for vitamin A was only 19.3 and for carotenoids only 59.4. In 13 patients with uraemia from several causes, mostly from chronic nephritis, the average value for carotenoids was about normal at 91.4, but that for vitamin A was very high at 65.9. In 6 patients with renal disease, but without uraemia, the averages were within the normal range, 98.3 and 27.5, respectively. In 14 patients with cirrhosis of the liver, the vitamin A value was always below 20, but that for carotenoids was normal. In contrast, the average for vitamin A was normal in 8 patients with obstructive jaundice, but that for carotenoids was low. In acute hepatitis both vitamin A and carotene were low. In 7 patients with cholecystitis and 7 with gallstones and no complication, the value for vitamin A was normal, but in cholecystitis that for carotenoids was low. The range for vitamin A in 16

patients with secondary carcinoma of the liver was wide, with limits of 5.1 and 42.3, but the average was low, only 17; the value for carotenoids also was low.—T. Moore.

2655

FORMAN, L. **Keratosis pilaris.** *Brit. J. Dermatol.*, 1954, 66, 279-282. [Guy's Hosp., London.] A brief review.

2656

GRANDBOIS, J. La vitamine "A" en solution alcoolique dans le psoriasis. [Vitamin A in alcoholic solution for psoriasis.] *Laval méd.*, 1954, 19, 740-752. [Serv. Dermatol., Hôtel Dieu, Quebec.]

Synthetic vitamin A palmitate was dissolved in 95 per cent. ethanol in an atmosphere of CO_2 to give a solution containing about 800,000 "units" per oz. Ten patients with psoriasis of from 5 to 30 years' standing were treated for from 1½ to 15 months with a teaspoonful (about 100,000 "units") of the solution taken orally. Protocols are given for all 10. In 5 the lesions disappeared almost completely, in 4 there was important improvement, and only in 1 was there none at all. Some of the patients had previously taken vitamin A in other forms with less benefit. On cessation of treatment there was a tendency to relapse.—E. M. Hume.

Vitamin D

2657

JUNG, W. Zur Frage der angeborenen Rachitis. [The question of congenital rickets.] *Monatsschr. Kinderheilk.*, 1954, 102, 379-383. [Kinderklinik., Univ. Mainz.]

The old controversy on the existence or non-existence of congenital rickets is reviewed.

Between November 1952 and May 1953, and in October to December 1953, 420 newborn infants born in the University Frauenklinik were examined for rickets. X-ray photographs were taken of both wrists with special precautions to obtain a position where the focus would be exactly adjusted. In 368 the edges at the distal ends of the metaphyses of the radius and ulna were perfectly sharp. In 52 children the ends of the metaphyses of the radius and ulna were not well defined and showed different degrees of irregularity and softness of outline. Reasons are put forward for attributing such appearances to faulty placing, leading to lack of correct focus at the crucial point, and not to rickets. The relation of congenital craniotabes to rickets is discussed. Craniotabes was no less frequent among 65 infants born in a private nursing-home than among infants of lower social status. The phosphatase values for newborn infants with and without craniotabes

did not differ. The difficulty is stressed of distinguishing between the earliest signs of rickets and the effect of bad position of the limbs in the X-ray photograph. Diagnosis of early rickets should be made only from a series of photographs.

E. M. Hume.

2658

PROUX, C. and HUMMEL, J. A. Rachitisme chez le nourrisson. [Rickets in the infant.] *Presse méd.*, 1954, **62**, No. 65, Atlas de radiologie clinique, pp. 4. [Paris.]

The Atlas forms a set of supplements on art paper; that to No. 65 contains 14 X-ray photographs, with diagrams and brief descriptions, from infants with rickets, scurvy, or non-nutritional disorders of bone which may be confused with them.—W. M. Deans.

2659

CATHALA, J. and HENNEQUET, A. Sur la prophylaxie du rachitisme par les laits vitaminisés. [Prevention of rickets by vitaminised milk.] *Presse méd.*, 1954, **62**, 1493-1496. [Paris.]

Official and high scientific opinion for and against adding vitamin D to milk is quoted. Experience abroad is reviewed, especially that of the United States and Germany. The condition of the milk supply in France and the attitude of authority to fortification are discussed. It is finally recommended that pasteurised, certified milk containing 400 "units" vitamin D per litre should be sold in sealed bottles, so labelled. No recommendation is made as to the mode of fortification.

E. M. Hume.

2660

PARK, E. A. Bone growth in health and disease. The influence of severe illness on rickets. *Arch. Dis. Childhood*, 1954, **29**, 269-281; 369-380. [Dept. Paediat., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

In the first Leonard Parsons inaugural lecture the effect of severe illness on the normal growth pattern of bone was considered on the basis of examinations of bones from more than 1500 children who died after illnesses varying widely in duration. The conclusions were that bone should not be thought of as an inert tissue nor as one in which growth proceeds at a uniform pace; rather its formation affected by the general state of health of the child and, after periods of stress, there may appear in the X-ray photograph lines of arrested growth of cartilage, and the growth retardation lattice which originates in the inability of osteoblasts to deal with cartilage as fast as it is produced.

In the second lecture the effect of illness on the osteoblasts and cartilage cells in the rachitic state is first considered. The importance of inanition as the concomitant of illness is discussed, and un-

published experiments with rats are cited in which rickets produced by a diet low in P and high in Ca was cured by starvation but not prevented by partial starvation. In the child evidence is adduced that severe illness promotes rickets by depressing the concentration of Ca and P in the blood, but that by retarding growth it acts in the opposite direction. On the whole, it is considered that the tendency to promote rickets is the stronger.—E. M. Hume.

2661

General softening of bone due to metabolic causes.

Brit. J. Radiol., 1954, **27**, 604-629.

Report of a symposium at the Annual Congress of the British Institute of Radiology, December 1953.

2662

HARRISON, H. E. Mechanisms of action of vitamin D. *Pediatrics*, 1954, **14**, 285-295. [4940 Eastern Ave., Baltimore 24, Md.]

The research work of the author and his wife is reviewed. The lack of antirachitic activity in resistant rickets of vitamin D at low dosage and its efficacy at high dosage, together with the inactivity of dihydrotachysterol in rickets in low dosage and its equivalence of action with vitamin D at high dosage are discussed, and it is suggested that for vitamin D the biochemical mechanism at high dosage is different from that with which the vitamin ordinarily operates, the normal mechanism being blocked in refractory rickets. In healing of refractory rickets the serum P value does not return to normal. The part played by renal tubular re-absorption of P is discussed, and studies on the behaviour of serum citrate in relation to vitamin D are summarised. It is considered possible that the serum citrate concentration is related to the activity of those metabolic processes in the skeleton which actively destroy bone matter and dissolve bone salts. The abnormal urinary loss of amino-acids in rickets is regarded as further evidence that defect of specific renal tubular functions results from lack of vitamin D.

Acetazolesamide and maleic acid are both substances which interfere with tubular re-absorption. Maleic acid is isomeric with fumaric acid which forms one of the steps in the tricarboxylic acid cycle of Krebs. The effect of injecting Na maleate intraperitoneally (see following Abst.) is discussed. As interpretation of the failure of vitamin D to counteract the effect of maleate, it is suggested that vitamin D does not directly affect the mechanism of the renal tubules for re-absorption of P, or that maleate inhibits the functioning of some system without which vitamin D cannot exert its influence on tubular re-absorption.

E. M. Hume.

2663

HARRISON, H. E. and HARRISON, H. C. **Experimental production of renal glycosuria, phosphaturia, and aminoaciduria by injection of maleic acid.** *Science*, 1954, **120**, 606-608. [Dept. Paediat., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

Citrate, P, Ca and amino-acids were estimated in the urine of 18 rats, 6 weeks old, maintained for 3 weeks on a rachitogenic diet high in Ca and low in P, before and during 3 days on which a daily subperitoneal injection of 1 or 2 ml. 0.1 M Na maleate was given. Ca and citrate were greatly diminished, but P and amino-acids were greatly increased; glucose appeared in the urine. The effect soon began to diminish but could be elicited again after a pause in maleate administration. Control [nature of control not stated] rats showed no such effect.

It was thought most probable that the increased losses in the urine resulted from failure of tubular re-absorption, since there was no rise in the plasma values. Three rats were given 20,000 "units" of vitamin D 3 days before the beginning of the maleate injection but no change resulted in the response to maleate injection.

It is pointed out that the occurrence of renal glycosuria, phosphaturia and amino-aciduria is characteristic of the congenital metabolic defect in man which is called Fanconi syndrome and is resistant to vitamin D.—E. M. Hume.

2664

BOHNCKE, H., LASSRICH, A., KRAUSFE, C. and MEYER, W. **Marmorknochenkrankheit mit "Rachitis" und Aminoacidurie.** [Marble bone disease with "rickets" and presence of amino-acids in the urine.] *Ztschr. Kinderheilk.*, 1954, **75**, 365-391. [Kinderkrankenhaus Hochallee, Hamburg.]

Three children, 2 from one family, with marble bone disease are described. All failed to thrive and died in infancy. The disease is essentially an osteosclerosis. Though changes like those of rickets may be present in the skeleton and there may be loss of amino-acids in the urine, it is considered improbable that deficiency of vitamin D has any part in the etiology.—E. M. Hume.

2665

ROBINSON, K. C., KALLBERG, M. H. and CROWLEY, M. F. **Idiopathic hypoparathyroidism presenting as dementia.** *Brit. Med. J.*, 1954, **ii**, 1203-1206. [Whittington Hosp., London, N.19.]

Idiopathic hypoparathyroidism is a rare condition. The patient under consideration was admitted to hospital at the age of 61 with a vague history going back for 7 years. She was disorientated

and apathetic, and subject to epileptiform seizures and attacks of tetany. The serum Ca value was 6.3 mg. per 100 ml. An X-ray picture of the skull showed calcification of the basal ganglia which frequently occurs in hypoparathyroidism. Successful treatment was by daily oral administration of 5 ml. dihydrotachysterol (A.T. 10) and 4 g. Ca lactate. Clinical improvement was rapid and a maintenance dose of 50,000 "units" calciferol was substituted after about a month. The rise of serum Ca was slow. The patient was discharged after a total of about 2 months, on the daily maintenance dose of calciferol and 4 g. Ca lactate.

E. M. Hume.

2666

ANDERSON, J., DENT, C. E., HARPER, C. and PHILIPOT, G. R. **Effect of cortisone on calcium metabolism in sarcoidosis with hypercalcaemia. Possibly antagonistic actions of cortisone and vitamin D.** *Lancet*, 1954, **267**, 720-724. [Med. Unit, University Coll. Hosp., London.]

Ca balance studies were made on 4 patients with Boeck's sarcoidosis in whom abnormally high values for plasma Ca had been recorded, which easily became still higher if vitamin D was given. Treatment with cortisone caused the plasma Ca to fall even when vitamin D was being given, and the patients felt much better, all having suffered from typical clinical manifestations of high blood Ca. The Ca balance studies showed that faecal Ca was abnormally low and urinary Ca high. Administration of cortisone increased Ca in the faeces, presumably by decreasing absorption.

E. M. Hume.

Vitamin E

2667

BECKMANN, R. and KUHLMANN, F. **Die Bedeutung des Vitamins E (Tocopherol) für den Bewegungs- und Stützapparat. [Importance of vitamin E (tocopherol) for the motor and supporting systems.]** *Münch. med. Wochenschr.*, 1954, **96**, 970-973. [Evangelisches Krankenhaus, Essen-Werden.]

The paper reviews the function of vitamin E in relation to the endocrine system, the neuromuscular system, the vascular system, and the connective tissue. The vitamin E content of the blood serum is discussed with reference to the occurrence of muscular and other disorders which may be due to deficiency of the vitamin.

A. M. Copping.

2668

WALTON, J. N. and NATTRASS, F. J. **On the classification, natural history and treatment of the myopathies.** *Brain*, 1954, **77**, 169-231. [Dept. Med., King's Coll., Univ. Durham.]

A series of 105 cases came under the personal examination of the authors; 84 had pure muscular

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dystrophy affecting different parts of the body. The remaining 21 exhibited the myotonic syndrome. The clinical features and natural history of the cases are described and discussed, and the cases are classified into 3 broad groups, the Duchenne, the facioscapulohumeral and the limb-girdle type, with further sub-groups.

Groups of about 20 patients, each group providing a representative sample of the different types, were treated 3 times daily with tablets or capsules of 50 mg. synthetic α -tocopherol as Ephynal (Roche), or 3 mg. natural tocopherols as wheat germ oil (Crookes), or 50 mg. of a mixture of α -, β - and γ -tocopherols as Tocopherex (Squibb), or 100 mg. nicotinamide (B.D.H.) or dummy tablets. Treatment was continued for 6 months. Results are presented for 98 patients. None showed any objective improvement; subjective improvement was reported by a few in each group, 18 in all, including 3 of those given dummy tablets.—E. M. Hume.

2669

LEWIS, L. A., QUATRE, M. L. and PAGE, I. H. Lipoproteins of serum, carriers of tocopherol. *Amer. J. Physiol.*, 1954, **178**, 221-222. [Res. Div., Cleveland Clin. Found., Ohio.]

The β -lipoproteins and low-density lipids of serum were concentrated with the ultracentrifuge at a density of 1.063 and the α + β -lipoproteins at a density of 1.21. In the whole serum of 12 normal human subjects α -tocopherol, and the β -lipoprotein and α + β -lipoprotein fractions were estimated. The average serum tocopherol value in mg. per 100 ml. was 1.47, of which 74 per cent. was carried in the α + β -lipoprotein fraction and 20 per cent. in the β -fraction. The mean serum tocopherol values of 4 patients who had been given 400 mg. tocopherol daily for 3 days rose to 2.18 from 1.04. After the short period of high intake only 60 per cent. of the tocopherol was concentrated in the lipoprotein fractions, compared with 80 per cent. before the treatment. The lipoproteins were divided into β_1 and low-density lipids, α_1 and α_2 fractions. When expressed as μ g. tocopherol per mg. lipoprotein the concentration in the α_2 -lipoprotein was about 10 times that in the β or α_1 fraction.—R. J. Ward.

2670

PROSPERI, P. and BORSELLI, L. Valori del tempo di ricalificazione e del tempo di protrombina dopo somministrazione frazionata ed unica di vitamina E. [Values for the clotting time of recalcified plasma and the prothrombin time after administration of vitamin E in several doses or in one.] *Riv. Clin. pediat.*, 1954, **53**, 73-81. [Clin. Pediat., Univ. Florence.] French and English summaries.

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In order to ascertain the point of participation by vitamin E in the coagulation process, a study was made of the clotting time of recalcified plasma, or time of Howell, which is thought to measure thrombokinase activity. In 35 children aged from 2 to 16 years and in one of the authors, the prothrombin time (Quick) and time of Howell were estimated before the first, and in the first 4 groups of children 2 hr. after the last, dose of vitamin E. The vitamin was given orally to 10 children in 6 doses of 50 mg. at 2-hr. intervals, to 10 children in 3 doses of 100 mg. at 4-hr. intervals, to 5 children in 2 doses of 150 mg. with a 4-hr. interval, and by suppository to 5 children in 2 doses of 150 mg. with a 4-hr. interval. For the remaining 6 children a single dose of 300 mg. was given by mouth or by intravenous or intramuscular injection, and the tests were made 1, 2 and 3 hr. later.

It is stated that in all the children except 2, the time of Howell was reduced after administration of vitamin E in any of the different ways, but that for the prothrombin time there was no consistent result.

It is, therefore, concluded that vitamin E activates thrombokinase.—E. M. Hume.

2671

PROSPERI, P. and DELL'ORSO, S. La vitamina E nella profilassi delle emorragie dei neonati. [Vitamin E in prevention of haemorrhage in the newborn.] *Riv. Clin. pediat.*, 1953, **52**, 501-511. [Clin. Pediat., Univ. Florence.] French and English summaries.

Thirty-two women in the period up to 12 hr. before parturition were given a total of 500 mg. vitamin E, variously distributed, by intravenous and intramuscular injection or by mouth. Coagulation time, bleeding time and time of Howell were estimated before and after treatment, before parturition.

After treatment coagulation time was reduced in 19 women, unchanged in 11 and increased in 2; bleeding time was reduced in 16, unchanged in 13 and increased in 3; time of Howell was reduced in 23, unchanged in 8 and increased in 1. None of the infants showed any haemorrhagic sign and for the cord blood the time of Howell was almost always considerably less than in the mother.

E. M. Hume.

2672

NEUWEILER, W. and HÄMMERLI, U. Bemerkungen über die Vitamin-E-Resorption. [Absorption of vitamin E.] *Schweiz. med. Wochenschr.*, 1954, **84**, 884-885. [Frauenklin., Univ. Berne.] French and English summaries.

By mouth vitamin E was given as *dl*- α -tocopheryl acetate but, since the ester cannot be split

in the blood, it was given by intramuscular injection as *dl*- α -tocopherol. When the vitamin was given parenterally to non-pregnant women in a dose of from 600 to 1200 mg. the mean vitamin E content of the blood, in mg. per cent., rose from 356 to 1120, and when it was given by mouth, from 365 to 2113. In pregnant women the same greater effectiveness of oral administration was seen in the blood of the mother, and was reflected in the arterial and venous blood from the umbilical cord and in blood from the placenta. Oral administration has the further advantages that the ester is stable while the alcohol is less so, and irritation at the site of injection is avoided.—E. M. Hume.

2673

DE HOFF, J. B. and OZAZEWSKI, J. **Alpha tocopherol to treat diabetic retinopathy.** *Amer. J. Ophthalmol.*, 1954, **37**, 581-582. [Dept. Med. Ophthalmol., Med. Sch., Univ. Maryland.]

Twelve patients with long-standing, stabilised diabetes and retinopathy were given 3 times a day 200 mg. α -tocopheryl acetate for 2 months, and then 100 mg. After 15 months' treatment there was no increase in visual acuity and no change in the fundus lesions.—E. M. Hume.

Vitamin B Complex

2674

ONUMA, Y. [Survey of disposition towards beriberi among personnel of 11th Ship Division.] *Jap. Safety Forces Med. J.*, 1954, **1**, No. 8, 23-26. In Japanese : English summary.

Reports during part of 1954 of 4 men with beriberi prompted a survey; 10 men from each of 6 ships were examined and a questionnaire was circulated. [The total population is not stated.]

Five more actual cases and 50 men considered likely to develop the disease were discovered. Its appearance seemed to be more frequent among subjects who had had a debilitating disease such as pulmonary tuberculosis. The crowding and poor ventilation on ships is suggested as a contributory cause in addition to dietary deficiency. (From summary.)—D. Harvey.

2675

PALLISTER, R. A. **The electrocardiogram in oriental beriberi.** *Trans. Roy. Soc. Trop. Med. Hyg.*, 1954, **48**, 490-494. [Gen. Hosp., Penang, Malaya.]

A description is given of 25 cases of beriberi studied in Penang during the last 5 years. The cases had occurred sporadically and been relatively infrequent; they included one Malay, 15 Indian, and 9 Chinese patients. Diagnosis was made from the association of peripheral neuritis with heart failure, and from the rapid recovery on

treatment with vitamin B₁. Treatment included rest in bed, normal ward diet, injection of from 10 to 20 mg. vitamin B₁ daily, and a small amount of vitamin B complex, given by mouth.

In the acute cases the heart rate, with one exception, was over 100 per min.; slow rates were usual during recovery. In 16 of the patients the electrocardiogram was abnormal, and usually characterised by inversion of the T wave and prolongation of the QT interval. The electrocardiogram, which returned to normal in less than 6 weeks of treatment, was not considered to be specific but of help in diagnosis. The changes are similar to those described for cardiac beriberi in Europe or America, where it is commonly associated with alcoholism.—H. Chick.

2676

LANGERON, L. **Le bérubéri cardiaque d'origine alcoolique. Sa place dans l'insuffisance cardiaque d'origine alcoolique. A propos d'une observation. [Cardiac beriberi of alcoholic origin: its place in cardiac insufficiency of alcoholic origin. An observation.]** *Presse méd.*, 1954, **62**, 1385-1386. [Lille.]

In support of his belief that some cardiac insufficiency in alcoholics is caused by beriberi of alcoholic origin, the author presents a case of a young man of 26 with massive oedema of cardiac origin, shortness of breath and loss of reflexes in the legs. He drank daily 7 or 8 litres of beer. The only treatment was with 200 mg. vitamin B₁ daily given intravenously for 15 days with 100 mg. more given by mouth for the last 10 days. The effect was dramatic. The amount of urine passed rose to 5 litres daily and the patient lost 16 kg. in weight. Oedema and dyspnoea vanished, but the reflexes did not return. It is suggested that the condition may be at first reversible, but may later become chronic and resistant to vitamin B₁ as is more often found.—E. M. Hume.

2677

WOHL, M. G., BRODY, M., SHUMAN, C. R., TURNER, R. and BRODY, J. **Thiamine and cocarboxylase concentration in heart, liver, and kidney, of patients with heart failure.** *J. Clin. Invest.*, 1954, **33**, 1580-1586. [Nutrit. Project., Gen. Hosp., Philadelphia, Pa.]

Vitamin B₁ and cocarboxylase were estimated by the colorimetric method of Hochberg and Melnick (Abst. 3137, Vol. 14) in tissues from 12 subjects who had died of heart failure and from 10 without evidence of cardiac disease. Significantly lower values for vitamin B₁ and cocarboxylase were found in the heart and for vitamin B₁ in the liver from cardiac patients. In all tissues examined the values for vitamin B₁ and cocarboxylase

were lower for cardiac than for other subjects, but the differences were not significant for coarboxylase in the liver or for either substance in the kidneys.—A. M. Copping.

2678

JOHNSTON, M. The treatment of alcoholics in an outpatient clinic with adrenal cortex hormones and vitamin B₁. *Quart. J. Studies Alcohol*, 1954, 15, 238-245. [Adult Guidance Centre, Dept. Pub. Health, San Francisco.]

In 3 groups, 300 outpatients seeking treatment for alcoholism were given from 10 to 12 intramuscular injections of 50 mg. vitamin B₁, or of Lipo-Adrenal Cortex or of cottonseed oil. They had taken no alcohol for 3 days before treatment began. As criteria the rates of improvement of sleep, tension, shakiness, sweating, weakness, headache, nausea and eating were recorded. All signs had disappeared within 8 days. The differences between the groups were not significant, and it was considered that the giving of the injections, with sympathetic interest, had contributed to the result.—E. M. Hume.

2679

LARIZZA, P., SUARDI, L. and GOBBI, F. Influenza della coarboxilasi sull'escrezione urinaria dei 17-chetosteroidi, degli 11-ossi- ed 11-desossicorticoidi. *Ricerche in soggetti normali. [Influence of coarboxylase on the urinary excretion of 17-ketosteroids, 11-oxo- and 11-deoxycorticoids. Studies on normal subjects.] Acta vitaminol.*, 1954, 8, 214-225. [Ist. Clin. Med. Gen., Univ. Pavia.] French, English, German and Spanish summaries.

Corticosteroids were estimated in the 24-hr. urine of human subjects after one or more intravenous injections of 50 mg. coarboxylase. After a single injection the amount of 17-ketosteroids rose in 12 out of 20 normal subjects; the amount of 11-deoxycorticoids rose in 13 out of 20, and the amount of 11-oxycorticoids in 15 out of 20. When the same dose was given daily for 5 days, the tendency of the excreted steroids to increase was accentuated, at least temporarily. The increase was most marked with the 11-oxycorticoids. The results are considered to provide some evidence that the beneficial effects on asthma reported with coarboxylase are due to its action on the adrenal cortex.—E. M. Hume.

2680

JAMPOLER, I. and DESPERAK-SECOMSKA, B. Przyzwajalność u człowieka tiaminy i ryboflawiny z drożdży żywych i zabitych. [The availability for human beings of vitamin B₁ and riboflavin in living and killed yeast.] *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 247-268. [Dział

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Hig. Żywnienia PZH.] Russian and English summaries.

Five healthy adults were given a controlled diet with from 100 to 150 g. yeast daily. Yeast was killed by boiling for 1 min. Urinary and faecal excretion of vitamin B₁ and riboflavin was measured daily.

With killed yeast both the vitamins were quantitatively absorbed and did not appear in the faeces. With live yeast riboflavin was absorbed to a very small extent. Vitamin B₁ was found in the faeces in amounts that suggested that live yeast depletes the body of the vitamin. It was estimated that the daily ingestion of 100 g. live yeast for 3 or 4 days has the same effect as reducing the intake of vitamin B₁ by 25 per cent. (From summary.)—T. D. Bell.

2681

ŠNAJDER, K. Narodna shvatanja o prirodi pelagre. [The popular conception of the nature of pellagra.] *Zborn. Rad., Srpska Akad. Nauka*, 1954, 28 (Inst. Nutrit., No. 2), pp. 19. [Inst. Nutrit., Serb. Acad. Sci., Belgrade.] French summary.

The notions are those of the people of Kosovo-Metohija in Serbia. Pellagra is considered by them to be a simple deficiency disease arising primarily from restricted diet, especially with maize bread. The tendency is to treat the disease by adding to the diet foods known to have high nutritive value such as milk or meat. Use of tobacco is thought to be curative; for the skin condition ointments and fats are in common use. (From summary.)—D. Harvey.

2682

BORIĆ, D. Oplemenjivanje kukuruznog brašna u profilaksi pelagre. [Enrichment of maize flour in the prevention of pellagra.] *Zborn. Rad., Srpska Akad. Nauka*, 1954, 28 (Inst. Nutrit., No. 2), pp. 25. [Inst. Nutrit., Serb. Acad. Sci., Belgrade.] English summary.

Late in 1952 enrichment of whole maize meal with vitamin B₁, Fe, nicotinic acid, riboflavin and Ca was begun in Kosovo-Metohija, where the incidence of pellagra was known to be high. Of 5811 persons examined between 1949 and 1953, 831 adults and 730 children under 14 years of age were found to be affected. In April 1953, 309 of them were questioned, and 132 were making constant, 53 only intermittent, and 124 no, use of the enriched meal. Of the continuous users 32 were in the acute stage, 77 had passed it and 23 were, at the time, without signs whereas in previous spring seasons they had regularly had the disease. Of the intermittent users 30 were in the acute stage, 21 had passed it and 2 were seriously ill; none had escaped. For those making no use of the

enriched flour corresponding numbers were 81, 26 and 17 and again none had escaped. The value of flour enrichment is taken to have been proved even over the short period for which it had been practised. See also Abst. 2332, Vol. 24. (From summary.)—D. Harvey.

2683

AGARWAL, L. P. and DATT, K. **Role of nicotinic acid in healing of corneal ulcers.** *Amer. J. Ophthalmol.*, 1954, **37**, 764-767. [Dept. Ophthalmol., Med. Coll., Agra, India.]

Incisions were made in the cornea of rabbits, superficial in 3, and deep in 3. All the rabbits received a diet adequate in nicotinic acid, and 2 in each group received in addition 50 mg. nicotinic acid daily till the wounds healed. For the rabbits given and not given nicotinic acid, respectively, the healing of superficial wounds was complete in 3 and 5 days, and of severe wounds in 4 or 5 and 7 days. Scarring was less severe in those given nicotinic acid.

Of 57 patients with corneal ulcers given routine treatment, 20 had no other treatment, 20 had a daily intramuscular injection of 50 mg. nicotinic acid, and 17 received 25 mg. nicotinic acid subconjunctivally on alternate days. Results are reported separately for superficial and deep ulcers. For the former the average healing time in days, with range in brackets, was for untreated 9.9 (7 to 16), treated systemically 7.7 (3 to 14), treated subconjunctivally 5.4 (2 to 7). For the deep ulcers the values were for untreated 23.7 (12 to 39), treated systemically 19.9 (11 to 26), treated subconjunctivally 10 (4 to 15). Scar formation was reduced with nicotinic acid.

No significant change or deviation from the normal was observed in the blood value for nicotinic acid. See Abst. 2661, Vol. 25.—E. M. Hume.

2684

TRAVIA, L. **Significato biologico e clinico del rapporto lattoflavina libera: lattoflavina fosforilata nelle urine.** [Biological and clinical significance of the ratio of free riboflavin to riboflavin phosphate in the urine.] *Quad. Nutrizione*, 1953, **13**, 36-51. [Ist. Clin. Med. Gen., Univ. Rome.]

The author discusses his own and other work, and reaches certain conclusions. In the urine of normal human subjects riboflavin is present largely in the phosphorylated form when first secreted but, within the bladder or on standing after being passed, the proportion esterified steadily diminishes under the influence of a hydrolysing enzyme. The proportion phosphorylated is less if glucose has been given by mouth or riboflavin by intramuscular injection. In cirrhosis of the liver, experimental

hyperthyroidism and Graves' disease, and diabetes the proportion of free riboflavin is much larger.

E. M. Hume.

2685

ALBEGGIANI, A. **Reperti istologici ottenuti mediante biopsia-puntato del fegato in bambini affetti da malattie carenziali con particolare riguardo alla malattia da carenza di riboflavina.** [Histological results of liver biopsy in children with deficiency diseases, particularly with riboflavin deficiency.] *Pediatrica*, 1954, **62**, 175-208. [Clin. Pediat., Univ. Palermo.] French, English, Spanish and German summaries.

Histological examination was made of material from liver biopsies of 17 children aged from 3 to 24 months, and one of 7 years. Ten had clear signs of riboflavin deficiency; the remainder had less clear signs, with signs of other deficiencies, and with other diseases, niliary tuberculosis, pernicious anaemia of infantile type, severe protein deficiency, coeliac disease and sepsis. All individual case histories are given.

Every liver specimen showed fatty infiltration of varying degrees of severity. The primary conducting cause seemed to be diarrhoea, for the treatment of which aureomycin was the most satisfactory drug.—E. M. Hume.

2686

BEAN, W. B. and HODGES, R. E. **Pantothenic acid deficiency induced in human subjects.** *Proc. Soc. Exp. Biol. Med.*, 1954, **86**, 693-698. [Dept. Int. Med., State Univ. Iowa, Iowa City.]

Signs of pantothenic acid deficiency produced in 4 healthy young men by a purified basal diet lacking pantothenic acid and containing the antagonist, ω -methylpantothenic acid, included peripheral neuropathies such as paraesthesias, vertigo and burning feet, and biochemical abnormalities related to disturbances of adrenal cortical function. The symptoms were not immediately relieved by pantothenic acid alone, but consumption of a good mixed diet and a multiple vitamin mixture allowed complete recovery.

A. M. Copping.

2687

MAINARDI, L. **Acido pantotenico ed atonia intestinale.** [Pantothenic acid and intestinal lack of tone.] *Acta vitaminol.*, 1954, **8**, 226-230. [Lab. Direzione Med. Cent., Lepetit S.p.A., Milan.] French, English, German and Spanish summaries.

The subject is reviewed and, in connection with it, the pharmacological properties of pantothenic acid are discussed.—E. M. Hume.

2688

PETROCINI, S. and DEBERNARDI, P. La biotina nel trattamento dell'eritrodermia desquamativa e della dermatite seborroica. [Biotin in treatment of erythrodermia desquamativa and seborrhoeic dermatitis.] *Lattante*, 1954, **25**, 360-366. [Sez. Pediat., Osp. Infermi, Biella.] English summary.

The literature is reviewed and the results are tabulated for 66 infants treated by other workers for erythrodermia desquamativa and kindred conditions with biotin.

Treatment with biotin was given orally in daily doses of 10 mg., or by intramuscular injection in daily doses of 5 mg., for from 6 to 30 days to 7 infants with erythrodermia desquamativa, 5 with seborrhoeic dermatitis and 3 with exudative diathesis. Almost all were breast fed. There was cure or very great improvement with erythrodermia desquamativa and seborrhoeic dermatitis but none with exudative diathesis.—E. M. Hume.

2689

NEUWEILER, W. Über die Versorgungslage und den Bedarf an Vitamin B₆ bei Graviden. [Provision and requirement of vitamin B₆ for pregnant women.] *Schweiz. med. Wochenschr.*, 1954, **84**, 883-884. [Frauenklin., Univ. Berne.] French and English summaries.

For 43 non-pregnant women and for 35 women in the 8th to 10th month of pregnancy, 4-pyridoxic acid was estimated chemically in the urine passed in the 24 hr. after oral administration of 40 mg. pyridoxine. The mean value in mg. was for the non-pregnant women 8.32 with range from 1.0 to 18.2, and for the pregnant women 5.53 with range 0.5 to 10.0.—E. M. Hume.

2690

MAY, C. D. Vitamin B₆ in human nutrition: a critique and an object lesson. *Pediatrics*, 1954, **14**, 269-279. [Dept. Paediat., Coll. Med., State Univ., Iowa.]

Two recent reports of convulsions in infants due to vitamin B₆ deficiency (Absts. 3646, 3647, Vol. 24) are discussed critically with a review of the experimental findings in vitamin B₆ deficiency and consideration of conditions contributing to the development of deficiency in early infancy. Modifications and improvements in the manufacture of the proprietary food with which the signs of deficiency developed are suggested as the possible cause of the inadequate synthesis in the intestine, or the faulty absorption, or the increased requirement, which led to the state of deficiency. The importance of fully investigating all "idiopathic" seizures in infants is stressed.—A. M. Copping.

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2691

VILTER, R. W., BIEHL, J. P., MUELLER, J. F. and FRIEDMAN, B. I. Symposium on basic and applied studies of the newer B-complex factors. Some abnormalities of vitamin B₆ metabolism in human beings. *Federation Proc.*, 1954, **13**, 776-779. [Dept. Int. Med., Coll. Med., Univ. Cincinnati, Ohio.]

2692

QUAGLIARIELLO, G. Vitamine antianemiche. [Anti-anaemic vitamins.] *Quad. Nutrizione*, 1952, **12**, 465-474. [Univ. Naples.] A review.

2693

MURPHY, M. L., ELLISON, R. R., KARNOFSKY, D. A. and BURCHENAL, J. H. Clinical effects of the dichloro and monochlorophenyl analogues of diaminopyrimidine: antagonists of folic acid. *J. Clin. Invest.*, 1954, **33**, 1388-1396. [Chemotherap. Serv., Mem. Centre, New York.]

Some substituted diaminopyrimidines had an antagonistic effect towards folic acid as measured by the growth of *Lactobacillus casei*; pharmacological and clinical tests were, therefore, made on 2:4-diamino-5-(3':4'-dichlorophenyl)-6-methylpyrimidine and on 2:4-diamino-5-*p*-chlorophenyl-6-ethylpyrimidine. Adequate trials of the first compound were made on 34 patients with leucaemia or other malignant disease. Haematological improvement occurred in 3 children with leucaemia, but there was no other therapeutic benefit, and the drug was highly toxic. Its toxic effects were more prolonged than those of A-methopterin. In 2 patients very large doses of leucovorin were protective against the toxic effects. The monochloro-derivative, an antimalarial drug, produced toxic effects when given in very large doses. The possible action of the substituted pyrimidines in folic acid metabolism or in inhibiting the formation of citrovorum factor is discussed.

A. M. Copping.

2694

BURCHENAL, J. H. Symposium on basic and applied studies of the newer B-complex factors. Clinical effects of analogs of folic acid, purines, pyrimidines, and amino acids. *Federation Proc.*, 1954, **13**, 760-768. [Chemotherap. Serv., Mem. Centre, New York.]

2695

ROESEN, E. and OHLSEN, A. S. Achrestic anemia. Completely refractory megaloblastic anemia. A case followed for nearly four years. *Acta med. scand.*, 1954, **150**, 17-32. [Med. Dept., Cent. Hosp., Silkeborg, Denmark.]

The patient was studied for 4 years while being kept alive by repeated blood transfusions. The megaloblastic anaemia failed to respond to folic acid, vitamin B₁₂, several types of liver preparation, ascorbic acid, yeast, tyrosine, *p*-aminobenzoic acid and many other therapeutic measures.

D. Duncan.

2696

SCOTT, J. M. Therapy in the megaloblastic anaemias of pregnancy. *J. Obstet. Gynaecol. Brit. Empire*, 1954, **61**, 646-651. [Res. Dept., Royal Maternity Hosp., Glasgow.]

Most of the 37 women treated had red cell counts between 1.5 and 2 million. Vitamin B₁₂ gave a poor response in 5 women treated before and 3 treated after delivery, though 5 women (outside the series) with pernicious anaemia continued to be maintained by their vitamin B₁₂ treatment throughout pregnancy.

Crude liver preparations given by injection gave a good response with 5 out of 9 women before and 5 out of 7 after delivery. The patients resistant to liver or vitamin B₁₂, and others given no other treatment, responded well to folic acid. Many other patients required Fe also.

It is concluded that folic acid is the most suitable for treatment in megaloblastic anaemia of pregnancy and that a disturbance of folic acid utilisation and not a primary dietary deficiency was the cause of the condition.—D. Duncan.

2697

FERNANDES, J. J. Contribuição para o estudo de anemias na mulher Goesa durante a gravidez. [Anaemias of Goanese women during pregnancy.] *Arg. Escola Méd.-Cirurg. Goa*, 1953, Ser. A, No. 26, 39-71. [Centro Hematol. Hemoterap., Goa.]

Of 100 Goanese women on whom blood studies were made, 55 showed anaemia between the sixth and ninth month of pregnancy. The highest incidence was in the seventh month. Normocytic anaemia occurred in 14.5 per cent. cases, microcytic anaemia in 67.2 per cent. and macrocytic in 18.1, all of the last being hypochromic except for one case of macrocytic normochromic anaemia. In some the cause of anaemia was infections or parasites but in many it was dietary deficiency. The diet was generally poor and based on rice.

A. M. Copping.

2698

NIEWEG, H. O., FABER, J. G., DE VRIES, J. A. and STENFERT KROESE, W. F. The relationship of vitamin B₁₂ and folic acid in megaloblastic anaemias. *J. Lab. Clin. Med.*, 1954, **44**, 118-132. [Dept. Int. Med., State Univ. Groningen.]

Vitamin B₁₂ in blood serum was estimated with *Lactobacillus leichmannii* A.T.C.C. 7830, Strain 313 in the basal medium of Skeggs *et al.* (Abst. 1820, Vol. 20). Five different methods of treating the samples of serum were compared on 4 specimens of human serum. Folic acid was estimated with *Streptococcus faecalis* by the method of Tely and Elvehjem (Abst. 355, Vol. 15).

For 36 normal persons the values in μg . total vitamin B₁₂ per ml. ranged from 0.3 to 1.05, and for 17 patients with pernicious anaemia in relapse from 0.005 to 0.175; in other megaloblastic anaemias responding to vitamin B₁₂, serum values were low. In patients with megaloblastic anaemia resistant to vitamin B₁₂ the values were normal or even high.

The folic acid values in the blood of 43 normal persons ranged from 2.9 to 24.1 μg . per ml., with average 8.05. In 4 patients with sprue and in one with megaloblastic anaemia of pregnancy the folic acid value was low; these patients responded to folic acid but not to vitamin B₁₂. In 16 patients with pernicious anaemia in relapse, values for folic acid were normal in about half and low in the rest. In 7 untreated patients with pernicious anaemia, a single large injection of vitamin B₁₂ was followed at first by a fall in the concentration of folic acid in the blood, but, if observation was continued beyond 73 hr., an increase always occurred. Some results are given also for 14 patients with megaloblastic anaemia arising from nutritional causes and in pregnancy and from sprue; some of them responded to the one factor and some to the other.

In order to ascertain whether a patient is in need of vitamin B₁₂ or folic acid, estimation of vitamin B₁₂ in the blood is recommended. If the value is low, the vitamin should be given; if it is not low, folic acid should be given. The part played by the two substances in metabolism is discussed at some length. The authors are inclined at present to favour the view that vitamin B₁₂ and folic acid interact in the tissues as co-enzymes at different stages of nucleic acid synthesis, and that vitamin B₁₂, in addition, influences in some way the storage or intake of folic acid.

E. M. Hume.

2699

HORÁNYI, M. and ZÁDORY, E. Über den Nachweis des intrinsic factor und die Pathogenese der Anaemia perniciosa. [The intrinsic factor and pathogenesis of pernicious anaemia.] *Folia haematol.*, 1954, **72**, 297-310. [1. Int. Klin. Med., Univ. Budapest.] English, French and Russian summaries.

An account is given of 3 patients with severe megaloblastic, macrocytic anaemia, who had free gastric HCl. They responded well to injection of

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liver extract. The gastric juice was tested for intrinsic factor by withdrawing from 80 to 100 ml. daily for 8 days from each patient and giving it to an untreated patient with pernicious anaemia at the same time as 100 g. minced meat. There was no reticulocyte response to the gastric juice of 2 of the patients and only a very small one to that of the third. The patients with pernicious anaemia who failed to respond subsequently responded fully to gastric juice from normal persons. Full case histories of the 3 patients are given. All had had much illness but no common predisposing factor could be recognised.—E. M. Hume.

2700

GIRDWOOD, R. H. Rapid estimation of the serum vitamin B₁₂ level by a microbiological method. *Brit. Med. J.*, 1954, ii, 954-956. [Dept. Med., Univ. Edinburgh.]

Growth of *Lactobacillus leichmannii*, measured by turbidity after incubation for 16 hr., was used to estimate vitamin B₁₂ in the blood serum of 36 patients with pernicious anaemia in relapse, 24 patients with other megaloblastic anaemias, 55 subjects with no anaemia, and 20 patients under treatment for pernicious anaemia. In pernicious anaemia patients values below 130 $\mu\mu\text{g.}$ per ml. were found unless treatment was in progress. In all others examined only 6 subjects had values as low as 130 $\mu\mu\text{g.}$ per ml. The test with *L. leichmannii* was useful as an aid to diagnosis in some cases of megaloblastic anaemia.—A. M. Copping.

2701

ALÉS, J. M. and VIVANCO, F. La determinación de la vitamina B₁₂ en la sangre de normales y enfermos. [Estimation of vitamin B₁₂ in the blood of the healthy and sick.] *Rev. clín. española*, 1954, 54, 72-75. [Inst. Invest. Méd., Madrid.] English, German and French summaries.

The content of vitamin B₁₂, estimated with *Lactobacillus leichmannii* in the blood of 20 normal subjects ranged from 50 to 560, with mean 226, $\mu\mu\text{g.}$ per ml. In an untreated patient with pernicious anaemia the value was 80, and in 2 patients under treatment with vitamin B₁₂ the values were 1520 and 1150.—A. M. Copping.

2702

CHOW, B. F. Vitamin B₁₂ and aging. *Nat. Vitamin Found., Inc., N.Y., Nutrit. Symposium Ser.* No. 9, 1954, 59-72. [Sch. Hyg. Pub. Health, Johns Hopkins Univ., Baltimore, Md.]

Serum values for vitamin B₁₂ were used as an index of absorption of the vitamin given orally to healthy young subjects and to subjects aged from

65 to 90. In young subjects 3 of 9 showed a marked rise in the value in response to a dose of 250 $\mu\text{g.}$, and 10 of 11 responded to 1000 $\mu\text{g.}$ Of 35 old subjects, 14 responded to the high dose and of 8 none to the low dose. The capacity of the gastric secretion to bind vitamin B₁₂ after a parenteral dose was two or three times as great in young subjects, which suggested a relative unsaturation with vitamin B₁₂ in the tissues of old people.

A. M. Copping.

2703

GLASS, G. B. J., LILICK, L. C. and BOYD, L. J. (with GUNNIS, C. and CORTI, L. G.) Metabolic interrelations between gastric intrinsic hematopoietic factor and vitamin B₁₂. 2. Further assays of vitamin B₁₂ in blood and urine of patients with pernicious anemia and following total gastrectomy by means of *Escherichia coli* mutant and *Euglena gracilis* technics. *Blood, J. Hematol.*, 1954, 9, 1127-1140. [Dept. Med., New York Med. Coll., Flower and Fifth Avenue Hosps., New York.] Interlingua summary.

A study of 3 patients with pernicious anaemia (*Bull. New York Med. Coll.*, 1952, 15, 17) had shown that much more vitamin B₁₂, given orally with intrinsic factor or by intramuscular injection, was absorbed from the intestine than was excreted in the urine. Seven patients were investigated in the present study with diets low in vitamin B₁₂; large test doses of the vitamin were given by mouth, alone or with intrinsic factor from pig's stomach. Vitamin B₁₂ was estimated in the blood and urine with a *Bacterium coli* mutant or *Euglena gracilis*.

In 2 patients after total gastrectomy but with no anaemia very high values were found in the blood within the first few hr. after a dose of 100 $\mu\text{g.}$ vitamin B₁₂. A considerable rise occurred in the blood of 4 patients with pernicious anaemia in relapse when 100 or 150 $\mu\text{g.}$ was given by mouth with intrinsic factor. A patient with nutritional macrocytic anaemia responded by a raised blood value when the vitamin was given with or without intrinsic factor. During the experimental period the urinary output of vitamin B₁₂ was in all cases less than 0.5 per cent. of the dose taken by mouth. After the haemopoietic response was established in patients with pernicious anaemia a definite increase occurred in the urinary excretion of vitamin B₁₂.—A. M. Copping.

2704

KILLANDER, A. B₁₂-vitaminhalt i serum vid akut och kronisk leukemi. [Vitamin B₁₂ in serum in acute and chronic leukaemia.] *Nord. Med.*, 1954, 52, 1513-1515. [Med.-Kem. Inst., Upsala.] English summary.

Vitamin B₁₂ was estimated, with *Euglena gracilis*, var. *bacillaris* as test organism, in serum from 5 patients with acute leukaemia, 7 with chronic myeloid leukaemia, 7 with chronic lymphatic leukaemia and 5 with cirrhosis of the liver. For comparison, 40 patients with pernicious anaemia had on the average 0.04 mμg. per ml. Two patients with cirrhosis and severe jaundice had values between 2 and 4 mμg. and 2 others had values above normal limits, which are shown as from 0.1 to 0.75 mμg. per ml. The patients with chronic myeloid leukaemia all had between 3 and 13 mμg. per ml. The values for the rest were within normal limits or were only slightly abnormal. No explanation of the high values can be offered at present.—I. Leitch.

2705

SCHILLING, R. F. Symposium on basic and applied studies of the newer B-complex factors. Recent studies of intrinsic factor and the utilization of radioactive vitamin B₁₂. *Federation Proc.*, 1954, 13, 769-775. [Dept. Med., Med. Sch., Univ. Wisconsin, Madison.]

2706

MACLEAN, L. D. and BLOCH, H. S. Gastrointestinal absorption and urinary excretion of vitamin B₁₂-Co⁶⁰. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 171-174. [Dept. Surg., Med. Sch., Univ. Minnesota, Minneapolis.]

Urinary excretion of radio-active vitamin B₁₂ containing ⁶⁰Co was measured in human subjects during 24 hr. after a dose of 0.7 μg. by mouth followed by subcutaneous injection of 1000 μg. unlabelled vitamin B₁₂ to act as a flushing dose. The radio-active material could be extracted from the urine by *n*-butanol and was identified by chromatographic methods. Detectable amounts of radio-active vitamin B₁₂ were excreted only when the subcutaneous dose of inactive vitamin was given in addition to the radio-active dose by mouth. In 3 normal subjects from 20 to 29 per cent. of the oral dose of ⁶⁰Co, representing from 34 to 39 per cent. of the absorbed dose of vitamin B₁₂ was excreted in the urine within 24 hr. The test appeared to measure absorption of vitamin B₁₂ from the gut, not the absorption of breakdown products of the vitamin. It is considered that the test can be used to estimate intrinsic factor activity.—A. M. Copping.

2707

SWENDSEID, M. E., GASSTER, M. and HALSTED, J. A. Limits of absorption of orally administered vitamin B₁₂: effect of intrinsic factor sources. *Proc. Soc. Exp. Biol. Med.*, 1954, 86, 834-836. [Vet. Admin. Centre, Los Angeles, Calif.]

The absorption of vitamin B₁₂ from the gut was studied by giving the vitamin labelled with ⁶⁰Co and measuring the amount excreted in the faeces. Fasting normal subjects receiving 0.5, 2.0, 5.0 and 10.0 μg., absorbed a maximum of 1.65 μg. Administration of a test meal or of intrinsic factor did not increase the amount of the vitamin absorbed. In experiments with 2 gastrectomised patients, absorption of doses of 0.5 and 5 μg. vitamin B₁₂ was promoted by giving increasing amounts of intrinsic factor, but above the dose of 5 μg. a larger amount of intrinsic factor did not increase absorption beyond that attained in normal subjects.—A. M. Copping.

2708

HEINRICH, H. C. Die biochemischen Grundlagen der Diagnostik und Therapie der Vitamin B₁₂-Mangelzustände (B₁₂-Hypo- und Avitaminosen) des Menschen und der Haustiere. 4. Resorption, Verteilung und Exkretion der B₁₂-Vitamine bei der oralen Therapie der perniziösen Anämie mit kristallisiertem Vitamin B₁₂ + "intrinsic factor". [Diagnosis and treatment of partial and complete deficiency of vitamin B₁₂ in man and domestic animals. 4. Absorption, distribution and excretion of vitamin B₁₂ in oral treatment of pernicious anaemia with crystalline vitamin B₁₂ and intrinsic factor.] *Klin. Wochenschr.*, 1954, 32, 867-878. [Physiol. Chem. Inst., Univ. Hamburg.]

The diagnosis and treatment of pernicious anaemia by oral administration of pure vitamin B₁₂ with a preparation of pig gastric mucosa to provide intrinsic factor are described. In patients with pernicious anaemia the low serum content and low urinary excretion of vitamin B₁₂, estimated with *Euglena*, rose gradually to normal in from 3 to 6 weeks after an initial dose of 30 μg. vitamin B₁₂, later reduced to from 2 to 10 μg. daily and all given with intrinsic factor. A dose of from 0.5 to 5 μg. daily with intrinsic factor maintained health for 1½ years. The content of vitamin B₁₂ in the urine was a better criterion of cure than in the serum where the value did not always rise to normal. The daily human requirement of vitamin B₁₂ is estimated as from 0.1 to 1 μg. Detailed case histories and charts for 4 patients are given in illustration.

Megaloblastic anaemias with normal serum content of vitamin B₁₂ and resistant to treatment with the vitamin, but which often respond to treatment with folic acid, are attributed to deficiency of that substance.—H. Chick.

2709

JASIŃSKI, B. and STIEFEL, G. E. Intrinsic Faktor (Castle) und Resorption von Vitamin B₁₂.

N.A. and B., April 1955

[Castle's intrinsic factor and the absorption of vitamin B₁₂.] *Schweiz. med. Wochenschr.*, 1954, 84, 1123-1124. [Med. Abt., Kantons-spital, Winterthur.]

A brief report is given of 2 patients with pernicious anaemia treated unsuccessfully with small oral doses of vitamin B₁₂ but successfully when an extract of gastric mucosa was added.

E. M. Hume.

2710

BRÜCHER, H. Perorale Behandlung der perniziösen Anämie mit einem Kombinationspräparat aus Vitamin B₁₂ und Pylorusschleimhaut. [Treatment by mouth of pernicious anaemia with a combined preparation of vitamin B₁₂ and pyloric mucosa.] *Deutsch. med. Wochenschr.*, 1954, 79, 1726-1728. [Med. Poliklin., Univ. Heidelberg.]

Oral treatment of pernicious anaemia with a preparation of vitamin B₁₂ and powdered pyloric mucosa gave satisfactory results. Each tablet contained 5 µg. vitamin B₁₂ and 130 mg. pyloric powder; the doses given to the 7 patients described ranged from 4 to 10 tablets, according to the severity of the anaemia. The therapeutic action was assumed from the reticulocyte response, the increase in the number of erythrocytes, the Hb value, the results of repeated bone marrow tests, and, in some, estimation of serum Fe. In all the patients the marrow became completely normal. Subsequent treatment with high doses of a vitamin B₁₂ preparation given parenterally induced no further reticulocyte response.

M. B. Richards.

2711

TAYLOR, W. H. Water diuresis in pernicious anaemia. *Clin. Sci.*, 1954, 13, 497-509. [Dept. Biochem., Radcliffe Infirmary, Univ. Oxford.]

The diuretic response to drinking 1 litre of water was significantly less in a group of 20 untreated patients with pernicious anaemia than in 16 treated patients, and in both groups it was significantly less than in 25 normal subjects. Diuretic response increased after effective treatment for 5 days with vitamin B₁₂, liver extract or folic acid. The delay was not related to Hb level. Dilution of plasma chloride, which occurs during normal water diuresis, was delayed in untreated pernicious anaemia. Dilution patterns were restored towards normal after treatment for about 7 days.

It is suggested that the delay in water diuresis results from a combination of delay in water absorption and in renal excretion.—F. C. Aitken.

2712

BECKER, B., ALLEN, R., WINTER, F. C., MAENGWYN-DAVIES, G. and FRIEDENWALD, J. S. The role of the adrenal cortex and vitamin B₁₂ in diabetic retinopathy. *Amer. J. Ophthalmol.*,

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1954, 38, No. 1 Part 2, 53-58 (with discussion 58-59). [Wilmer Ophthalmol. Inst., Johns Hopkins Hosp., Baltimore, Md.]

2713

CHOW, B. F., ROSEN, D. A. and LANG, C. A. Vitamin B₁₂ serum levels and diabetic retinopathy. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 38-39. [Dept. Biochem., Sch. Hyg., Johns Hopkins Univ., Baltimore, Md.]

A modified method which made it possible to measure very small amounts of vitamin B₁₂ was used to study 16 diabetic patients with, and 18 without, retinal lesions. The average amount of vitamin B₁₂ in the blood in µg. per ml. was 292 ± 24 for those with lesions and 162 ± 18 for those without. The difference is highly significant. The implications from the accumulation of vitamin B₁₂ in the blood are discussed with reference to its possible role in carbohydrate metabolism.

A. M. Copping.

2714

KAYE, K., CAUGHEY, R. H. and MCCRORY, W. W. Nitrogen balances on low nitrogen intakes in infants and the effects of gelatin supplementation with and without vitamin B₁₂ and aureomycin. *Pediatrics*, 1954, 14, 305-313. [Child. Hosp., Philadelphia, Pa.] Spanish summary.

After an adjustment period of at least 4 days on a low-protein diet, N balances were estimated in 5 infants for periods of 10 or 12 days. One infant with an intake of 70 mg. N per kg. bodyweight daily was in slightly negative balance; 2 with intakes of 110 mg. N per kg. were in slightly positive balance. Of the 2 infants with intakes of 100 mg. N per kg. daily, one was in slightly negative balance and the other was in N equilibrium. The last 2 were continued for a further 12-day period when N intake was doubled with gelatine and for a further 12-day period when 300 µg. vitamin B₁₂ and from 200 to 300 mg. aureomycin daily, were given in addition to gelatine. Gelatine increased N retention by 50 and 60 mg. per kg. daily; there was no further increase with vitamin B₁₂ and aureomycin.

Results of balance tests are given also for Na, K and Cl, the retention of which was increased in the subjects given gelatine. Retention of N and electrolytes was greater than would be expected from the gain in bodyweight that occurred during the periods of gelatine administration.

F. C. Aitken.

Vitamin C

2715

HOWELLS, G., PALMER, P. E. S. and ST. JOHN-BROOKS, W. H. Six cases of infantile scurvy. *Brit. Med. J.*, 1954, ii, 1143-1145. [W. Cornwall Clin. Area.]

The 6 infants, and a seventh mentioned in an addendum, were between 6 months and 1 year old and were seen in the course of 3 years in a population of about a quarter of a million. Clinical, and in some cases radiological, descriptions are given, and the lesson is drawn that, in spite of modern welfare facilities, scurvy may still appear in infants.

D. Harvey.

2716

COCCHI, R. Su un caso di malattia scorbutica.

[A case of scurvy.] *Riv. Clin. pediat.*, 1953, 52, 379-384. [Clin. Pediat., Univ. Florence.] English summary.

Scurvy is described which appeared during an attack of fever in a mentally afflicted child aged 5 years, in an institution.—E. M. Hume.

2717

HUGHES, W. and MACLENNAN, D. C. Scurvy in old age. *Brit. Med. J.*, 1954, ii, 1149-1150. [Stapleton Hosp., Bristol.]

The patient was a man of 80 living alone and incapable of looking after himself.—E. M. Hume.

2718

DEWHURST, K. A case of scurvy simulating a gastric neoplasm. *Brit. Med. J.*, 1954, ii, 148-149. [Cowley Road Hosp., Oxford.]

The patient was a man of 72 living alone. He had many signs of scurvy. He was thought at first to have a prepyloric tumour, but when it had disappeared after treatment with ascorbic acid it was concluded that it must have been a sub-mucosal haematoma.—E. M. Hume.

2719

GRUSIN, H. and KINCAID-SMITH, P. S. Scurvy in adult Africans. A clinical, haematological, and pathological study. *Amer. J. Clin. Nutr.*, 1954, 2, 323-335. [Baragwanath Hosp., Johannesburg.] Spanish summary.

Scurvy was diagnosed in 40 Africans representing 0.13 per cent. of patients admitted to the hospital between August 1952 and July 1953 but, because mild cases were not admitted, its incidence among the African urban population must have been higher. It occurred mainly in spring and summer and almost always in men. Thirty patients, one a woman, were studied of whom 20 had had signs for from 1 to 4 weeks, 7 for from 2 to 3 months, and 3 for from 2 to 3 years. The clinical signs and histopathological changes were predominantly in the leg muscles; they are described in detail.

Some findings deserved special mention. Scurvy frequently occurred when fruit and green vegetables were plentiful and cheap, but the diet consisted mainly of maize porridge, bread and small amounts of meat and cooked vegetables. Extensive chronic changes in patients with thin legs,

when the skin and subcutaneous tissue became closely bound together, might persist for many months and still, to some extent, respond to treatment with ascorbic acid. X-ray examinations were made of 15 patients and 4 showed signs of osteoporosis; in Africans in whom such a finding might be otherwise inexplicable, scurvy might be the cause. Nineteen patients had gum lesions but none had haemorrhagic effusions or gross bleeding from bowel or kidney. The changes in Hb value were not related to the severity of tissue haemorrhage, and it is considered that they, together with an oedema which could not be related to heart failure, renal disease or anaemia, may have been due, to some extent, to fluctuations in blood volume. Blood proteins were low, particularly the albumin fraction.—D. Harvey.

2720

CAMPBELL, A. M., GRASS, R. J., HACKER, D. B., HOTOPP, M. and LANTZ, E. M. The relation of vitamin C to the condition of the gums of New Mexico school children in selected areas. *New Mexico Agric. Exp. Stat. Bull.* No. 380, June 1953, pp. 21.

Schoolchildren with sore or spongy gums from 6 different schools, 2 in each of 3 counties, were physically examined, their diets were recorded and ascorbic acid in the serum was estimated 4 times at intervals of 6 weeks. Diet was in general low in ascorbic acid, and more than half of the 231 children examined had subnormal values of less than 0.4 mg. ascorbic acid per 100 ml. serum.

After the first examination, 100 mg. ascorbic acid was given every school day to children from one school in each county. Serum ascorbic acid was normal at the second examination and the dose was altered according to the condition of the gums; in the other children the serum value continued to fall until ascorbic acid was supplied. The condition of the gums improved slowly. Redness of the eyes was referred to deficiency of ascorbic acid.—A. Hepburn.

2721

RAKIĆ, G. Prilog poznavanju ishrane naših trdnbenika. Sezonske varijacije sadržaja vitamina C u krvi. [The nutritional status of our workers. Seasonal variations in vitamin C content of the blood.] *Zborn. Rad., Srpska Akad. Nauka*, 1954, 28 (Inst. Nutr., No. 2), pp. 8. [Inst. Nutr., Serb. Acad. Sci., Belgrade.] English summary.

The vitamin C content of samples of blood plasma from workers in a Belgrade factory varied during the year. In many it was below 0.4 mg. per 100 ml. because of the low intake of the vitamin. (From summary.)—D. Harvey.

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2722

KAUS, H. Genese und diagnostischer Wert von unter Saugglöcken entstandenen Hautblutungen. [Genesis and diagnostic value of haemorrhages of the skin produced by cupping.] *Ztschr. ges. exp. Med.*, 1954, **124**, 448-464. [Hautklin., Städt. Krankenanst., Aachen.]

The paper deals chiefly with the physical properties of the skin tissues, particularly their elasticity, and the gross errors which differences in them introduce into any method using the appearance of petechiae under negative pressure as a criterion of capillary resistance.—E. M. Hume.

2723

JONXIS, J. H. P. and HUISMAN, T. H. J. **Amino aciduria and ascorbic acid deficiency.** *Pediatrics*, 1954, **14**, 238-244. [Dept. Paediat., Univ. Groningen.] Spanish summary.

The amount of amino-acids in the urine of 2 infants with scurvy was abnormally high, but became normal during administration of ascorbic acid for 3 or more weeks. The most pronounced increase was in taurine, threonine, serine, glycine, tyrosine, histidine, lysine and a β -alanine complex shown by paper chromatography to consist largely of β -aminoisobutyric acid. As ultrafiltrates of plasma from 2 scorbutic infants contained only normal amounts of amino-acids, the excessive amount in scorbutic urine was attributed to defective tubular re-absorption in the kidneys.

A. Hepburn.

2724

HUISMAN, T. H. J. **The concentration of different amino acids in the blood plasma in children suffering from rickets and scurvy.** *Pediatrics*, 1954, **14**, 245-253. [Child. Hosp., Univ. Groningen.] Spanish summary.

Plasma filtrates from children, 2 with scurvy, 3 with rickets and 4 normal, and from 2 normal adults, were analysed for amino-acids by cation exchange chromatography before and after hydrolysis. Most of the common amino-acids were present in moderately reasonable amounts but hydroxyproline was not found. Asparagine and glutamine were present in large amounts and several unknown substances were detected. The concentration of alanine, valine, leucine, phenylalanine and histidine was greater after hydrolysis. Plasma from scorbutic and rachitic children was not significantly different in amino-acid composition from that of the normals.—A. Hepburn.

2725

DAS GUPTA, N. K. **Biochemical studies with prothrombin, fibrinogen, ascorbic acid and calcium in relation to some haemorrhagic conditions. Coagulation of the blood.**

Ascorbic acid and its relation to scorbutic and non-scorbutic haemorrhages. Method for estimation of fibrinogen in plasma. Method for estimation of ascorbic acid and calcium in plasma. Prothrombin, fibrinogen, ascorbic acid and calcium levels in peptic ulcer. Method for estimation of ascorbic acid and calcium in plasma. *Calcutta Med. J.*, 1953, **50**, 341-347; 380-386; 418-421; 460-472; 1954, **51**, 19-30; 57-66; 100-101.

Prothrombin time, fibrinogen and ascorbic acid were estimated in plasma and Ca in serum from 50 normal males and 15 normal females. Age and sex apparently had no effect and the average results with ranges were, prothrombin time 20.3 (17.3 to 24.6) sec., fibrinogen 0.265 (0.200 to 0.360) g. per cent., ascorbic acid 0.48 (0.0 to 1.34) mg. per cent. and Ca 9.50 (8.34 to 11.25) mg. per cent.

In 9 patients with enteric fever studied, prolonged prothrombin times of from 33.2 to 96.3 sec. were found, especially when there was haemorrhage or much toxæmia. Two patients had little fibrinogen; the values ranged from 0.228 to only a trace and were not related to extent of haemorrhage. Patients with low blood prothrombin values and very low fibrinogen died. The initial average value for ascorbic acid was 0.14 mg. per cent.

Among 15 patients with liver diseases, bleeding with jaundice was associated with prolonged prothrombin times, 42.5 to 90.6 sec., but some with such times, from 60 to 70 sec., had no haemorrhage. Haemorrhage stopped as the prothrombin time decreased. In conditions associated with irritation of the liver like early cirrhosis and early stages of infective jaundice, both prothrombin time and fibrinogen value improved at first, and deteriorated later with the progress of liver damage. The average initial value of ascorbic acid was 0.29 mg. per cent.

High values for prothrombin time and low values for fibrinogen, 69.3 sec. and 0.06 g. per cent. at the extremes, were found in 8 of 10 patients with malignant disease. The abnormality was more pronounced with the more rapidly growing tumours and was independent of metastasis in the liver. Ascorbic acid averaged 0.12 mg. per cent.

In 9 hypertensive subjects with or without haemorrhage only 2 had a low value for blood prothrombin; it was slightly high in 2 patients with thrombosis. Fibrinogen tended to be low, ranging from 0.119 to 0.213 g. per cent. The average initial ascorbic acid was 0.22 mg. per cent.

Results are given also for patients with kala-azar, pulmonary tuberculosis and peptic ulcer.

In all the haemorrhagic diseases mentioned, the serum Ca value was normal. The values for ascorbic acid and Ca were not related to the extent of haemorrhage.—A. Hepburn.

2726

CLAYTON, B. E., MCSWINEY, R. R. and PRUNTY, F. T. G. **Metabolism of dehydroascorbic acid and the effect of adrenocorticotrophic hormone and cortisone.** *Biochem. J.*, 1954, **58**, 542-552. [Dept. Chem. Pathol., St. Thomas's Hosp. Med. Sch., London, S.E.1.]

Dehydroascorbic acid had some antiscorbutic effect and prolonged life when injected into guinea-pigs receiving a scorbutic diet; it increased the amount of ascorbic acid in the tissues, but most of that injected was not accounted for. It did not appear in the tissues or urine, which contained increased amounts of oxidation products. In many animals loss of fur, respiratory difficulty and paralysis of the hind limbs preceded ultimate death. Post-mortem examination showed fatty livers but no sign of scurvy.

In 2 human subjects previously given 600 mg. ascorbic acid daily, the same amount of dehydroascorbic acid given by mouth did not alter the urinary excretion of ascorbic acid. The sample of dehydroascorbic acid used was unsuitable for injection into human subjects. Intramuscular injections of dehydroascorbic acid methanolate (readily dissociable in water to dehydroascorbic acid and methanol) into a subject saturated with ascorbic acid decreased by one-third the excretion of ascorbic acid and by one-half that, taken together, of ascorbic acid, dehydroascorbic acid, diketogulonic acid and possibly unidentified impurities, as measured by the method of Roe and Kuether (Abst. 261, Vol. 13), and subsequently referred to as R. and K. material. The amount of ascorbic acid in the plasma and of dehydroascorbic acid in the plasma and urine was little changed. Similar injections into a subject moderately depleted of ascorbic acid increased the ascorbic acid in plasma and urine. The R. and K. material in the urine rose promptly.

The metabolism of ascorbic acid or dehydroascorbic acid in guinea-pigs was unaltered by administration of adrenocorticotrophic hormone or cortisone acetate. In human subjects into whom dehydroascorbic acid was injected, the hormone caused a transitory increase in ascorbic acid, and in R. and K. material excluding ascorbic acid in 1 subject, a sharp rise of R. and K. material excluding ascorbic acid in another, and a significant small increase in the excretion of dehydroascorbic acid in a third. It was concluded that adrenocorticotrophic hormone does not retard the reduction of dehydroascorbic acid to ascorbic acid regularly or significantly, especially in guinea-pigs.

A. Hepburn.

2727

MARINACCIO, G. and BUONSANTO, A. **Cortico-surrene e vitamina C (contributo clinico sperimentale).** [Adrenal cortex and vitamin C, a

clinical experiment.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 311-312. [Ist. Patol., Univ. Bari.]

2728

BOSCOTT, R. J. and COOKE, W. T. **Ascorbic acid requirements and urinary excretion of *p*-hydroxyphenylacetic acid in steatorrhoea and macrocytic anaemia, with a description of the paper-chromatographic technique for identification of hydroxyphenylic acids.** *Quart. J. Med.*, 1954, **23**, 307-322. [Dept. Anat., Univ. Birmingham.]

In patients with steatorrhoea abnormally large quantities of ascorbic acid had to be administered before significant amounts were excreted in the urine. None of the usual signs of clinical scurvy was present, but refractory macrocytic anaemia was frequently found. A study of the acidic *p*-hydroxyphenylic compounds in the urine was made by paper chromatography, the technique of which is fully described; it showed that the chief abnormal component was *p*-hydroxyphenylacetic acid. The clinical and chemical significance of the findings is discussed. There appeared to be a defect in tyrosine metabolism which was less rapidly rectified by ascorbic acid in patients with steatorrhoea than in other subjects. The defect was not due to a primary dietary deficiency or to difficulty of absorption. It is considered that the refractory macrocytic anaemia, the abnormal ascorbic acid utilisation and the disturbed tyrosine metabolism are manifestations of a common underlying metabolic error. Haematological response to ascorbic acid is reported in 3 patients, and the relationship of ascorbic acid to haemopoiesis is discussed.—M. B. Richards.

2729

SPIEGEL-ADOLF, M., BAIRD, H. W., III, SZEKELY, E. G. and WYGIS, H. T. **Cerebrospinal fluid studies in infant children with cerebral palsy and other neurologic disorders.** *Pediatrics*, 1954, **14**, 215-221. [Dept. Colloid Chem., Sch. Med., Temple Univ., Philadelphia, Pa.] Spanish summary.

The extinction coefficient of cerebrospinal fluid from 100 children with cerebral palsy or other neurological disorders was studied by spectrography in ultraviolet light. Ascorbic acid and protein, the principal constituents of cerebrospinal fluid with maximum absorption near 265 m μ , were estimated chemically and from the results the so-called D value, which is a measure of the other substances absorbing at 265 m μ , was obtained.

The average D values for the sick group, including children with birth trauma, cerebral palsy, mental retardation, hydrocephalus and convulsions, were significantly higher than normal except in the case of convulsions. Previous work

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(Spiegel-Adolf and Wycis, *Confinia Neurol.*, 1951, 11, 87; Windle et al., *Surg. Gynecol. Obstet.*, 1944, 79, 561) suggested that a high D value was evidence of cellular damage. Mentally retarded children had high D values which were related inversely to the degree of mental development.

In normal newborn infants there was more protein and ascorbic acid in the cerebrospinal fluid than in older children and adults. Since the concentration of protein in the blood is lower than in adults the finding was a sign of greater permeability of the blood-brain barrier. In children with neurological signs the values for protein in the cerebrospinal fluid had a wider deviation than in normal children, the respective values being 35.28 ± 26.97 and 28.50 ± 6.06 mg. per cent.

A. Hepburn.

Other Vitamins

2730

GLANDER, R. and LANDBECK, G. Die Wirkung von Vitamin K₁ auf den Prothrombin- und Faktor VII-Mangel des Neugeborenen. [Effect of vitamin K₁ on deficiency of prothrombin and factor VII in the newborn.] *Ztschr. Kinderheilk.*, 1954, 75, 392-400. [Kinderklin., Univ. Hamburg, Eppendorf.]

Thirty infants were given by mouth, from the age of 1 or 2 days, 10 mg. daily of a synthetic preparation of vitamin K₁, Konaktion (Hofmann-La-Roche), to determine its influence on prothrombin and Factor VII. Estimations made at the age of 3 or 4 days, when prothrombin is known to reach its minimum in blood, showed that in 13 infants the coagulation time was entirely, and in 6 others nearly, normal. Such results could not be attained with the water-soluble vitamin K₁ preparations hitherto available. No difference in response was found between premature and full-term infants. Disturbances of absorption and immaturity of the liver are suggested as possible explanations of the complete lack of effect in the other 11 infants.—M. B. Richards.

2731

GEILL, T., LUND, E., DAM, H. and SØNDERGAARD, E. Studies on the efficiency of vitamin K₁ in small doses as antidote against anticoagulants of the dicoumarol type. *Scand. J. Clin. Lab. Invest.*, 1954, 6, 203-209. [Dept. Med., De Gamles By (Old Peoples Town), Copenhagen.]

Of 40 normal subjects, 22 received dicoumarol by mouth and 18 2-p-chlor-phenyl-1-3-indandione in doses sufficient to depress the concentration of prothrombin and proconvertin below 10 per cent. of normal. Vitamin K₁ and menadiol sodium bisulphite were administered both intravenously and by mouth. Menadiol sodium sulphate was injected intramuscularly.

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Vitamin K₁ raised the concentration of prothrombin and proconvertin markedly when given intravenously, more slowly when given by mouth. The 2 derivatives of menadione had only a slight effect even in doses of 100 mg. Intravenous injection of from 10 to 20 mg. vitamin K₁ in the form of a sterile aqueous colloidal solution gave a therapeutic effect within 2 hr. and is recommended for raising the concentration of prothrombin and proconvertin where dicoumarol anticoagulants have produced serious haemorrhage. Higher doses are unnecessary and may be dangerous by favouring thrombosis.—A. Hepburn.

2732

CHALMERS, J. N. M., DIXON, M. F. and POLACK, W. Antagonistic effect of oral vitamin K₁ on the action of ethyl biscoumacetate and phenylindanedione. *Brit. Med. J.*, 1954, ii, 956-959. [Haematol. Dept., St. George's Hosp. Med. Sch., London.]

The effect of a single oral dose of 100 mg. vitamin K₁, 2-methyl-3-phytyl-1:4-naphthoquinone, was tested on healthy subjects taking regular therapeutic doses of the anticoagulant ethyl biscoumacetate or phenylindanedione. The vitamin was dissolved with an emulsifying agent and given with fruit juice. The prothrombin activity of the blood, reduced by the anticoagulant drugs, rose again immediately after vitamin K₁ was given. In patients with thrombo-embolic diseases under treatment by anticoagulant drugs, small doses of vitamin K₁ modified the low blood prothrombin value and controlled the therapeutic process.

A. M. Copping.

2733

STRAGNELL, R. and WARE, A. G. Mephyton (emulsified vitamin K₁) in the treatment of excessive therapeutic hypoprothrombinemia. *Med. Clin. N. Amer.*, 1954, 38, 413-417. [Dept. Med., Sch. Med., Univ. S. California, Los Angeles.]

Mephyton is a 5 per cent. emulsion of synthetic vitamin K₁ in 1 per cent. lecithin for parenteral use and is best given intravenously. From 50 to 100 mg. usually controls within from 2 to 4 hr. haemorrhage accompanying low blood prothrombin values induced by 1:3-indandione or coumarin anticoagulants. Prothrombin values are restored to normal in from 12 to 14 hr. No serious toxic effect has been reported. An example of the drug's clinical use is described.—D. Duncan.

2734

BENTLEY, W. B. A. Accidental ingestion of bis-hydroxycoumarin: use of vitamin K₁ emulsion in two cases. *J. Amer. Med. Assoc.*, 1954, 156, 496-497. [Waterbury, Conn.]

Haemorrhage due to accidental ingestion of dicumarol was promptly arrested by intravenous administration of vitamin K₁ emulsion. The prothrombin time returned to normal.

F. C. Aitken.

2735

ASTRUP, T. and MÜLLERTZ, S. **Standardized estimation of prothrombin activity and the accurate control of dicumarol therapy.** *Schweiz. med. Wochenschr.*, 1954, **84**, 815-817. [Biol. Inst., Carlsberg Found., Copenhagen.] German summary.

2736

ARONS, I., FREEMAN, J., SOKOLOFF, B. and EDDY, W. H. **Bio-Flavonoids in radiation injury. 1. The effect of ionizing radiation on capillaries.** *Brit. J. Radiol.*, 1954, **27**, 583-585. [Dept. Radiation Therapy, Harlem City Hosp., New York.]

In tests made on healthy subjects, capillaries of the nailbed were protected against radiation injury when a dose of 600 mg. vitamin P extracted from citrus fruit was given daily for 10 days before exposure to X-rays.—A. M. Copping.

2737

NORDIO, S. Contributo clinico-biochimico allo studio del "T-vitamin" di Goetsch. [Clinical and biochemical study of T vitamin Goetsch.] *Lattante*, 1954, **25**, 342-351. [Ist Clin. Pediat. "G. Gaslini", Univ. Genoa.] English summary.

Values for infants are reported without details. Weight gain of babies in fair nutritive state showed no constant improvement when vitamin T was given. Blood protein showed some increase. Blood phosphatase and urinary excretion of uric acid showed no consistent change.

Rats were given daily from 1 to 2 ml. vitamin T orally for from 5 to 7 days and, in the liver, values for nucleic acid were somewhat higher than in normal rats.—E. M. Hume.

DENTAL DISEASES

2738

NEVIN, R. B. **The diet and mastication; their effects on diffusion and the inception of dental caries.** *J. Dent. Res.*, 1954, **33**, 714. *Proc.* [Dept. Basic Dent. Sci., Otago Univ., Dunedin.] See Absts. 1252, 1253, Vol. 25.

2739

MELLANBY, M. and MELLANBY, H. (with KELLEY, M.) **Dental structure and caries in 5-year-old children attending L.C.C. schools (1949 and 1951).** *Brit. Med. J.*, 1954, **ii**, 944-948. [Nutrit. Building, Nat. Inst. Med. Res., Mill Hill, London.]

Results of the 1951 survey, which covered 1395 children, are tabulated and shown graphically along with those of the 1949 survey, hitherto published only in summarised form (Abst. 2730, Vol. 20). Not much change was found, respective figures for 1949 and 1951 being as follows: percentage of children free or almost free from caries, 24.9, 23.5; percentage of caries-free teeth, 73.3, 72.5; percentage of teeth not showing hyperplasia, 32.0, 42.3.

It is suggested that the increase in the incidence of caries since 1947 may have been due to consumption of less of the protective foods such as milk, eggs and cod liver oil and more of oatmeal and other cereals as the food controls were lifted. The increases in sugar and sweet rations are thought to have been too small to account for it, either directly or by reducing the consumption of other foods.—W. M. Deans.

2740

PARFITT, G. J. **The apparent delay between alteration in diet and change in caries incidence: a note on conditions in Norway reported by Toverud.** *Brit. Dent. J.*, 1954, **97**, 235-237.

Toverud's conclusions (see Abst. 2722, Vol. 19 and Titles 2723, Vol. 19 and 4245, Vol. 20) were criticised by Sognnaes (Abst. 5460, Vol. 19), who showed that in certain age groups the fall in the incidence of caries continued after the rise in consumption of sugar. An attempt has been made to reconcile these findings. Hypothetical graphs of caries rates have been constructed, beginning with the incidence recorded in 1937 and applying to each age an equal incidence which, however, varied from year to year in relation to the consumption of sugar. The resulting curves have a close resemblance to Toverud's graphs and show also that in the 6-year-old group a time lag was possible before a rise in caries incidence occurred.

D. Harvey.

2741

GRAINGER, R. M. and REID, D. B. W. **Distribution of dental caries in children.** *J. Dent. Res.*, 1954, **33**, 613-623. [Div. Dent. Res., Univ. Toronto, Ont.]

In this investigation into the distribution of carious tooth surfaces in children the surfaces were divided into two classes, smooth and pitted. The statistical methods, which are developed at some length, show that the negative binomial distribution fits the case for smooth surfaces. This agrees with the idea that dental caries is a chance phenomenon where susceptibility varies between individuals. Complications are encountered in the analysis of the carious pitted surfaces. It becomes necessary in the first place to consider one side of the mouth only. The differing susceptibility

between pitted tooth surfaces has also to be considered, as well as the correlation between some pitted surfaces; for example, with young children, the occlusal surfaces of the upper and lower first molars are responsible for most of the caries.

It is considered that with very young age groups the number of tooth surfaces exposed to risk varies too much to enable a fit to be made, but with older children where the number of tooth surfaces is relatively constant, a model, assuming that the proportion of pitted surfaces follows a beta distribution, enables the numbers of children with a given number of carious pitted surfaces to be estimated with satisfactory approximation to the observed numbers.—A. W. Boyne.

2742

GRAINGER, R. M., SELLERS, A. H. and REID, D. B. W. A provincial survey of caries incidence. *J. Dent. Res.*, 1954, **33**, 659. *Proc.* [Div. Med. Statistics, Ontario Dept. Health.]

2743

SAVARA, B. S. and SUHER, T. A study of dental caries in children 1 to 6 years of age as related to socio-economic level, food habits and oral hygiene. *J. Dent. Res.*, 1954, **33**, 715-716. *Proc.* [Dent. Sch., Univ. Oregon, Portland.]

2744

WEINKREB, M. M. and BEN-SHUSHAN, D. Dental caries studies in Israel. *J. Dent. Res.*, 1954, **33**, 719-720. *Proc.* [H.Q. Surg. Gen., Israel Defence Army.]

2745

HILL, I. N. The Evanston Dental Caries Study. 12. A survey of lactobacillus counts with reference to untreated carious surfaces before and after exposure to fluoridated water.

YUDKIN, E. P., CZERNIEJEWSKI, J. and BLAYNEY, J. R. 13. Preliminary report on comparative fluoride retention in human tissue.

HILL, I. N., BLAYNEY, J. R. and WOLF, W. 14. Effect of sodium fluoride in communal water supply on caries rates of 6-, 7- and 8-year-old children. *J. Dent. Res.*, 1954, **33**, 662; 691-692; 662. *Proc.* [Zoller Mem. Dent. Clin., Univ. Chicago, Ill.]

2746

CARTER, W. J., JAY, P., SHKLAIR, I. and DANIEL, L. The effect of topical fluoride on the dental caries experience in adult females of a military population. *J. Dent. Res.*, 1954, **33**, 652. *Proc.* [Dent. Depr., Great Lakes, Ill.]

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2747

WESPI, H. J. Fluor-Jodsalz zur Krepf- und Cariesbekämpfung. [Fluorinated and iodinated salt in prophylaxis of goitre and caries.] *Schweiz. med. Wochenschr.*, 1954, **84**, 885-890. [Geburtshilf. Gynäkol. Abt., Kantonsspital, Aarau.] French and English summaries.

The risks of toxicity are discussed, but no harm is expected to result from the addition of NaF as well as KI to salt. Addition of fluoride to water or milk supplies for scattered Alpine communities is impracticable. Its addition to salt sold in packets is preferable but, as this costs more than salt sold loose, the NaF may not reach the poorer people. It is recommended that 200 mg. NaF and 10 mg. KI per kg. salt should be added. When low-salt diets are required an aqueous solution containing 5 g. NaF and 0.5 g. KI per litre should be used to supply 500 µg. F and 100 µg. I daily.—E. M. Hume.

2748

HORASAWA, I., HAGIWARA, K. and NAKAJIMA, F. On the fluoride in the drinking water of two villages in Nagano Prefecture and its relation to the occurrence of mottled enamel. *Bull. Inst. Pub. Health, Tokyo*, 1952, **2**, No. 2, 24-26 (English). [Dept. Sanit. Engin., Inst. Pub. Health, Tokyo.]

The occurrence of mottled enamel was surveyed in the villages of Tokiwa and Matsukawa in Nagano Prefecture. The villages are in the middle of rice fields. The water drunk comes chiefly from the Takase river, which rises in the Japan Alps and has a fluorine content of from 0.35 to 0.8 p.p.m., but some people got water from other streams or wells with from 0.04 to 0.24 p.p.m. Between 300 and 400 junior high-school children were examined in each of the villages and the percentage incidences of mottled enamel were 43 and 58, respectively. Corresponding percentages for about 750 elementary schoolchildren from each of the villages were 41 and 50. For small samples of individuals from different areas in Tokiwa village the incidence ranged from 19 to 60 per cent. It is noted that mottled enamel seemed to occur with a concentration of F in the water lower than that commonly reported. Survey of the land showed that water high in F from hot springs entered the Takase river not very far above the villages.—E. M. Hume.

2749

KAWAHARA, H. and KAWAHARA, K. The new method of classifying mottled teeth based on fluorine content in drinking water. *Shikoku Acta Med.*, 1954, **5**, No. 3, 16-20. [Dept. Int. Med., Sch. Med., Univ. Tokushima.] Japanese summary.

A system for the classification of mottling of teeth according to 4 types of change with 5 degrees of each is described and illustrated. The need for distinguishing changes similar to mottling and not caused by fluorine is emphasised. There is brief mention of some evidence that dental fluorosis occurs more readily in Japanese than in Americans when they are drinking water with similar contents of F.—D. Harvey.

2750

LEONE, N. C., SHIMKIN, M. B., ARNOLD, F. A. (Jr.), STEVENSON, C. A., ZIMMERMAN, E. R., GEISER, P. B. and LIEBERMAN, J. E. **Medical aspects of excessive fluoride in a water supply.** *Pub. Health Rep., Washington*, 1954, **69**, 925-936. [Nat. Inst. Dent. Res., Nat. Inst. Health, Pub. Health Serv.]

Two population groups were studied, one of 116 persons in Bartlett, Texas, where the water supply contained about 8 p.p.m. F, and the other of 121 persons in Cameron, also in Texas, where the F content of the water was only 0.4 p.p.m. The criterion for participation was 15 years' residence before the first examination made in 1943. The second examination was made in 1953. This paper deals with the statistical analysis of the results; clinical impressions will be reported later.

Of the 237 persons originally seen, 71 per cent. were available in the towns at the time of the re-examination; 8 per cent. had died in the interval. The number who had moved elsewhere was 47, of whom 37 were examined in 1953; the remaining 10 were not examined, but were interviewed and

gave no history of serious illnesses. In 1953 the average duration of exposure to high F intake was 36.7 years. Eighteen months before the second examination a defluoridation plant had been installed at Bartlett, but its use was thought unlikely to have affected the findings. The data are fully tabulated.

Statistically significant differences between the communities were found only for the incidence of cardiovascular disorders other than uncomplicated hypertension, which was higher, and for blood white cell counts, which were lower, in Cameron than in Bartlett. Dental fluorosis was common in Bartlett.—D. Harvey.

POISONS: PATHOGENIC ORGANISMS: FOOD LAWS

2751

BOLHUIS, G. G. **The toxicity of cassava roots.** *Netherlands J. Agric. Sci.*, 1954, **2**, 176-185. [Lab. Trop. Agric., Wageningen.]

The literature on the toxicity of cassava roots is reviewed in terms of effects of soil and climate, yield, age of plant, Javanese beliefs on planting, colchicine treatment and bud formation. The abolition of descriptions as sweet or bitter is recommended and their replacement by measurements of toxicity in terms of the HCN content of the fresh root is advocated.—D. Harvey.

IMMUNITY

2752

COLLINS-WILLIAMS, C. **Gastrointestinal allergy in infancy.** *J. Pediat.*, 1954, **45**, 337-346. [Allergy Clin., Hosp. Sick Child., Toronto, Ont.]

THERAPEUTIC AND PREVENTIVE DIETETICS

GENERAL

2753

FANCONI, G. **Wandlungen in der Auffassung und der Therapie der Ernährungsstörungen des Säuglings und des Kleinkindes im Verlauf der letzten 50 Jahre.** [Changes in the concept and treatment of nutritional disturbances in infants and children during the last 50 years.] *Deutsch. med. Wochenschr.*, 1954, **79**, 1773-1778. [Kinderklinik, Univ. Zürich.]

A review.

2754

OLIVÉ BADOSA, A. **La distrofia nutritiva del lactante. Estudio de la reparación.** [Nutritional dystrophy in the infant. Study of rehabilitation.] *Rev. española Pediat.*, 1954, **10**, 447-471. [Clin. Pediat., Hosp. Sta. Cruz y S. Pablo, Barcelona.] French, English and German summaries.

The treatment by diet is described.

2755

PEREIRA, M. D., CONRAD, E. J., HICKS, W. and ELMAN, R. **Therapeutic nutrition with tube feeding.** *J. Amer. Med. Assoc.*, 1954, **156**, 810-816. [Surg. Metabol. Div., Homer G. Phillips Hosp., Sch. Med., Washington Univ., St. Louis, Mo.]

Experiences are described in the use of a liquid mixture in chronic disease, trauma and surgical operation; 240 patients were fed by tube, 12 for between 3 and 9 months, and 76 more took the mixture as a drink. Diarrhoea appeared in less than 7 per cent., and in only about 2 per cent. was it so severe as to necessitate discontinuation of the system of feeding. None of the patients failed to show a positive N balance.—D. Harvey.

2756

Discussion on the nutrition of the surgical patient. *Proc. Roy. Soc. Med.*, 1954, **47**, 981-997.

N.A. and R., April 1955

There are 4 papers. The first, by L. P. le Quesne, deals chiefly with loss of water or NaCl, which means Na, the difference between the effects of depletion of water and of Na and the correct measures for their replacement. The second, by R. H. F. Brain, discusses the replacement of lost weight, preparation for operation and balances of energy (weight), N and certain minerals before and after major operations. The third by W. H. H. Merrivale, deals with acid base balance and potassium depletion, the adjustments that occur and methods of control. The fourth, by A. B. Sutherland, gives metabolism data for 4 patients with burns.—I. Leitch.

2757

BERNSTEIN, R. E. The assessment and management of fluid and electrolyte requirements in surgical patients. *S. African J. Clin. Sci.*, 1954, 5, 131-150. [Dept. Physiol., Med. Sch., Univ. Witwatersrand.]

2758

ROBINSON, C. H. The low cholesterol, low fat diet. *Amer. J. Clin. Nutr.*, 1954, 2, 353-355. [Dept. Food Nutr., Coll. Home Econ., Drexel Inst. Technol., Philadelphia, Pa.]

Details are given of a diet low in cholesterol and fat but providing allowances of other nutrients recommended for men or women. It includes, daily, 5 cups skimmed milk, 5 oz. lean beef, veal, lamb, poultry or fish, 1 serving whole-grain or enriched cereal, 6 slices whole-grain or enriched bread, 1 medium potato and servings of fruits; extra energy is provided by sugar, jelly, jam or greater amounts of vegetables, fruits, cereals or breads. Foods high in cholesterol and fat, and therefore to be avoided, are listed and sample menus are described. It is emphasised that the value of such a diet in vascular disease has not been established; it should not be used indiscriminately.—G. F. Garton.

2759

MCLESTER, J. S. and HOLLEY, H. L. Physiologic basis for salt depletion regimens in disease states. *Geriatrics*, 1954, 9, 457-464. [Dept. Int. Med., Med. Coll., Alabama.]
A review.

2760

DAVIDSON, C. S., CLIFCOCK, L. E., CLIFFORD, P. A., GABUZDA, G. J. and ROBINSON, C. Sodium-restricted diets: the rationale, complications and practical aspects of their use. *J. Amer. Med. Assoc.*, 1954, 156, 1081-1083; 1171-1173; 1252-1253.

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2761

OLMSTREAD, E. G., CASSIDY, J. E. and MURPHY, F. D. Nutritional value of beer with reference to the low salt diet. *Amer. J. Clin. Nutr.*, 1954, 2, 392-395. [Dept. Med., Sch. Med., Marquette Univ., Milwaukee, Wis.] Spanish summary.

The average Na content of 25 representative samples of United States beer was 6.95 mg. per 100 g. Urinary excretion of Na by 4 patients was measured while they were on a hospital, low-Na, diet and when they were on a low-Na diet in which one-quarter of the energy was supplied by a beer containing 2.9 mg. Na per 100 g. The results indicated that more accurate salt restriction was obtained on the diet which contained beer.

F. C. Aitken.

2762

LINDEBOOM, G. A. Hyponatraemie bij decompensatio cordis. [Low blood sodium in cardiac decomposition.] *Nederland. Tijdschr. Geneesk.*, 1954, 98, 3206-3217. [Afd. Inw. Ziekten, Vrije Univ., Weesperplein Ziekenhuis, Amsterdam.] English summary.

A distinction is drawn between "low-salt syndrome" which arises acutely from loss or deliberate deprivation of salt, and "chronic dilution with low blood sodium". Both occur in cardiac decompensation, with oedema. In the former total body Na is low, in the latter normal or high. NaCl relieves the former. But the latter disturbance is not relieved by NaCl, nor does deprivation of salt relieve the oedema, which is progressive. Urea and K have sometimes been found helpful.—I. Leitch.

2763

GARRIDO PERALTA, M. Problemas en la deplecion salina yatrogenica. [Problems of medically-induced salt depletion.] *Rev. clín. española*, 1954, 54, 75-81. [Serv. Med. Intern., Hosp. Provincial, Almería.] English, German and French summaries.

Changes that can arise as a result of salt restriction and the frequent administration of diuretics include hypochlorhaemic alkalosis, acute reversible salt depletion, and chronic low blood sodium levels, reversible or not. The measures to be taken for the correction of these conditions are outlined.—M. B. Richards.

2764

AMULREE (Lord), FREEDMAN, P., GEFFEN, D. and TRACY, S. High protein feeding in the elderly. *Med. Officer*, 1954, 92, 227. [University Coll. Hosp., London.]

Report of a trial of Casilan, a protein-rich milk product.

DIABETES

2765

- PETERS, J. P. Some remarks on the management of diabetes mellitus. *Yale J. Biol. Med.*, 1954, 27, 75-89. [Dept. Int. Med., Sch. Med., Yale Univ.]

2766

- JACOBI, H. G. (with KAUFMAN, M. and OGATA, T.) The food consumption of juvenile diabetics. Evaluation of diets used at home and at summer camp. *Amer. J. Clin. Nutr.*, 1954, 2, 343-347. [111 East 80th St., New York 21.] Spanish summary.

The feeding was studied of 58 diabetic boys and 62 diabetic girls aged 10 to 17 years at home and in a camp for diabetic children which they attended. Data are given for prescribed and actual home diets, for the final camp diets and for the corresponding insulin dosages in a representative group of campers. Most of the children were taking carbohydrate in great excess; only about one-fifth of the boys and one-third of the girls followed their prescribed diet. In many instances the prescribed home diet was considered to be inadequate in energy content to meet the needs of active and growing children. There was ignorance among children and parents of food values, and instructions from their doctors or dietitians had been inadequate.

In a group of 37 of the children who were on an unrestricted diet before attending the camp about one-half took a diet considered, by recommended standards, to be normal for their energy needs; the remainder were eating to excess, some more than twice these amounts.—G. F. Garton.

2767

- FERGUSON, A. W. The use of the insulin zinc suspensions in diabetic children. *Arch. Dis. Childhood*, 1954, 29, 436-442. [Dept. Child Health, Univ. Bristol.]

2768

- HALLAS-MÖLLER, K. Chemical, biological, and physiological background of the new insulin-zinc suspensions. *Lancet*, 1954, 267, 1029-1034. [Novo Therapeutisk Lab., Copenhagen.] See also Absts. 2673, 2712.

GASTRO-INTESTINAL CONDITIONS

2769

- LEWIS, M. N., MURRAY, M. A. and ZOLLINGER, R. M. Dietary regimen following partial gastric resection. *J. Amer. Dietetic Assoc.*, 1954, 30, 852-855. [Dept. Dietetics, Ohio State Univ. Hosp., Columbus.] Eighty-three patients who had undergone partial gastric resection less than 1, or 1 to 5 years

previously were interviewed. About one-third had lost weight and about one-quarter reported discomfort after ingestion of food. A study in hospital of the diet of 26 patients immediately after operation showed that the feeding programme followed was not suitable for most of them and a new and more acceptable feeding plan was devised. This consisted of 5 meals of foods low in volume, concentrated in food value and of suitable temperature and consistency. Sample menus are given.

F. C. Aitken.

2770

- ROCHA, A. Consideraciones dieteticas en el "dumping" de los gastrectomizados. [Diet in "dumping" after gastrectomy.] *Rev. española Enferm. Apart. digest. Nutricion*, 1954, 13, 444-446. [Serv. Med. Gen., Hosp. S. Cruz y S. Pablo, Barcelona.]

Since jejunitis is the chief cause of digestive disturbance after gastrectomy, the aim must be to provide an adequate diet which will avoid inflammation of the jejunum. Particular care must be taken in the early days after operation, since jejunitis, once established, can lead to acceleration of gastric evacuation. As milk in liquid form passes rapidly into the intestine, which is not provided with enzymes for its digestion, it should be given coagulated with lactic acid, or as yoghurt. Meat containing excessive collagen, and vegetable cellulose are to be avoided, and fats should be given with caution since their excessive use leads to steatorrhea, which can cause intestinal irritation. The diet must be progressively regulated both quantitatively and qualitatively before permitting an uncontrolled diet, which might be the first step towards the establishment of "dumping" in the patient.—M. B. Richards.

2771

- DOLL, R. and PYGOTT, F. Clinical trial of robaden and of cabbage juice in the treatment of gastric ulcer. *Lancet*, 1954, 267, 1200-1204. [Statistical Res. Unit, Med. Res. Council.]

Twenty-four patients were given 1 litre fresh cabbage juice daily for 3 weeks; 24 controls were treated similarly but without cabbage juice; 32 patients were given robaden or (robuden) daily for 3 months and 32 controls were treated similarly but without robaden. All of these patients were kept in bed for the first month and were outpatients during the second and third months. Fifty outpatients were given robaden daily for 1 year and 50 controls received no robaden. Progress in all groups was assessed subjectively and radiographically. No evidence was obtained that either cabbage juice or robaden influenced the healing of gastric ulcers.—F. C. Aitken.

N.A. and R., April 1955

2772

- NOTKIN, L. J. Gastroduodenal tissue extracts in the treatment of peptic ulcer with special reference to the effectiveness of robuden. *Amer. J. Digest. Dis.*, 1954, **21**, 251-261. [Dept. Med., Jewish Gen. Hosp., Montreal.]

2773

- GINZBERG, R. and BRINEGAR, W. C. Studies of appetite and of constipation in advanced life: psychological and statistical evaluation of a county home survey in Iowa. *Amer. J. Digest. Dis.*, 1954, **21**, 267-272. [Vet. Admin. Hosp., Tomah, Wis.]

2774

- GRYTTING, G. Glutenfri diet ved sprue. [Gluten-free diet in sprue.] *Nord. Med.*, 1954, **52**, 1339-1340. [Diakonissehusets Sykehus, Oslo.] English summary.

The patient was a 74-year-old woman who had suffered from sprue for some years. Conventional diet with liver extract and folic acid had no effect. A diet without wheat, oats, barley or rye and with, instead, wheat starch, soya bean meal, cornflour, potato flour and polenta, as used in the paediatric department for coeliac disease, rapidly produced improvement in all the signs and symptoms.

I. Leitch.

2775

- ARENDTS, A., NIEWEG, H. O. and ENGELHARDT, J. Nutritional liver disease due to impaired absorption. *Acta med. scand.*, 1954, **150**, 163-168. [Dept. Pathol., Univ. Groningen.]

Damage to the liver parenchyma caused by fatty infiltration, cirrhosis or necrosis, was found in 11 patients with widely different digestive tract disorders. The common feature is considered to be faulty absorption; 9 of the patients had steatorrhoea.—D. Duncan.

2776

- BOGAERT, R. Maladie de Milkman-Looser et stéatorrhées. [Milkman-Looser syndrome and steatorrhoea.] *Acta gastro-enterol. belg.*, 1954, **17**, 715-721 (with discussion 735-736). [Hôp. Stuivenberg, Antwerp.] Dutch, English, German and Spanish summaries.

The form of osteomalacia with linear transverse zones of decalcification, described by Milkman and Looser, occurred in a woman with idiopathic steatorrhoea and in another with sprue after gastrectomy. Both responded to treatment with vitamin D and Ca, combined for the first woman with a diet low in fat.—D. Duncan.

See also Abst. 1727.

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THYROID DISEASE

2777

- THALMANN, A. Die Häufigkeit der Struma maligna am Berner pathologischen Institut von 1910-1950 und ihre Beziehung zur Jodprophylaxe des endemischen Kropfes. [Frequency of malignant goitre at the Berne Pathological Institute, 1910-1950, and its relation to iodine prophylaxis of endemic goitre.] *Schweiz. med. Wochenschr.*, 1954, **84**, 473-478. [Pathol. Inst., Univ. Berne.]

The world literature on the incidence of malignant goitre is reviewed. Records of material from operations and post-mortems, investigated histologically between 1910 and 1950 in the Berne Pathological Institute, were examined. Not all goitres were examined histologically, so total figures cannot be given. The 10 years from 1917 to 1927 are taken as representative of the period before the introduction of I prophylaxis, and those from 1940 to 1950 of the period after it. Of 2823 goitres removed by operation in the first 10 years 6.94 per cent. were malignant, and of 7457 removed in the second 10 years, 5.44 per cent. The percentage of malignant goitres found at post-mortem remained almost constant. There was not, therefore, any evidence that the adoption of general I prophylaxis had influenced the incidence of malignant goitre in either direction, though there was some evidence that the type had changed, papilloma and large-celled adenoma having become more frequent, and sarcoma and carcinoma less so.

A warning is given of the possible goitrogenic effect of fluorine administered for prophylaxis against dental caries.—E. M. Hume.

2778

- DARDEL, G. El bocio y el contenido de yodo en el agua potable. [Goitre and the iodine content of the drinking water.] *Arch. urug. Med.*, 1954, **44**, 13-37. [Univ. Berne.]

The relation between the incidence of goitre and the I content of the water supply is reviewed; reports from Switzerland and some other countries during the past 150 years are considered. The problems of treatment are discussed and a protective dose of 5 mg. KI per kg. edible salt is suggested. There is probably no endemic goitre in Uruguay though sporadic cases occur.

A. M. Copping.

2779

- WILSON, D. C., GRUNDY, H. M., STEEL, R. W. and EDDY, T. P. Goitre in Sierra Leone. *Trans. Roy. Soc. Trop. Med. Hyg.*, 1954, **48**, 481-489. [Lab. Human Nutrit., Univ. Oxford.]

Findings are tabulated on the incidence of goitre among adults, 1068 indigenous inhabitants and 53 immigrants and among 79 children, 14 of whom were natives of the coastal area and 65 natives of

the Kono district in the west. Information about their accustomed diets was obtained and data were available on the I content of 26 different water supplies. It is concluded that the distribution of the disease follows that of pre-Cambrian granite rocks and of water supplies with less than 1.0 µg. I per litre. In these parts the seasonal scarcity of red palm oil and the pollution of water supplies may also play a part.—D. Harvey.

2780

DEMAEYER, E. M. and VANDERBORGH, H. L. Enquête sur le goitre endémique au Ruanda. [Inquiry into endemic goitre in Ruanda.] *Ann. Soc. belg. Méd. trop.*, 1953, **33**, 579-592. [Inst. Recherche Sci. Afrique Centrale, Kivu, Belg. Congo.] English and Flemish summaries.

A survey was made of groups of about 1000 persons of the Bahutu and Batutsi tribes in 22 places in the territory of Ruanda. The state of the thyroid gland was classified as showing no enlargement, parenchymatous goitre (3 grades), or nodular goitre (2 grades). As there was no difference between the tribes, the results are presented together. The incidence of goitre was larger among women than men; it was highest among men just before the age of 20 and among women from 20 to 40. There were few nodular or large parenchymatous goitres, and no cretin, deaf mute or person with Graves' disease was seen. The weighted mean of incidence for both sexes ranged from 1.83 to 28.37 per cent. in different places. Geographically the association of goitre seemed to be with high rainfall and high content of K, Mg, and Ca in the water.—E. M. Hume.

2781

DE SMET, M. P. Contribution à l'étude de la pathologie thyroïdienne au Congo Belge. [Thyroid pathology in the Belgian Congo.] *Ann. Soc. belg. Méd. trop.*, 1954, **34**, 47-101. Flemish summary.

Goitre is endemic in the neighbourhood of Yangambi on the right bank of the Upper Congo, in the triangle formed with its tributary the Aruwimi. From Yangambi towards the north and the Aruwimi river, the incidence increases from about 1.5 to 80 per cent. of the population. On the left (south) bank of the Congo the population is reported to be free of the disorder. The explanation given is that centuries of rain have washed out iodine from the soil on the right bank, which is aeolian in type, but the alluvial soil on the left bank is being constantly reinforced with minerals from the river. Among dwellers on the actual river banks on either side, where much fish is consumed, there is no goitre.

In only about 3 per cent. of the goitrous people is the goitre of a pathological type. The greater

part of this long paper is devoted to a detailed description of 150 patients, mostly women, admitted to the Yangambi Hospital with toxic goitre, of the operative procedures adopted and the complications encountered, and of the results of the histological examination of the tissues removed. Biochemical tests included measurement of the degree of fixation of administered radio-active iodine in normal subjects, and in goitrous patients before and after operation. Of the 150 patients, 86 per cent. came from tribes on the right bank of the Congo and 14 per cent. from tribes on the left bank. The habits and customs of the two sets of tribes are said to differ very little. Six female patients with goitrous fibroma came from all districts and there was no association with endemic goitre; this condition, often accompanied by sterility, is considered to be associated with hypersecretion of folliculin.

In a special inquiry, 14 per cent. of 74 goitrous patients attending hospital provided evidence of heredity playing a part in the etiology.—H. Chick.

2782

VELGHE, A. De l'influence du goitre sur la stérilité en chefferie des Matapa. [Influence of goitre on sterility in a district of the Matapa.] *Ann. Soc. belg. Méd. trop.*, 1954, **34**, 127-134. [Fonds du Bien-être Indigène, Formation Médicale de Vieux, Kasongo.] Flemish summary.

In a study of sterility in women of the district, simple goitre was found to be more frequent than in the neighbouring districts. Measurements of basal metabolism were made on 132 women and 34 men, of whom 34 and 5, respectively, were goitrous. The relatively high values obtained in about 1/3 of the subjects, whether goitrous or not, is attributed to the difficulty of preventing emotional excitement during the test. Lack of iodine in the water and soil is not considered to be primarily responsible for the frequency of goitre, since it is much less in adjacent communities living in the same external conditions. It is considered that the sterility among the women is due to a conditioned deficiency of iodine produced by an excessive secretion of the sex hormone, folliculin, acting as a goitrogenic agent. The men are less affected by goitre, since the secretion of testosterone is generally normal in amount. The distribution of iodised salt as a prophylactic measure is recommended.—H. Chick.

2783

MORINAGA, H. Medical studies on the rural people. 2. A study on the incidence of struma in the south-western rural districts of Okayama Prefecture, Japan. *Rep. Balneol. Lab. Okayama Univ.*, 1954, No. 14, 56-61. [Div. Int.

N.A. and R., April 1955

Med., Balneol. Lab., Univ. Okayama.] In Japanese: English summary.

In 1950 a survey of 1480 schoolchildren aged from 6 to 14, in the vicinity of Yakage in Okayama Prefecture, and of 1516 outpatients in Yakage Hospital, showed a respective mean percentage incidence of struma of 4.6 and 4.7. The percentage [presumably in all subjects] was 7.8 in spring and 2.98 in summer, so that the effect of season should not be neglected. (From summary.)

E. M. Hume.

See also Absts. 1769, 2167, 2178, 2179, 2747.

ANAEMIA

2784

MOURIQUAND, C. Les anémies nutritionnelles du nourrisson. [Nutritional anaemias of infants.] *Pédiatrie*, 1954, 9, 485-499. [Lyons.]
A review.

2785

DE SMET, M. P. Traitement d'attaque des anémies-oedèmes graves par transfusions fractionnées chez les enfants sévrés. [Treatment of severe anaemia and oedema with fractional transfusions in weaned infants.] *Ann. Soc. belg. Méd. trop.*, 1954, 34, 155-169. Flemish summary.

Descriptions and classification are given of the different types of anaemia, with or without oedema, found in young weaned children, with indications and methods to be used for treatment by blood transfusion. Although in most cases the anaemia was caused chiefly by infestation with intestinal or blood parasites, mainly ankylostoma and malaria, it is thought that in some instances defective nutrition might have been a contributory cause.—H. Chick.

2786

BOSE, A. N. and BOSE, S. An environmental factor influencing the toxicity of intravenous iron. *J. Indian Med. Assoc.*, 1954, 23, 547-548. [Bengal Immunity Res. Inst., Calcutta.]

2787

CAPPELL, D. F., HUTCHISON, H. E., HENDRY, E. B. and CONWAY, H. A new carbohydrate-iron haematinic for intramuscular use. *Brit. Med. J.*, 1954, ii, 1255-1257. [Dept. Pathol., Univ. Glasgow.]

A new dextran-iron complex, Imferon, was effective and non-toxic in the treatment of 15 patients with Fe deficiency anaemia. Absorption by way of the lymphatics was demonstrated in one patient who died of cerebral embolism.

F. C. Aitken.

2788

SCOTT, J. M. and GOVAN, A. D. T. Anaemia of pregnancy treated with intramuscular iron. *Brit. Med. J.*, 1954, ii, 1257-1259. [Dept. Res., Glasgow Royal Maternity and Women's Hosp.]

Fifty patients with anaemia of pregnancy were treated with Imferon, intramuscularly. All responded satisfactorily. Comparison with a previous series treated with saccharated oxide of iron, intravenously, showed that utilisation of Fe for Hb formation was the same for the 2 preparations. Since Imferon contains 5 per cent. elemental Fe compared with 2 per cent. in saccharated oxide of iron, fewer injections of Imferon are required.

F. C. Aitken.

2789

BATRD, I. M. and PODMORE, D. A. Intramuscular iron therapy in iron-deficiency anaemia. *Lancet*, 1954, 267, 942-946. [Royal Infirmary, Sheffield.]

In a small group of anaemic and normal subjects serum Fe rose to a peak after intramuscular injection of a dextran-iron preparation and returned to about normal pre-injection level 6 or 7 days after injection. The time taken to reach the peak and its height were variable. There was no increase in urinary excretion of Fe. Of 40 anaemic patients treated with intramuscular injections of the dextran-iron preparation 38 responded adequately. Injections were well tolerated.—F. C. Aitken.

2790

HASEGAWA, M. and ITO, S. The importance of copper in the treatment of anaemia. *Keio J. Med.*, 1954, 3, 25-34. [Dept. Int. Med., Sch. Med., Univ. Keio.]

Of 360 anaemic patients examined during 2 years, 13 showed low serum values for Cu. Three cases are described in which anaemia that had proved intractable to other treatment was cured when copper sulphate in doses of 10 mg. daily was given in addition to Fe and folic acid. Both hyperchromic and hypochromic anaemia responded to treatment with Cu. It is recommended that the Cu content of the serum should be examined in all patients with anaemia who fail to respond to the usual treatment.—A. M. Copping.

2791

FORSHAW, J. W. B. Idiopathic hypochromic anaemia in males. *Brit. Med. J.*, 1954, ii, 908-910. [Whiston Hosp., Liverpool.]

Idiopathic hypochromic anaemia in males is rare. Eleven cases are reported, in none of which was there evidence of haemorrhage or steatorrhoea. The etiology is discussed. Poor Fe absorption and, in adolescence, poor Fe intake are thought to be the causes.—F. C. Aitken.

2792

DOMINICI, G., OLIVA, G. and TRAMONTANA, C.
Influence of the gastric juice on tissue metabolism. *Lancet*, 1954, 267, 1105-1106. [Med. Clin., Univ. Perugia, Italy.]

Gastric juice obtained from human subjects by stomach tube, centrifuged and brought to pH 7.5 was injected intramuscularly. Gastric juice from healthy subjects or from those with pernicious anaemia and histamine-resistant achlorhydria, hyperchromic hypersideraemic anaemia of pregnancy, hypoplastic anaemia of several types or granulocytopenic syndromes, when injected into healthy subjects, or those with idiopathic hypochromic anaemia, or with achlorhydria with or without pernicious anaemia, always caused a drop in blood sugar, serum Fe and serum amino-acids, the lowest values occurring 4 to 6 hr. after the injection. Gastric juice from a patient with hypochromic anaemia and achlorhydria did not produce these effects.

The etiology of idiopathic hypochromic anaemia and related syndromes is discussed in the light of these findings. Treatment with gastric juice from normal subjects was beneficial, and the syndromes are thought to be caused by a deficiency of the substance capable of causing the blood changes described above. An example is given of a woman with hypochromic anaemia, glossitis and histamine-resistant achlorhydria, cured by treatment with gastric juice.—D. Duncan.

2793

DAS GUPTA, C. R. and BASU, P. **Liver function tests in nutritional anaemias.** *J. Indian Med. Assoc.*, 1954, 23, 542-547. [Dept. Haematol., Sch. Trop. Med., Calcutta.]

2794

KÜNKEL, H. A., MAASS, H., SCHMERMUND, H. J. and GOLDECK, H. Tierexperimentelle und klinische Untersuchungen zur Schwangerschafts-Sideropenie mit einem Radio-Eisen⁵⁵ Komplex. [Animal experiments and clinical investigation of iron deficiency in pregnancy with a complex of radio-active ferric iron.] *Klin. Wochenschr.*, 1954, 32, 878-886. [2. Med. Klin., Univ. Hamburg, Eppendorf.]

Three rabbits, which had been made anaemic by removal of 100 to 140 ml. blood, and in which the Hb content of the blood had fallen to about 40 per cent. of the original, received a single intravenous injection of from 2.3 to 2.9 ml. Ferronascin, a preparation containing labelled ⁵⁵Fe and ⁵⁹Fe in amounts equivalent to from 25 to 32 mg. ferric iron. A continuous rise of radio-active Fe in the red blood cells occurred during the following 8 to 15 days and when the rabbits were killed deposits of the labelled Fe were found chiefly in

the liver, spleen, bone marrow and adrenal glands. The red blood cells of 3 normal rabbits, similarly treated, showed a much smaller rise in radio-active Fe. In both groups there was an immediate rise of radio-active Fe in the plasma followed by a fall within 12 hr. after the injection.

Tests were made on 8 pregnant women in whom Fe deficiency had been indicated by a marked rise of serum Fe after administration of a ferrous iron compound. They received intravenous injections of Ferronascin equivalent to 30 mg. radio-active Fe. Little radio-active Fe was detected in the red blood cells in the ensuing 24 hr., but later an increase occurred for the next 2 months in varying degree in the different subjects; the average total was estimated to represent about 75 per cent. of the dose injected. The test was controlled by trials with 2 non-pregnant women with severe hypochromic anaemia and 2 with normal Fe metabolism; after Ferronascin injections they showed absorption in their red blood cells of about 90 and 40 per cent., respectively, of the radio-active Fe injected. In all subjects there was a rise in the first 2 to 5 days of labelled Fe in the plasma, most of which was combined with protein; subsequently only traces were found in the plasma. In the umbilical blood of the infants born from 13 to 109 days after the injection of the mother an amount of radio-active Fe was found equal to about 7 per cent. of that in the maternal blood. No significant transmission of Fe to the milk was detected.—H. Chick.

2795

JENNISON, R. F. and ELLIS, H. R. **Intramuscular iron. A clinical trial in pregnancy.** *Lancet*, 1954, 267, 1245-1249. [Saint Mary's Hosps. Women and Child., Manchester.]

2796

DAS GUPTA, C. R. **Anaemia in pregnancy: a critical review. With recommendations for future lines of work in India.** *Indian J. Med. Res.*, 1954, 42, 411-474. [Dept. Haematol., Sch. Trop. Med., Calcutta.]

2797

JHATAKIA, K. U. and DAMANY, S. J. **A few observations on the nature and aetiology of anaemias.** *J. Indian Med. Assoc.*, 1954, 24, 129-132. [Sir J. J. Hosp., Bombay.]

The subjects were 100 hospital patients, 62 male and 38 female, between 10 and 72 years of age. Their complaints and the clinical findings are tabulated and described. The main haematological findings were: in 50 patients the red cell count was less than 2 million per c. mm. blood; Hb, by Sahli method, was below 6 g. per 100 ml. in 63 patients; mean corpuscular volume outside

the range 80 to 95 c.p. showed 35 as microcytic and 60 as macrocytic; mean corpuscular Hb was below 27 μg . for 59 and above 32 μg . for 5; mean corpuscular Hb concentration was below 32 per cent. in 92. Bone marrow also was examined in 89 patients; in only 1 was it megaloblastic, in all the others normoblastic (46 normoplastic, 28 hypoplastic and 14 hyperplastic).

Of the 60 patients with macrocytic anaemia 1 had megaloblastic marrow; the other 59 had normoblastic marrow (31 normoplastic, 23 hypoplastic and 5 hyperplastic). The existence of macrocytic anaemia with non-megaloblastic bone marrow may, it is suggested, be associated with a low level of blood plasma proteins.—D. Harvey.

2798

YOUSSEF, A. F., ALI, A. M. and EL MAHDI, A. A. H. **Anaemia in pregnancy in Egypt. A problem of national importance.** *J. Egypt. Med. Assoc.*, 1954, **37**, 319-332. [Dept. Obstet. Gynaecol., Kasr-el-Aini Hosp., Cairo.]

In 50 unselected pregnant women, aged from 17 to 42 years, attending the antenatal service at the Kasr-el-Aini Hospital, the blood of 3 was normal, and that of 19 showed what is described as physiological anaemia, reduction of the red cell count and of Hb concentration due to increase in the plasma volume. Of the remainder, 12 showed hypochromic anaemia with Hb concentration less than 10 g. per cent. and a colour index below 0.9; 2 had a macrocytic orthochromic type with red cell count less than 3.5×10^6 per c.mm., Hb less than 10 g. per cent. and a colour index above 0.9; in 14 the 2 types of anaemia were mixed. In 25 of the subjects there was a significantly low gastric acidity; the 25 included 13 of the 16 women who showed the macrocytic and mixed types of anaemia. Parasitic infection was present in only 2 instances. The high incidence of anaemia in pregnant women is attributed to faulty nutrition, and especially to defective absorption of iron and deficiency of animal protein in the diet.—H. Chick.

2799

MOHI-ELDIN, O. **Studies in anaemias of pregnancy.** *J. Egypt. Med. Assoc.*, 1954, **37**, 613-628.

The study was made on 200 supposedly normal pregnant women, mostly resident in Cairo, attending an antenatal outpatient clinic; 20 non-pregnant women of the same age and social class served as controls. All the subjects were free from parasites. In the blood of the non-pregnant group the average Hb value was 12.4 g. per 100 ml., 86 per cent. of normal, and the red cell count 4.7×10^6 per c.mm. Dilution due to the increase of plasma volume which is usual in pregnancy would, at its maximum, reduce the Hb value to

10.1 g. and the red cell count to 4.01×10^6 . Among the pregnant subjects 44 had a Hb value ranging from 10 to 12.4 g., mean corpuscular volume 83.7 c.p. and mean corpuscular Hb 26.9 μg ., figures very near to those of 85 and 27.4, respectively, for the non-pregnant group. This group of pregnant subjects is considered to be normal and to show only "physiological anaemia". There was little response to administration of Fe.

Of 124 pregnant women with blood Hb below 10.1 g. per 100 ml., 100 showed typical hypochromic microcytic anaemia, with average values for Hb 8.4 g., red cell count 3.9×10^6 per c.mm., mean corpuscular volume 76.3 c.p., mean corpuscular Hb 22.4 μg . and colour index 0.69. When 17 of this group were treated for 6 weeks with Fe given as 1.8 g. daily of ferrous gluconate, there was great improvement in 15, with a daily increase of about 0.9 g. per cent. Hb in the blood, and of 37,000 per c.mm. in the red cell count. The 2 women who did not react to Fe did so when HCl was given between meals.

There were only 4 women with typical macrocytic anaemia, showing a mean corpuscular volume above 92 c.p., a red cell count of 2.8×10^6 per c.mm., and a colour index of 1.09. A mixed type of anaemia was shown by 28 patients, some of whom gave little response to Fe, but improved immediately when receiving in addition a high-protein diet in hospital. The blood of the women with macrocytic anaemia also was restored to normal when they were given a high-protein diet with 110 g. protein daily, including meat, milk and eggs.

A study of the usual diet of these women showed that it consisted mainly of rice, lentils, beans, potatoes and other vegetables and cheap fruits and that it was deficient in both Fe and protein, of which the daily intakes were estimated to be about 6 mg. and 37 g., respectively, mostly from vegetable sources.—H. Chick.

See also Absts. 2575, 2695-99, 2703, 2708-10.

OTHER CONDITIONS

2800

MORTENSEN, O. and SØNDERGAARD, G. **Galactosaemia (galactose disease).** *Acta paediat.*, 1954, **43**, 467-477. [Paediat. Univ. Clin., Municip. Hosp., Aarhus.]

A review with 74 references.

2801

LOTTNER, B. **Über einen Behandlungsversuch mit Haferflocken bei minderbegabten Kindern. [Experimental treatment of mentally subnormal children with oat flakes.]** *Deutsch. med. Wochenschr.*, 1954, **79**, 1837-1840. [Abt. Jugendpsychiat., Gesundheitsamt, Düsseldorf.]

For 2½ months 25 boys and 8 girls aged between about 9 and 12 years and with intelligence quotients mostly between 70 and 90, from poor families and attending 2 classes in a special school for the backward, enjoyed a breakfast of oat flakes in the form of "Müslí", i.e., uncooked, stirred up with a little milk and sugar and eaten with fruit and nuts. The oat flakes supplied, per 100 g., 410 Cal., protein 11.5, fat 9.8, carbohydrate 66.3 g., vitamin B, 500 µg., vitamin E 60 mg., Ca salts 1.5 g., Fe 31 mg., Cu 0.5 mg., F 3 µg., Mn 4.87 mg., Zn 7.0 mg., I 4 µg. Many of the children improved in arithmetic, dictation, letter-cancelling and drawing-completion tests, and teachers and parents agreed that they were less restless and less easily tired and showed better concentration. It is suggested that the beneficial effects of oat flakes may be due to their high protein content.

W. M. Deans.

2802

KINSELL, L. W. Some thoughts regarding obesity. *Amer. J. Clin. Nutr.*, 1954, 2, 350-352. [Inst. Metabol. Res., Highland Alameda County Hosp., Oakland, Calif.]

2803

BERRYMAN, G. H. Obesity: a brief review of the problem. *Metabolism*, 1954, 3, 544-560. [Coll. Med., Univ. Illinois, Chicago.]

2804

ROSTOSKI, O. Bemerkungen über Fettleibigkeit. [Obesity.] *Ztschr. ges. inn. Med.*, 1954, 9, 498-502. [Abt. Stoffwechselkranke, Friedrichstädter Krankenhaus, Dresden.]

The causes and treatment of obesity are reviewed in a lecture, with descriptions of some typical cases.—A. M. Copping.

2805

FLETCHER, A. P. The effect of weight reduction upon the blood-pressure of obese hypertensive women. *Quart. J. Med.*, 1954, 23, 331-345. [Wright-Fleming Inst. Microbiol., London.]

The blood pressure of obese middle-aged or elderly women outpatients, 155 in all, under treatment for at least 4 months with a diet supplying from 600 to 1000 Cal. daily, was measured monthly by sphygmomanometer. The women were classified in 4 groups (blood pressure normal or high at the outset, success or failure in losing at least 14 lb. weight). Statistical analysis of the results showed that in hypertensive women who lost weight the fall of blood pressure, both systolic and diastolic, was highly significant compared with that of hypertensive women who did not lose weight; and this was still true when a correction was made for error due to the decrease

of arm girth as weight was lost. A follow-up, admittedly incomplete, suggested that the effect was lasting. It was concluded that in this group of women obesity had played some part in raising the blood pressure.—W. M. Deans.

2806

DOLE, V. P., SCHWARTZ, I. L., THAYSEN, J. H., THORN, N. A. and SILVER, L. Treatment of obesity with a low protein calorically unrestricted diet. *Amer. J. Clin. Nutr.*, 1954, 2, 381-391. [Hosp., Rockefeller Inst. Med. Res.] Spanish summary.

The therapeutic diet supplied 35 ± 5 g. protein daily; non-protein calories were unrestricted. Thirty-six patients were given this diet for several weeks, 16 of them after a control period of 3 to 6 weeks during which a supplement of 46 to 96 g. protein had been given daily. Six subjects were given the diet supplemented at the lower rate and lost weight so rapidly that they were continued on that intake of protein throughout the experiment. Four of the 16 patients also lost weight during the period on the supplemented diet. On the basal diet weight loss was more rapid. Patients consumed less of unrestricted non-protein calories on the low-protein diet. A follow-up study 3 to 12 months later showed that 52 per cent. of the patients had regained all of their original weight, 30 per cent. showed little change in weight and 18 per cent. had continued to reduce without supervision.—F. C. Aitken.

2807

BECK, J. C. and BRÖCHNER-MORTENSEN, K. Observations on the prognosis in anorexia nervosa. *Acta med. scand.*, 1954, 149, 409-430. [Med. Dept. A, Univ. Hosp., Copenhagen.]

A clinical study was made of 28 women with anorexia nervosa, of whom 25 were followed up for an average of 11.8 years. The clinical response during the initial time in hospital was good in 23, moderate in 1 and poor in 4. Of the 25 followed up, 20 were in excellent health, 4 had persistent signs and symptoms and showed chronic inanition, and 1 had died as a consequence of the disorder.

It is concluded that prognosis is better than has previously been inferred, only the more severe personality disorders having an unfavourable prognosis; this accounts for the poor prospects suggested by results from psychiatric departments, which receive selected patients.—D. Duncan.

2808

MOSES, C. Prevention and treatment of atherosclerosis. *J. Amer. Med. Assoc.*, 1954, 156, 492-493. [Addison H. Gibson Lab., Univ. Pittsburgh, Pa.]

2809

ORGAIN, E. S. **Cation exchange resins in congestive heart failure.** *Med. Clin. N. Amer.*, 1954, **38**, 419-430. [Dept. Med., Sch. Med., Duke Univ., Durham, N.C.]

Preparations of cation exchange resins available commercially for prescription are described and an account is given of their pharmacology and clinical use. This is supported by 3 case reports and a bibliography of 48 references.—F. C. Aitken.

2810

VAN BOUWDIJK BASTIAANSE, M. A. **Etiological aspects in the problem of toxemia of pregnancy.** *Amer. J. Obstet. Gynecol.*, 1954, **68**, 151-158. [Dept. Obstet. Gynaecol., Univ. Amsterdam.]

This review first discusses the diagnostic criteria, which the author concludes are hypertension and pitting oedema, with or without albuminuria. In etiology, the essential feature is thought to be increased resistance in the blood vessels of the pregnant uterus, leading to a decrease in the flow of blood to the placenta. The relatively ischaemic placenta produces substances which cause albuminuria and retention of salt and water and also changes in the elimination of mineralocorticoids and pregnanediol. The general pathology of toxemia is the result of arteriolar spasm. Data are given illustrating the fall in the incidence of eclampsia in Dutch patients during the 1939-45 war; possible explanations were "the poor state of the muscular system caused by malnutrition. The poor condition of the muscles of the arterioles causes a fall in blood pressure. The diminished tonus of the uterine muscle results in a reduced pressure upon the vessels of the uterus so that more blood can pass through." As the incidence of eclampsia diminished, atonic post-partum haemorrhages became increasingly frequent. Treatment resolves itself into a question of how to increase the uterine circulation.

A. M. Thomson.

2811

DAHL, L. K. and LOVE, R. A. **Evidence for relationship between sodium (chloride) intake and human essential hypertension.** *Arch. Int. Med.*, 1954, **94**, 525-531. [Dept. Med., Brookhaven Nat. Lab., Upton, N.Y.]

The results presented in the paper relate to 547 adults but in an addendum the observations are extended to include 897 persons. Of these, 397 added salt to food as a routine without previous tasting, 402 sometimes added salt after tasting

food and 98 never used salt at table. In these 3 groups the numbers of persons with hypertension were 40, 30 and 1.

While it is admitted that high NaCl intake may be merely a manifestation of the disease, a cause-effect relationship is postulated between NaCl intake and the development of hypertension and it is thought that only the Na ion is of importance.

F. C. Aitken.

2812

DAHL, L. K., STALL, B. G. (III) and COTZIAS, G. C. **Metabolic effects of marked sodium restriction in hypertensive patients: changes in total exchangeable sodium and potassium.** *J. Clin. Invest.*, 1954, **33**, 1397-1406. [Dept. Med., Brookhaven Nat. Lab., Upton, N.Y.]

Total exchangeable Na and K were measured by isotope dilution techniques in 11 patients during a period of 3 months. The first 5 or 6 weeks was the control period; thereafter intake of Na was restricted to approximately 6 m. eq. daily. After restriction of Na intake no correlation was found between changes in blood pressure and either total exchangeable Na or K. The results are discussed.—F. C. Aitken.

2813

ROCHE, M. and VERA, J. **Diagnostic et traitement de l'hypopotassémie. [Diagnosis and treatment of low blood potassium.]** *Presse Méd.*, 1954, **62**, 1642-1643. [Inst. Invest. Méd., Fund. Luis Roche, Plaza Morelos, Caracas, Venezuela.]

2814

WULF, K. **Vitaminbehandlung in der Dermatologie. [Vitamin treatment in dermatology.]** *Deutsch. med. Wochenschr.*, 1954, **79**, 1604-1606. [Hautklin., Univ. Hamburg, Eppendorf.]

A review.

2815

BUNTON, M. S. **Dietary treatment of tuberculosis. A retrospect.** *J. Amer. Dietetic Assoc.*, 1954, **30**, 1115-1119. [Dept. Dietetics, Freedmen's Hosp., U.S. Dept. Health, Educat. and Welfare, Washington, D.C.]

An historical review.

See also Absts. 2231, 2389, 2643, 2651, 2656, 2678, 2683, 2688, 2696.

6. FEEDING OF ANIMALS

GENERAL, INCLUDING DIGESTIBILITY TRIALS

2816

NEHRING, K. Zum Problem der Schaffung einer europäischen Futterwertseinheit. [The problem of procuring a European unit of feeding value.] *Arch. Tierernährung*, 1954, 4, No. 4, Beihefte, 19-37. [Oskar Kellner Inst. Tierernährung, Leipzig-Rostock.]

Units of feeding value have reference only to energy value for maintenance or production, and they have meaning only when balanced rations are used in experiments to measure the value of individual feeds or to estimate requirements of animals. The history and nature of feed units is reviewed from the hay unit of Thaer, via the Scandinavian barley unit to the Soviet oat unit (1 kg. oats = 150 g. fat in ruminants, which is equivalent to 1414 Cal.); and from Kellner's starch unit, via Møllgaard's NK₇ to Fuchs's Kellner unit, KE (see Abst. 2791, Vol. 21). In the interests of uniformity of application, it is suggested that Fuchs's idea be taken a step further, that the KE be taken as 2500 Cal., so removing it from the cattle context of 1 kg. starch and 2360 Cal. of ox fat, and that both "feed value" and requirement be expressed in terms of KE, i.e., multiples of 2500 Cal. Ideally both feed value and requirement should be in terms of net energy. Where there is no information in terms of net energy, or to procure sufficient calorimeter data to give a reliable result would be too expensive, the second best is digestible energy, and it too should be expressed in KE, i.e., units of 2500 Cal.

I. Leitch.

2817

BARBORIAK, J. Der Einfluss von Rohfaserzulagen auf den Energiehaushalt des Kaninchens. Ein Beitrag zur Erweiterung der Wertigkeitslehre von O. Kellner. [Effect of additions of fibre on the energy metabolism of the rabbit. Extension of the "value" system of Kellner.] *Thesis, Univ. Zürich*, 1953, pp. 74.

The "value" system by which Kellner evaluated feedingstuffs was based on experiments on oxen, in which he found that the productive effect of pure isolated nutrients was greater than that of the same nutrients contained in feedingstuffs such as hay and straw. He ascribed the decrease in value of the feeds to their fibre content, which increased the work of mastication and digestion, and possibly intensified fermentation processes. In the present work the effect on the energy metabolism of rabbits of fibre additions to a basal ration slightly above maintenance level was investigated. Finely ground winter-wheat straw

was added in amounts which increased the consumption of dry matter by from 110 to 177 per cent., of fibre by 216 to 972 per cent. and of ballast, i.e., indigestible organic matter, by 209 to 609 per cent. The added straw was found to be almost undigested, but the digestibility of the basal ration was not affected by the additions, except for a slight reduction of protein digestibility. With increasing amounts of fibre and ballast in the ration, the faecal excretion of N increased, but urinary N and N retention were not influenced. The energy metabolism, as represented by the energy of the digested feed, metabolisable energy, thermal and net energy, showed no regular effect of the fibre additions.

It is suggested that the differences between these results and those of Kellner may be due to anatomical and physiological differences in the digestive processes of ruminants and rabbits; to differences in the thermal compensation; to differences in activity of the experimental animals; or to partial digestibility of the wheat straw used by Kellner. Feeds high in fibre do not always show the loss of fat-producing power to be expected according to Kellner's "value" theory. It is suggested that there is need for further experiments on different species of animals, to find the true causes of the decrease in value of the digestible constituents in the different feedingstuffs.

M. B. Richards.

2818

BELL, J. M. Some aspects of bulk in non-ruminant nutrition. *J. Animal Sci.*, 1954, 13, 976. *Proc. [Univ. Saskatchewan.]*

2819

BALCH, D. A., BALCH, C. C. and ROWLAND, S. J. The influence of the method of determination of lignin on the lignin-ratio technique for digestibility in the cow. *J. Sci. Food Agric.*, 1954, 5, 584-588. [Nat. Inst. Res. Dairying (Univ. Reading), Shinfield.]

Three methods of estimating lignin were compared: (1) Norman and Jenkins (Abst. 3136, Vol. 4) as modified by Gray (Abst. 4613, Vol. 17), (2) Ellis *et al.* (Abst. 2495, Vol. 16), (3) Armitage *et al.* (Abst. 2713, Vol. 18). The crude lignin values were corrected for their content of contaminating protein ($N \times 6.25$) and values for "corrected" lignin are quoted. Estimations on feed and faeces showed that method 1 gave the highest values, method 3 the lowest. The methods giving the higher lignin values gave lignins with a higher N content. The "corrected" values for 1 and 2

N.A. and R., April 1955

were similar, but method 3 gave consistently lower values.

From digestibility trials with 4 lactating cows over a 14-day period lignin digestibility coefficients were estimated. Method 1 gave mean values of 9.3 and 8.3 for crude and corrected lignin digestibility coefficients. For methods 2 and 3 the respective values were 4.7, 9.1 and 1.3, 4.4.

The method of Armitage *et al.* is recommended for use in the lignin-ratio technique.—D. M. Walker.

2820

BRUNDAGE, A. L. and SWEETMAN, W. J. The comparative feeding value of brome-grass hay and silage determined by feeding trials and digestion studies. *J. Animal Sci.*, 1954, 13, 1007. *Proc.* [Alaska Agric. Exp. Stat.]

2821

LLOYD, L. E. and CRAMPTON, E. W. The apparent digestibility of the crude protein of the pig ration as a function of its proximate composition. *J. Animal Sci.*, 1954, 13, 993. *Proc.* [Macdonald Coll. (McGill Univ.)]

2822

BOLTON, W. The digestibility of the carbohydrate complex of bran and oats by adult cocks. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 94-98. [Poultry Res. Centre, King's Bldgs., W. Mains Rd., Edinburgh 9.]

2823

ERIKSSON, S. Some factors to consider in determining the digestibility of poultry feeds. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 100-102. [Inst. Animal Nutrit., Royal Agric. Coll. Sweden, Uppsala.]

2824

FOREMAN, C. F. and HERMAN, H. A. Effects of carbohydrate feeding levels on roughage digestion in dairy cattle. *Missouri Agric. Exp. Stat. Res. Bull.* No. 535, October 1953, pp. 56. [Columbia, Mo.]

The coefficients of digestibility of the nutrients of rations supplemented with varying amounts of molasses were estimated in a series of 5 digestion trials with Jersey, Guernsey, and Holstein cows. Rumen samples were taken at the end of each trial and the numbers of bacteria and protozoa with different levels of molasses were found. Coefficients of digestibility were estimated by the chromic oxide indicator method.

Five different hays were tested: a green lespedeza timothy hay of good quality, a stemmy alfalfa hay, a good alfalfa brome-grass hay, a medium alfalfa hay and a brown alfalfa hay of average quality. Hay was used alone or with a

grain mixture with molasses at levels of 1, 2, 4, 6 or 8 lb. daily. The digestibility of crude protein, cellulose and crude fibre of all hays increased when molasses was given at a rate of up to 2 lb. daily. The digestibility of N-free extractives increased as the level of molasses rose. When the roughage was good quality alfalfa brome hay, 4 lb. molasses daily greatly decreased the digestibility of crude protein, crude fibre and cellulose. It was concluded that up to 4 lb. molasses could be included in practical rations for dairy cows without detriment, except when the roughage was good quality alfalfa hay, when the limit of molasses feeding should be 2 lb. daily. A fall in the price of molasses might mean that up to 8 lb. could be given daily even though the digestibility of the roughage portion of the ration was reduced.

There was no relation between the type of ration and the numbers of protozoa in the rumen samples. Bacterial numbers increased as the level of molasses rose. A review is given of the literature on molasses as a source of carbohydrates and the effect of carbohydrates on digestibility.

J. N. Aitken.

2825

RAYMOND, W. F., HARRIS, C. E. and KEMP, C. D. Studies in the digestibility of herbage. 5. The variation, with age, of the ability of sheep to digest herbage, with observations on the effect of season on digestive ability. *J. Brit. Grassland Soc.*, 1954, 9, 209-220. [Grassland Res. Inst., Hurley, Berks.]

Nine experiments were made with sheep ranging in age from lambs to 4-year-old on herbage feeds with digestibilities ranging from 60 to 80 per cent. In experiments 1 to 7 comparisons were made between animals of different ages fed at the same time on one particular feed (frozen herbage). In experiments 8 and 9 the same animals received this same feed at intervals as they became older.

There was an apparent increase in digestive capacity with age, but this increase did not occur with all feeds tested. Part of the variation may have been due to the level of feeding, an allowance being made by feeding each age-group at a dry-matter intake proportional to the average maintenance requirement of the sheep in the group. Experiments 8 and 9 indicated a seasonal fluctuation of digestibility, a fall in winter followed by a rise in summer.—D. M. Walker.

2826

SKAARE, S. Kjemisk innhold, fordøyelighet og forverdi i lusernehøy. [Chemical composition, digestibility and feeding value of alfalfa hay.] *Forsk. Forsøk Landbruken*, 1954, 5, 375-391. [Stamsaeds-gard Vidarshov, Hjelsum.] English summary.

Results of 11 years' study of the composition of alfalfa hay in Norway are summarised. The first 6 years' results were reported earlier (Skaare, *Forsk. Forsøk Landbruket*, 1950). The stands examined were mixed, of alfalfa, red clover and timothy, with alfalfa dominant.

Details are given of botanical composition and of digestibility by wethers of 2 cuts in each of 9 years, taken over the years from 6 different centres, and of the composition of 33 samples from mixed pastures, 20 to 41 per cent. alfalfa, 1 to 4 years old, taken over 11 years. For the samples of which the digestibility was estimated, first cut had a feeding value of 1.91 kg. per feed unit, 220 g. digestible crude protein per feed unit and 17.0 g. Ca and 2.32 g. P per kg., all computed to 85 per cent. dry matter in hay. Corresponding values for second cut were 2.19 kg., 202 g., 16.3 and 1.99 g. For the other samples, with average digestibilities applied, the same values were 2.34 kg., 151 g., 8.92 and 1.78 g.—I. Leitch.

2827

TILLMAN, A. D., SIRNY, R. J. and MACVICAR, R. The effect of alfalfa ash upon the digestibility and utilization of cottonseed hulls by sheep. *J. Animal Sci.*, 1954, 13, 726-731. [Dept. Animal Husb., Oklahoma Agric. Exp. Stat.]

Three digestibility trials with 14 Western wether lambs in all are described. Addition of alfalfa ash to a semi-purified basal ration of which 60 per cent. was cottonseed hulls improved the digestibility of dry matter, crude fibre, ether extract, N-free extract, organic matter and energy ($p = 0.01$) and of the crude protein ($p = 0.05$). Sheep on the basal ration lost weight, but they gained weight when the alfalfa ash was added to the ration. Depletion-repletion studies showed that cobalt had no effect, but that synthetic alfalfa ash caused a gain similar to that of natural alfalfa ash.

J. C. Gill.

2828

THOMAS, B. and SMITH, A. N. The nutritive value of *Calluna vulgaris*. 3. Digestibility at four and ten years after burning. *J. Agric. Sci.*, 1954, 45, 104-109. [King's Coll. (Newcastle upon Tyne), Univ. Durham.]

For earlier work see Abst. 5149, Vol. 23.

Two Blackface wethers were used for digestibility trials with heather collected from moorland 4 years and 10 years after burning. Digestibility values were obtained on diets containing equal proportions of hay and heather (periods 2 and 3). Hay alone was given in the first and fourth periods of the experiment.

Metabolic faecal N was estimated by the Wedemeyer method, crude protein on fresh faeces, and other proximate nutrients on the dry matter.

Ether extract, crude protein and N-free extract had a higher digestibility in young heather than in old heather, but the reverse was apparently true for the digestibility of crude fibre. Metabolic faecal N excretion was reduced by the addition of heather to the diet.—D. M. Walker.

2829

LUCIFERO, M. L'urea quale integratore proteico nell'alimentazione del bestiame. [Urea as protein component in stock feeding.] *Riv. Zootec.*, 1954, 27, 257-259.

A review.

2830

THOMPSON, C. M. and GRAINGER, R. B. Effect of aureomycin on digestion of low quality roughage by sheep. *J. Animal Sci.*, 1954, 13, 1002. *Proc.* [Univ. Kentucky.]

2831

LUTHER, H. G., ADAMS, C. R., HARDIE, W. B., ZOLLIE, Z., REYNOLDS, W. M. and DOWNING, H. E. Antibiotics in ruminants. Bacteriology—artificial rumen—growth studies. *J. Animal Sci.*, 1954, 13, 993. *Proc.* [Chas. Pfizer and Co., Inc.]

2832

BRÜGGEMANN, J. Die Verwendung von Antibiotika in der Ernährung unserer landwirtschaftlichen Nutztiere. [The use of antibiotics in the feeding of farm animals.] *Arch. Tierernährung*, 1954, 4, 71-74. *Proc.* [Munich.]

2833

MEREGALLI, A. Recenti contributi sperimentali sull'uso degli antibiotici nell'alimentazione del bestiame. [Recent experimental contributions to the use of antibiotics in animal feeding.] *Riv. Zootec.*, 1954, 27, 277-280.

A review.

2834

PORTER, J. W. G. Antibiotics and nutrition. *J. Appl. Bacteriol.*, 1954, 17, 152-158. [Nat. Inst. Res. Dairying, Univ. Reading.]

2835

KOVAL'SKII, V. V. Znachenie mikroelementov v zhivotnovodstve. [The importance of microelements in stock raising.] *Priroda*, 1954, No. 4, 11-20.

This is a general discussion of the importance of trace elements in animal husbandry, with brief references to particular diseases occurring in different areas where there is a deficiency of one of the trace elements, with special emphasis on cobalt.

In the U.S.S.R. the largest zone is that of turf-podsol soils deficient in cobalt, copper and iodine. In certain regions where the soils are deficient in Co, the sheep, particularly the lambs, suffer from epizootic anaemia. By using Co salts as a supplement for sheep in Co-deficient regions, it was found possible to increase the weight of lambs at birth by 24 per cent. As leguminous plants are particularly rich in Co it was found that where perennial legumes were being grown animals were less liable to disease.

In "biogeochemical" areas where soils and fodder are deficient in Cu animals suffer from enzootic ataxia and plants from spot disease. As an example of areas characterised by excess of micro-elements molybdenum areas are quoted, where cattle suffer from enzootic diarrhoea, selenium areas where the animals develop so-called alkali disease, beryllium and strontium areas where the animals are attacked by particular forms of rickets, and fluorine areas where animals suffer from fluorosis of the bones and spotted enamel of the teeth. In Northern Kazakhstan, where the soils and fodder are rich in nickel, animals often become blind owing to deposit of nickel forming on the cornea.—H. Scherbatoft.

2836

HICKEY, F. Mineral nutrition of farm animals. *N.Z. Agriculturist*, 1954, 8, No. 6, 3-11. [Wonder Distributors Ltd.]

2837

WILLHITE, F. M., ROUSE, H. K. and MILLER, D. E. Use of beef cattle feeding data in evaluating mountain meadow management practices. *J. Animal Sci.*, 1954, 13, 808-816. [Colorado Agric. Exp. Stat.]

A direct relation was found between the daily consumption by fattening cattle of crude protein in their hay ration and their rate of liveweight increase. It is suggested that by means of this relation it is possible to evaluate fertiliser applications, time of cutting the hay crop and other management procedures in terms of beef production per acre.—J. L. Corbett.

2838

FÉVRIER, R., JACQUOT, R., MATET, J. and PERO, R. Influence du mode de préparation sur la valeur nutritive de trois farines de poisson. Le problème des eaux de presse et de la protéolyse. [Effect of method of preparation on the nutritive value of three fishmeals. The problem of press water and proteolysis.] *Ann. Zootech.*, 1954, 3, 223-246. [Stat. Recherches Élevage, Jouy-en-Josas.]

A quantity of sardines was divided into 3 parts from which the following meals were prepared:

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E (extracted), with press water removed and the remainder oven-dried; I (incorporated), with press water dried and re-incorporated into meal prepared like E; and D (degraded), for which the fish was broken down enzymically and then dried. The meals were sent to 3 laboratories where they were compared in trials with rats, pigs and chickens.

For experiments with rats of 55 to 60 g. weight in groups of 6, the 3 meals were given at the 5, 10 and 15 per cent. levels, for about 6 weeks, during which time 4-day balance trials were made on each group. Growth was good only in the groups receiving 15 per cent. fishmeal. Meal E was slightly better than D or I, especially at the high level. For protein efficiency D followed closely, but this meal produced digestive disturbances and was somewhat unpalatable.

For 3 groups of 9 young pigs the 3 meals were incorporated at 5.5 to 6.5 per cent. to give a crude protein content of 135 g. per kg. diet, the rest of the diet consisting of maize and groundnut meal. The pigs were fed to appetite for 10 weeks, and then only 2 of each group continued to receive fishmeal until they were killed at 100 kg. liveweight. There was no significant difference between the 3 meals under these conditions.

The 3 meals were given as the sole source of animal protein to groups of 10 chickens, I and D at 5 per cent. and E at 6 per cent. of the ration, which provided 19.4 to 19.8 per cent. crude protein. None gave as good results as a control ration without fishmeal, but there was no difference between the 3 fishmeals.—D. Duncan.

2839

SCHREUBEN, L. W. and CLIFTON, R. E. Grain substitution in feeding livestock. *Kansas Agric. Exp. Stat. Circular* No. 299, July 1953. [Manhattan, Kans.]

Scales are given from which may be read off the comparative monetary values of maize, wheat, barley, sorghum and oats for the feeding of dairy cows and the fattening of beef cattle, pigs and lambs in Kansas. These scales take into account the nutritional values of the different grains for different classes of stock. The object is to provide the farmer with a rapid means of assessing the most economical feed to use, with reference to the grain market.—I. A. M. Lucas.

2840

VEZZANI, V. and CARENA, A. L'uso alimentare dei gusci di cacao. Sintesi delle esperienze condotte dall'Istituto Zootecnico e Caseario per il Piemonte. [The use of cacao pods in feeding. Summary of experiments at the Istituto Zootecnico e Caseario of Piedmont.] *Riv. Zootech.*, 1954, 27, 282-285.

Cacao pods may be used for feeding cattle, sheep or pigs. Pigs, especially when young, are somewhat more sensitive than the other species to the alkaloids, theobromine and caffeine, and showed some loss of appetite when given pods at rates between 3 and 5 per cent. soon after weaning. The pods could be substituted for bran in rations for cattle and sheep, and were less than two-thirds the price of bran.—D. Duncan.

2841

PRESTHEGGE, K. Forsøk med lav til drøvtyggere og svin. [Experiments with lichen for ruminants and pigs.] *Forsk. Forsøk Landbruget*, 1954, 5, 437-523. [Norges Landbruks-høgskole, Aas.] English summary.

Lichen has always been used as winter feed in Norway and is regarded as much better than straw. In the districts where the supply is plentiful, large quantities (up to a hundred loads) may be collected. In some areas the lichen moors are used as reindeer pastures, but that is possible only in treeless areas. Most of the lichen moors are in pine or birch forest or on the tree-line.

The lichens commonly collected are *Cladonia rangiferina*, *Cl. alpestris* and *Cl. sylvatica*, all called "reindeer moss"; *Cl. alpestris* is the most plentiful. The biggest lichen moors are in Finnmark and when they are heavily grazed by reindeer, smaller, more rapidly-growing lichens such as *Stereocaulon paschale* and *Cetraria nivalis* appear. *Cetraria islandica* (Iceland moss) and other *Cetr.* species are used also.

Older chemical studies found *Cetraria* rich and *Cladonia* poor in water-soluble carbohydrates. Conventional feedingstuff analysis gives fibre content as 40 per cent. of dry matter for *Cladonia* and only 10 per cent. for *Cetraria*.

The chief carbohydrate in *Cetraria* is lichenin, and chemical studies of it are reviewed. In chemical composition it resembles cellulose, in physical properties it is nearer to starch. Ether extract varies in quantity and kind from one species to another; there is little fat and not enough total ether extract to make investigation possible of the "lichen acids" which make up most of it.

Older biological studies of lichen show that higher animals cannot digest even the highly water-soluble lichenin, since they produce no lichenase; lower animals and bacteria do. *Cetraria* has been used in bread in time of food shortage and tests made during the recent war are reviewed. *Cetraria cucullata* contains enough vitamin C to prevent and cure scurvy (Granat, Abst. 4970, Vol. 6). Earlier experiments with farm stock are also reviewed.

In the present series of studies analyses were made of 30 samples of *Cladonia alpestris*, 50 of

Cetraria islandica and 4 of *Centr. nivalis*, 2 of *Stereocaulon paschale* and 1 each of *Cladonia rangiferina* and *sylvatica*, *Alectoria ochrolia* and *Cetr. crispa*. The chemical composition may be summarised as follows in per cent. of dry matter: organic matter 98.0 to 99.4; crude protein 2.15 to 7.1 (*Stereocaulon* only; others maximum 4.1); crude fat 0.7 to 8.5; N-free extract, *Cladonia* and *Stereocaulon* 53.0 to 66.8, others 82.6 to 85.6; fibre, *Cladonia* 24.2 to 41.2, others 2.6 to 10.05.

Digestibility trials with sheep were made, 36 with *Cladonia alpestris*, 2 with *Cetraria islandica* and 5 with *Cetraria nivalis* of which 2 were after treatment with alkali. The basal ration was of 600 g. hay, cereal, herringmeal and salt (NaCl).

The mean digestibility coefficients in that order were for organic matter 47.8, 48.3, 73.9 and 61.1; for N-free extract plus fibre 52.1, 54.2, 78.9 and 65.3. Digestible protein was negative, -3.5, -3.9, -3.2 and -2.3 per g. dry matter.

The experiments with *Cladonia* were repeated in several years in an attempt to discover reasons for the considerable variations in digestibility, but no relation was found to any of the following: length of preliminary accustoming period, whether the sheep came from a lichen district or not, whether the lichen was stored fresh and frozen, or dry, whether it was given dry or steeped, or the quality of the hay in the basal ration. There was a negative correlation ($r = -0.48$) between fibre content and digestibility of organic matter. The highest digestibility was found with *Cetraria nivalis* but, in its natural condition, it was not readily eaten and caused digestive disturbances. After alkali treatment it was eagerly taken but part of the digestible matter was lost.

The feeding value of the more important species, computed by the methods of Kellner and Møllgaard or of Hansson, corrected by Lehmann's "ballast reduction" for fibre, was in feed units per 100 kg. dry matter: *Cladonia alpestris* 31 or 36, *Cetraria islandica* 64 or 71 and *Cetraria nivalis*, alkali-treated and washed, 54 and 60.

A feeding experiment with 2 groups each of 7 cows is described in detail. Lichen, chiefly *Cladonia alpestris*, 10.75 kg., replaced 2.05 kg. cellulose, i.e., in approximately equivalent feed unit value. Milk yield was slightly increased and percentage fat reduced. In terms of 4 per cent. milk, there was no significant change in milk and there was none in bodyweight. Two groups, each of 11 pregnant ewes, were similarly fed, with lichen replacing cellulose, and again the records of performance were not significantly different.

From the experiments with cows and ewes the feeding value of mixed lichens, chiefly *Cladonia alpestris*, is reckoned to be 0.45 feed unit per kg. dry matter.

The experiments with pigs were with *Cetraria islandica* boiled for $\frac{1}{2}$ hr. (without effect on digestibility) or for 2 hr. in water; and with *Cladonia alpestris*, soaked in 0.5 per cent. NaOH or boiled in dilute HCl or H_2SO_4 . Boiling for 2 hr. increased the digestibility of organic matter of *Cetraria* from 27 to 45 per cent.; that of *Cladonia* after alkali treatment was 45 and after acid hydrolysis 65 per cent. Loss of protein was up to 100 g. per kg. dry matter of lichen. In feeding experiments there were 2 groups each given a normal cereal and herringmeal ration to 60 per cent. of their normal allowance and one given one or other of the prepared lichens. None of them had any feeding value for pigs.

The gathering and storage of lichen is described and discussed. It is a useful fodder for ruminants. I. Leitch.

2842

CURASSON, M. G. Études sur les pâturages tropicaux et subtropicaux. 3. Utilisation des pâturages naturels. [Study of tropical and subtropical pastures. 3. Utilisation of natural pastures.] *Rev. Élevage Méd. vét. Pays trop.*, 1954, 7, 177-189.

A review.

2843

LUCIFERO, M. L'autoalimentazione: originale metodo di somministrazione del foraggio al bestiame. [Self-feeding: original method of supplying fodder to stock.] *Riv. Zootec.*, 1954, 27, 256-257.

See also Absts. 1812, 1831.

HORSES

2844

TAYLOR, J. H., GORDON, W. S. and BURRELL, P. The effect of supplementing the diet of thoroughbred foals with aureomycin hydrochloride. *Vet. Rec.*, 1954, 66, 744-748. [Agric. Res. Council. Field Stat., Compton, Berks.]

A daily supplement of 50 to 100 mg. aureomycin hydrochloride given to 6 of 12 foals from birth to 9 months of age significantly increased growth rate. A decrease followed the removal of the aureomycin, but it was not significant. Utilisation of feed as measured by intake of oats was not improved.—A. Hepburn.

CATTLE

GROWTH AND FATTENING

2845

JOUBERT, D. M. and HAMMOND, J. Maternal effect on birth weight in South Devon \times Dexter cattle crosses. *Nature*, 1954, 174, 647-648. [Sch. Agric., Univ. Cambridge.]

Three South Devon heifers were inseminated with Dexter semen and 3 Dexter females similarly with South Devon semen. After conception all animals received routine treatment. The average birthweight of calves from the South Devon dams was 72 lb. They were thus 22 lb. below the average for pure South Devon calves and 20 lb. above the average for pure Dexter calves. The calves of the Dexter dams had an average birthweight of 57.5 lb., only slightly heavier than the average for pure Dexter calves. It was concluded that these results provide evidence of a maternal effect on birthweight.

J. N. Aitken.

2846

GRIMBERGEN, A. H. M. Enige proeven in vitro en in vivo met "Rumex" een droogproduct, bereid uit pensinhoud. [Tests *in vitro* and

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in vivo with Rumex, a dried product, prepared from rumen contents.] *Inst. Moderne Veevoeding "De Schothorst"*, S42, pp. 8. English summary.

Reports of improved growth of calves given rumen contents from older cattle are reviewed. Trials at "De Schothorst" have not shown any benefit, and possibly benefit would be expected only for calves isolated from birth from older animals.

Trials are described with a proprietary preparation, Rumex. Incubated with fresh or sterilised rumen contents in suitable culture medium it had no effect on digestion of filter paper; cultured on bouillon agar with 0.1 per cent. glucose it contained a viable streptococcus with the characteristics of *Str. bovis*.

In tests with calves, 4 were reared in contact with older cattle, 2 given Rumex in the prescribed amounts daily and 2 without, and 3 were reared in isolation from cattle but not from other animals, 2 with Rumex. There was no difference in rate of growth or condition between ordinary and isolated with or without Rumex.

I. Leitch.

- 2847
DYER, A. J., MUHREER, M. E. and PFANDER, W. H. Rumen inoculation studies with cattle and sheep. *J. Animal Sci.*, 1954, 13, 981. *Proc.* [Univ. Missouri.]
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WILLIAMS, J. B. and JENSEN, C. Dried rumen contents in calf milk replacements. *J. Animal Sci.*, 1954, 13, 1004. *Proc.* [N. Dakota Agric. Exp. Stat.]
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LAMBERT, M. R., ALLEN, R. S., JACOBSON, N. L. and WARD, R. M. Effect of type and amount of dietary lipids and protein on growth and incidence of diarrhea of calves fed semisynthetic diets. *J. Animal Sci.*, 1954, 13, 991. *Proc.* [Iowa State Coll.]
- 2850
SORENSEN, A. M. (JR.), BRATTON, R. W., HANSEL, W. and HOUGH, W. H. The growth and sexual development of young Holstein heifers as influenced by three levels of nutrition. *J. Animal Sci.*, 1954, 13, 1031-1032. *Proc.* [Cornell Univ.]
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MARTIN, T. G., JACOBSON, N. L. and HOMEYER, P. G. Effects of season of birth, sex, birth weight and diet on growth of dairy calves. *J. Animal Sci.*, 1954, 13, 961. *Proc.* [Iowa State Coll.]
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WELLINGTON, G. H., REID, J. T., BRATZLER, L. J. and MILLER, J. I. Body composition and carcass changes of young cattle. *J. Animal Sci.*, 1954, 13, 973. *Proc.* [Cornell Univ.]
- 2853
HANSARD, S. L., CROWDER, H. M. and COMAR, C. L. The utilization by cattle of calcium from various sources. *J. Animal Sci.*, 1954, 13, 986. *Proc.* [Univ. Tennessee.]
- 2854
AMMERMAN, C. B., NEUMANN, A. L., FORBES, R. M. and NORTON, H. W. Utilization of phosphorus from various inorganic sources by steers. *J. Animal Sci.*, 1954, 13, 974. *Proc.* [Univ. Illinois.]
- 2855
FIELD, H. I. The influence of copper on the growth rate of cattle. *Proc. XVth Internat. Vet. Congr., Stockholm*, August 1953, pp. 9. French and German summaries.
- 2856
GRIFFITH, J. M., HOBBS, C. S., MOORMAN, R. P., MERRIMAN, G. M., GREGORY, R. P. (JR.) and MACINTIRE, W. H. Effects of dietary fluorine on fluorine content of bones in cattle and sheep. *J. Animal Sci.*, 1954, 13, 984-985. *Proc.* [Univ. Tennessee.]
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HEDRICK, H. B., BRADY, D. E. and DYER, A. J. Effect of plane of winter nutrition on quality of beef. *J. Animal Sci.*, 1954, 13, 969. *Proc.* [Univ. Missouri.]
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PORTER, G. H. and KESLER, E. M. The value of grass silage in the diet of the young dairy calf. *J. Animal Sci.*, 1954, 13, 1010-1011. *Proc.* [Pennsylvania State Univ.]
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SHRODER, J. D., POPE, L. S., MACVICAR, R. W. and STEPHENS, D. Effect of thyroprotein and supplemental feed during the late summer on the performance of beef cows. *J. Animal Sci.*, 1954, 13, 1012. *Proc.* [Oklahoma Agric. Exp. Stat.]
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DAVIS, R. F., TRIMBERGER, G. W., TURK, K. L. and LOOSLI, J. K. The utilization of molasses by growing dairy heifers. *J. Animal Sci.*, 1954, 13, 980-981. *Proc.* [Cornell Univ.]
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BARTLEY, E. E., FOUNTAINE, F. C., RADISSON, J. J. and ATKESON, F. W. Effects of aureomycin when fed in a calf starter, in milk, or by capsule on the growth of dairy calves. *J. Animal Sci.*, 1954, 13, 975. *Proc.* [Kansas State Coll.]
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HOGUE, D. E., WARNER, R. G., GRIFFIN, C. H. and LOOSLI, J. K. The influence of several antibiotics on the performance of young dairy calves. *J. Animal Sci.*, 1954, 13, 989. *Proc.* [Cornell Univ.]
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LASSITER, C. A., DENTON, T. W., DAVIS, C. L. and TAYLOR, J. A. The effect of various surfactants and aureomycin on the digestibility of feed nutrients by dairy steers. *J. Animal Sci.*, 1954, 13, 991. *Proc.* [Univ. Kentucky.]
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LASSITER, C. A., DENTON, T. W., RUST, J. W. and SEATH, D. M. The evaluation of an

unidentified growth factor and terramycin for young dairy calves. *J. Animal Sci.*, 1954, 13, 992. *Proc.* [Univ. Kentucky.]

2865

HESTER, H. H. (Jr.), LANDAGORA, F. T. and RUSOFF, L. L. The distribution of aureomycin in the body of dairy calves showing a growth response when the antibiotic is administered orally or intramuscularly. *J. Animal Sci.*, 1954, 13, 988-989. *Proc.* [Louisiana Agric. Exp. Stat.]

2866

GORDON, C. H., MOORE, L. A. and HOSTERMAN, W. H. The feeding value of U.S. No. 1 Alfalfa Hay and U.S. No. 2 Alfalfa Heavy Timothy Mixed Hay. *J. Dairy Sci.*, 1954, 37, 1116-1122. [Dairy Husb. Res. Branch, Agric. Res. Serv.]

Six lots of hay were given as the sole ration to 6 groups of 4 heifers for 120 days. Analysis showed 3 hays to have an average grade of U.S. No. 1 Alfalfa Hay and 3 an average grade of U.S. No. 2 Alfalfa Heavy Timothy Mixed Hay. Heifers fed on the former ate 24 per cent. more dry matter and gained 91 per cent. more bodyweight than those fed on the latter. In order of decreasing daily weight gains the alfalfa leaf content, protein and palatability as measured by dry matter consumption also decreased in the respective hays, while timothy and crude fibre increased. The addition of alfalfa ash or soya bean protein for 30 days after the feeding trial had no significant effect on growth rate.—A. Hepburn.

2867

ITTNER, N. R., BOND, T. E. and KELLY, C. F. Increasing summer gains of livestock with cool water, concentrate roughage, wire corrals, and adequate shades. *J. Animal Sci.*, 1954, 13, 867-877. [Div. Animal Husb., Univ. California, El Centro.]

During 2 experiments when the mean air temperatures were 91.8° and 91.3° F., respectively, with mean relative humidities of 40 and 36 per cent., Hereford steers were kept in 50 × 60 ft. corral pens enclosed by fences constructed of four 2 × 10 in. planks. Each pen had a hay or aluminum shade 10 ft. above ground.

In 1952, 3 groups each of 10 bullocks of average liveweight 768 lb. were given during a 71-day test period either uncooled drinking water at 89.6° F., or cold water at 65° F., or cold water plus a shower from sprays covering two-thirds of the corral. They were fed to appetite twice daily. These groups gained 0.78, 1.04 and 0.94 lb. daily, respectively, but the differences were not statistically significant. It is suggested that the shade area of 41 sq. ft. per steer was probably insufficient and

that the high humidity caused by spraying caused the slow growth in group 3 as compared with group 2.

In 1953, 4 groups each of 7 bullocks of average liveweight 871 lb. were given during an 84-day test period either hay feed plus cold drinking water, at 65° F., or hay and grain feed plus cold drinking water, or hay and grain feed plus uncooled drinking water at 89.2° F., or hay feed plus uncooled water. These groups gained 1.51, 2.01, 1.57 and 1.18 lb. daily, respectively. The effect of hay feed as compared with hay and grain was statistically significant and was attributed to the higher heat increment of the hay diet. The effect of uncooled water as compared with cold water was also statistically significant. There was no significant feed × water interaction. In both experiments the animals given cold water drank less than those given uncooled water.

Growth was better in corrals enclosed by wire fences than in those enclosed by heavy wooden fences. Physical measurements were made of these environments. The air velocity was greater in the wire pens and the air temperatures were lower; in the other pens the heavy wooden fences radiated an excessive amount of heat.

I. A. M. Lucas.

2868

GRIZZLE, J. E. and KINCAID, C. M. The relationship between body weight, daily gain, and efficiency of feed utilization in beef cattle. *J. Animal Sci.*, 1954, 13, 958. *Proc.* [Virginia Polytech. Inst.]

2869

BRANAMAN, G. A. and HOWE, P. E. Development of protein and fat in fattening steer and heifer calves. *J. Animal Sci.*, 1954, 13, 967-968. *Proc.* [Michigan State Coll.]

2870

NOLAND, P. R., FORD, B. F. and RAY, M. L. The use of ground chicken litter as a nitrogen source for fattening steers and gestating-lactating ewes. *J. Animal Sci.*, 1954, 13, 994. *Proc.* [Univ. Arkansas.]

2871

BAIRD, D. M. and SELL, O. E. Ration digestibility, grazing behavior and performance of beef cattle as affected by supplemental feeding on winter pasture. *J. Animal Sci.*, 1954, 13, 1005. *Proc.* [Georgia Exp. Stat.]

2872

BROWN, P. B., DAMON, R. A. (Jr.), SINGLETARY, C. B. and VERNON, E. H. Comparison of roughages for winter feeding and maintenance of beef cattle. *J. Animal Sci.*, 1954, 13, 1006-1007. *Proc.* [Louisiana State Univ.]

2873

RUSOFF, L. L., LANDAGORA, F. T., LEE, J. G. (Jr.) and BERTRAND, J. E. Effects of feeding high levels of ammoniated molasses to dairy steers on various feeding regimes. *J. Animal Sci.*, 1954, 18, 998. *Proc. [Louisiana Agric. Exp. Stat.]*

2874

RUMERY, M. G. A. and BAKER, G. N. Growing and feeding Holstein steers for beef. *Nebraska Agric. Exp. Stat. Bull.* No. 418, April 1953, pp. 28.

2875

ELLIOTT, R. C. Steer feeding trials. *Rhodesia Agric. J.*, 1954, 51, 263-270. [*Henderson Res. Stat.*]

The trial was made to determine the productive potential of Napier grass silage and the supplements necessary to achieve different rates of growth of 4-year-old Hereford steers weighing about 1000 lb. The production of the steers in terms of beef under conventional and modified Rhodesian methods of feeding was also studied. Five comparable groups of 10 animals each were used. The control group was slaughtered at the beginning of the trial. The remaining 4 groups were fed as follows: silage to appetite plus veld hay; silage plus legume hay; silage plus legume hay and limited concentrates; silage plus legume hay and up to 8 lb. concentrates. The silage contained 8 per cent. crude protein on a dry matter basis. The trial lasted 140 days. The animals receiving concentrates were slaughtered as they reached the required degree of fatness. The remaining animals required a further 100 days of vlei grazing before they were ready for slaughter. Carcase measurements of control and concentrate-supplemented groups were taken after slaughter. A loin sample joint from each animal was dissected into bone, muscle, intramuscular and subcutaneous fat.

From the results it was estimated that a daily intake of 50 to 60 lb. silage provided little more than maintenance. The daily rate of gain of the group fed on silage and legume hay was nearly double that of the group on silage and veld hay. The poor results in the latter group were attributed to deficiency of protein and total digestible nutrients. The daily rates of gain of the limited-concentrate and full-concentrate groups were, respectively, 1.53 and 2.08 lb.

On the assumption that the sample joints taken were indicative of carcase composition, it was found that of the total cold dressed weight increase over the feeding period 50 to 60 per cent. was fat and 30 to 40 per cent. muscle. Fat deposition was highest in the group with the highest rate of gain.

From a discussion of the economic aspects of the trial it was concluded that the feeding of the type of steer used was uneconomic and that a greater economy of feed utilisation would be obtained if the available feed was used for younger stock which have had no serious setback during their lives.

J. Aitken.

2876

DUTTSMAN, W. W. and KESSLER, F. B. Beef cattle feeding and breeding investigations for 1952-53. Round-up report No. 40 (a progress report). *Kansas Agric. Exp. Stat. Circular* No. 298, April 1953, pp. 15. [Fort Hays Branch, Hays, Kans.]

Trials were made to compare different protein and roughage supplements for wintering beef calves; to assess the value of antibiotics in winter rations for healthy calves, and calves suffering from haemorrhagic septicaemia (shipping fever); and to compare different milo grains combined with Ellis (sorgo) silage and cottonseed meal, or sorgo silage with other roughages, for fattening bullocks. The influence of sire on the efficiency of feed utilisation was also under investigation. The report deals only with the results of one year, 1952-53, and must be regarded as a progress report.

In the first test, alfalfa was the best protein supplement both on pasture and in dry lot. It cost more to winter calves on pasture than in dry lot with silage. Wintering on straw was uneconomical.

Calves in dry lot gained slightly more weight and cost slightly less to feed per unit of live-weight increase when receiving a supplement of aureomycin or bacitracin. Neither aureomycin nor terramycin, however, significantly improved the performance of calves which had had a setback because of shipping fever.

Midland milo grain was better than Martin milo grain and sorgo silage was better than sweet clover-kochia silage for liveweight increase of 2-year-old bullocks. Similarly, western wheatgrass hay and prairie hay were inferior to sorgo silage.

The investigations on the influence of the sire have not been going on long enough for conclusions to be reached.—T. D. Bell.

2877

HUGHES, G. P. The production and utilization of winter grass. *J. Agric. Sci.*, 1954, 45, 179-201. [Grassland Res. Inst., Hurley.]

Four series of trials made over the years 1946-1953 inclusive have shown that it is possible to maintain condition in beef cattle grazing through the winter on pasture rested during late summer and autumn. Yields of pasture herbage during the winter were generally of the order of 1500 to

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2500 lb. dry matter per acre with approximately 17 to 10 per cent. crude protein. Sowing and maintaining grass and lucerne in alternate rows one foot apart allowed maintenance of the legume over successive seasons and good summer production between periods of winter grazing.

J. L. Corbett.

2878

GEURIN, H. B., THOMPSON, J. C., WILCOKE, H. L. and BETHKE, R. M. **Cob portion of ground ear corn as sole roughage for fattening cattle.** *J. Animal Sci.*, 1954, 13, 984. *Proc.* [Rals-ton Furina Co.]

2879

KLOSTERMAN, E. W., BENTLEY, O. G., MOXON, A. L. and KUNKLE, L. E. **Relationships between level of protein, molasses and quality of hay in rations for fattening cattle.** *J. Animal Sci.*, 1954, 13, 990. *Proc.* [Ohio Agric. Exp. Stat.]

2880

BOND, J., NEUMANN, A. L., FORBES, R. M. and NORTON, H. W. **High-protein corn for fattening and wintering beef cattle.** *J. Animal Sci.*, 1954, 13, 977-978. *Proc.* [Univ. Illinois.]

2881

HENTGES, J. F. (Jr.), PEARSON, A. M. and TUCKER, C. A. (II). **Waste beef fat in steer fattening rations and its effect upon the carcass.** *J. Animal Sci.*, 1954, 13, 970. *Proc.* [Florida Agric. Exp. Stat.]

2882

KIRK, W. G., DAVIS, G. K. and PEACOCK, F. M. **Ammoniated citrus pulp in the fattening ration.** *J. Animal Sci.*, 1954, 13, 989-990. *Proc.* [Florida Range Cattle Exp. Stat.]

2883

KLOSTERMAN, E. W., KUNKLE, L. E., GERLAUGH P. and CAHILL, V. R. **The effect of age of castration upon rate and economy of gain and carcass quality of beef calves.** *J. Animal Sci.*, 1954, 13, 817-825. [Ohio Agric. Exp. Stat.]

Male Hereford cattle were slaughtered at about 15 months of age and 900 lb. liveweight. No difference in feed economy of gain and carcass quality was found between those castrated at 1 or 7 months of age. Uncastrated animals gained significantly faster and required less feed per unit of gain. Dressing percentage and market grade were lower, but owing to reduced fat cover there was a larger proportion of edible meat, only slightly less tender and without undesirable flavour. Castration at 7 months (weaning) would allow more accurate selection of calves for breeding.—J. L. Corbett.

2884

BURRIS, M. J., BOGART, R., OLIVER, A. W., MACKEY, A. O. and OLDFIELD, J. E. **Rate and efficiency of gains in beef cattle. 1. The response to injected testosterone.**

PIERCE, C. D., AVERY, H. G., BURRIS, M. and BOGART, R. **2. Some factors affecting performance testing.** *Oregon Agric. Exp. Stat. Tech. Bull.* Nos. 31 and 33, July 1954, pp. 35 and 32.

1. Hereford cattle were individually fed on a concentrate and hay ration to appetite, 6 bullocks and 6 heifers being treated as controls and 12 similar animals receiving intramuscular injections of 1 mg. testosterone per kg. bodyweight weekly during growth from 500 to 800 lb. liveweight. Heifers showed an immediate response to the injections, gaining 0.52 lb. daily more than the control heifers. All the bullock calves gained at a faster rate than the heifers throughout, but the effects of testosterone on the bullocks became marked only over the final 125 lb. of liveweight increase. Total digestible nutrients required per 100 lb. liveweight gain were on the average 513 and 401 lb. for control heifers and bullocks, respectively; requirements of the injected animals were 381 and 395 lb., respectively. Analyses of sample joints suggested that this improved efficiency was caused by proportionately greater gains of protein than of fat. In both sexes the proportion of hindquarter meat was reduced. Heifers gave a lower, steers a higher killing-out percentage. Testosterone also increased thyroid and adrenal weights and increased the thyro-tropic hormone content of the pituitary gland measured by chick assay. Palatability and cooking quality of the meat were unaffected, though masculine characters developed in the animals.

2. Hereford calves born in the spring and early summer were subjected to a 120- to 180-day test feeding period during the following winter. Birthweight, gains during the suckling period, and age and weight at the start of the test period (independent factors) were related to rate and economy of gains during the test period, and to gains per day from birth to the end of test, by multiple correlations. Birthweight had a significant positive effect on weight gains throughout. The other independent factors also affected gains during the test period and must be standardised for official testing.—J. L. Corbett.

2885

CLEGG, M. T. and CARROLL, F. D. **Further studies on the anabolic effects of stilbestrol in steers as indicated by carcass composition.** *J. Animal Sci.*, 1954, 13, 968. *Proc.* [Univ. California.]

2886

- BURROUGHS, W., CULBERTSON, C. C., KASTELIC, J., CHENG, E. W. and HALE, W. H. Oral administration of diethylstilbestrol for growth and fattening in beef cattle. *J. Animal Sci.*, 1954, 13, 978-979. *Proc.* [Iowa State Coll.]

2887

- LUTHER, H. G., ADAMS, C. R., DOWNING, H. E., REYNOLDS, W. M. and HAWLEY, G. E. Steroids in cattle fattening. *J. Animal Sci.*, 1954, 13, 1025. *Proc.* [Chas. Pfizer and Co., Inc.]

2888

- CAHILL, V. R., KLOSTERMAN, E. W., DEATHERAGE, F. E. and KUNKLE, L. E. The possible functions of diethylstilbestrol as observed in beef carcass evaluation and certain associated glands. *J. Animal Sci.*, 1954, 13, 968. *Proc.* [Ohio State Univ.]

2889

- BELL, M. C., MURPHER, R. L. and HOBBS, C. S. The use of urea and stilbestrol in rations for fattening yearling steers. *J. Animal Sci.*, 1954, 13, 976. *Proc.* [Univ. Tennessee.]

2890

- KINCAID, C. M., COPENHAVER, J. S. and McCLAGHERTY, F. S. Individual versus group feeding of steers on full feed. *J. Animal Sci.*, 1954, 13, 959-960. *Proc.* [Virginia Polytech. Inst.]

2891

- WILHELMY, H. Die Viehzucht im Karibischen Küstenland Columbiens. [Cattle raising in the Caribbean coastal area of Colombia.] *Ztschr. Tierzücht. Züchtungsbiol.*, 1954, 63, 201-222. [Kiel.]

The geography and climate of Colombia are briefly described. The Caribbean coast belongs to the *tierra caliente*, without rain from mid-December to mid-April and with a total rainfall of 386 to 1500 mm., with corresponding transition from thornbush and cactus to dry forest and rain forest. A third of the 14 million cattle in Colombia are in this area, on holdings from 5 to 50,000 hectare.

Much of the land is still cleared and cropped in traditional manner by a sequence of *colonos* who hold a small area of 1 to 2 hectare for 18 months at a time, but all types up to completely mechanised farming are to be found. The colono system is merely a transition stage to the establishment of cattle pastures with lucerne or guinea grass, or Yaraguá-Uriva grass (*Hyparrhenia rufa*) or Pará

grass (*Panicum barbinode*) according to the temperature and rainfall. There are also pastures inundated during the rains to which herds are transferred as soon as possible.

Carrying capacity is limited in some areas by water supply but great progress is being made in the creation of collecting ponds and the sinking of wells. The dairy herds are chiefly of Holstein, and Criollo cattle with Zebu crosses and, recently, some crosses with Santa Gertrudis. A detailed description is given of a big hacienda which carries about 1000 head of cattle, with grazing, cut grass, silage of green millet, and with elephant grass and oil cake for the dry season.

Further from the coast cattle are kept for beef, Criollo, Aberdeen-Angus, Red Polled and Romo-Sinuano, with Zebu and Santa Gertrudis crosses. Water and transport constitute the problems and an experiment in local cold storage has not been a success.—I. Leitch.

2892

- YEATES, N. T. M. Environmental control of coat changes in cattle. *Nature*, 1954, 174, 609-610. [C.S.I.R.O., Brisbane.]

Shorthorn calves were divided into 2 groups of 4 animals each. The groups received identical rations. Treatment consisted in reversing the seasonal trend of exposure to light by artificially lighting the stalls occupied by the treated group. Calves in this group were subjected to a gradually increasing exposure to light from 10 to 16½ hr. Control calves received the daily duration of light normal for the latitude of Brisbane.

Monthly hair samples were taken from standard areas of skin, and any changes were noted. The growth of all calves was satisfactory. Treated calves began to shed hair after 12 weeks of increasing light. The hair of the controls remained firmly attached. Growth of hair on the areas from which samples were taken was much less in the treated than in the control group.

J. N. Aitken.

2893

- WHITEMAN, J. V., LOGGINS, P. F., CHAMBERS, D., POPE, L. S. and STEPHENS, D. F. Some sources of error in weighing steers off grass. *J. Animal Sci.*, 1954, 13, 832-842. [Oklahoma Agric. Exp. Stat.]

It is necessary to use standardised procedures in weighing cattle, since the extent of gut fill can greatly effect such data. Under the conditions of the experiment availability of water was relatively more important than availability of pasture as a source of variation. Fasting cattle for 10 to 15 hr. before weighing may increase accuracy, but the measurements should be taken as rapidly as possible to avoid large changes in fill between

those weighed first and last. Bullocks weighing 800 to 1000 lb. lost on the average 1 lb. liveweight every 10 min. during the first 3 to 4 hours' fast.

J. L. Corbett.

See also Absts. 1860-63, 1912, 2030.

MILK PRODUCTION

2894

THOMAS, W. E., MOCHRIE, R. D., GASON, J. L. and WAUGH, R. K. Association of changes in rumen fill with live weight of lactating dairy cows. *J. Animal Sci.*, 1954, 13, 1012-1013. *Proc.* [N. Carolina State Coll.]

2895

SWANSON, E. W. and SPANN, T. R. The effect of rapid growth with fattening upon lactation in cattle and rats. *J. Animal Sci.*, 1954, 13, 1032. *Proc.* [Univ. Tennessee.]

2896

MAHADEVAN, P. Repeatability and heritability of milk yield in crosses between Indian and European breeds of dairy cattle. *Empire J. Exp. Agric.*, 1954, 22, 93-96. [Livestock Div., Dept. Agric., Peradeniya, Ceylon.]

2897

FLUX, D. S. and PATCHELL, M. R. The effect of undernutrition after calving on the quantity and composition of the milk produced by dairy cattle. *J. Agric. Sci.*, 1954, 45, 246-253. [Dairy Res. Inst. (N.Z.), Massey Coll. P.O., Palmerston North.]

Fourteen sets of monozygous twin cows were used. During an experimental period of 6 weeks from the third to the eighth week of lactation, 1 member of each set was maintained on a normal plane of nutrition while the remaining member of each set was fed on a low plane. Undernutrition was achieved by allowing the low-plane animals only 40 per cent. of the area of pasture grazed by the normal-plane animals and only 40 per cent. of the silage supplement. From the eighth week to the end of lactation both groups received the same treatment. Bodyweights were recorded. Milk was weighed daily and samples were taken for the estimation of butterfat, total solids and total protein.

During the experimental period the normal-plane cows gained on the average 13 lb. in weight while the low-plane cows lost 34 lb. Milk production of the normally treated animals was higher than that of their low-plane twins over the 6-week period. The milk of the well fed cows had a lower percentage of butterfat and a higher percentage of solids-not-fat and total protein than that of the poorly fed cows. Milk and butterfat production

of the 2 groups over the whole lactation did not differ significantly, but the average percentage of solids-not-fat in the milk of the well fed animals was significantly higher than that of the low-plane animals over the same period.

Differences in butterfat percentage during the experimental period were highly correlated with weight changes.—J. N. Aitken.

2898

HESELBARTH, K. Untersuchungen über Fresslust, Futteraufnahmevermögen und Futterverwertung bei Milchkühen. [Appetite, capacity and utilisation of feed by dairy cows.] *Arch. Tierernährung*, 1954, 4, 145-195. [Inst. Tierzucht, Justus Liebig Hochsch., Giessen.]

Earlier studies are reviewed. The experiments were made on the college farm, "Oberer Hardthof", on 19 cows, of which 16 were usually in condition for experiment at one time. They were individually fed. Nine of the cows calved during the study. All had 7 kg. hay in 2 portions and different combinations of beet, sugar beet slices, silage, brewer's grains and concentrates. Eight different concentrate mixtures were used, 7 of normal type and 1 with 249 g. digestible crude protein per kg. which was the Lüneberg stud herd mixture. It was used to test effects on appetite, as were minerals or fennel strewn on the concentrates. Capacity was measured in two 1-day tests with a mixture of dried red beet (steeped), dried sugar beet slices and Steffen slices in the ratio of 1:3:8:11 given in 20-kg. portions to complete satiety. Appetite was assessed as speed of eating.

Difficulties of interpretation were introduced by differences, in relation to calving and the peak of milk yield, of the stage at which tests were made, and by the use of an unfamiliar feed for capacity measurements.

The norms suggested by Svoboda (*Proc. XIII World Dairy Congress*, 1937, Vol. 1, p. 168) were compared with feed eaten, with little agreement. Feed eaten was related to size and milk yield but not closely, as assumed by Svoboda. Rate of eating, in g. dry matter per min., which varied from 50 to 150, in spite of considerable day-to-day variation was considered characteristic of individuals and a useful measure of appetite. Greed, induced by feeding half the group 10 min. before the rest, had little or no effect on rate of eating; this is attributed to individual feeding and hence lack of competition. Chalk sprinkled on concentrates depressed appetite and fennel stimulated it, but not sufficiently to offset the cost. The Lüneberg concentrate mixture was more acceptable than the others.

It is suggested, subject to confirmation of the results of these experiments, and repetition of the experiments with young stock, that a young herd

might be divisible into 3 classes, those that eat less than 60, from 60 to 100 and over 100 g. dry matter per min., and that those that eat least might be eliminated as unlikely to become high producers.

I. Leitch.

2899

LEROY, A. M. A propos du rassasiement de la vache laitière. [On satiety in the dairy cow.] *Ann. Zootech.*, 1952, 1, No. 2, 47-59. [Dept. Zootech., Inst. Nat. Agronom., Paris.]

2900

BALCH, C. C., BALCH, D. A., BARTLETT, S., JOHNSON, V. W., ROWLAND, S. J. and TURNER, J. Studies of the secretion of milk of low fat content by cows on diets low in hay and high in concentrates. 4. The effect of variations in the intake of digestible nutrients. *J. Dairy Res.*, 1954, 21, 305-317. [Nat. Inst. Res. Dairying, Univ. Reading.]

The experiment was made on 5 Shorthorn cows during a period of 18 weeks. The rations were of hay and one of two types of concentrate. One of the concentrates was of the war-time type sold in the form of cubes as National Cattle Food No. 1; the other was a simple mixture of flaked maize, wheat feed and decorticated groundnut meal.

The experiment was divided into 4 periods. In the preliminary period the cows received daily 20 lb. of hay and the concentrate cubes at the rate of 4.5 lb. per gal. milk. In period 2 the hay was gradually reduced to 4 lb. daily, the remainder of the requirements being met by an extra amount of cubes. In period 3 the hay allowance was kept at 4 lb. and the cubes were replaced by a smaller amount of the concentrate mixture. In the final period the hay allowance was increased to 18 lb. and the concentrate mixture was given at the rate of 4 to 5 lb. per gal. milk.

Digestibility trials were made during periods 1 to 3. Rate of passage of the hay through the alimentary tract was measured by a method previously described (Abst. 1370, Vol. 25). Milk production was recorded and fat estimations were made. Starch equivalents were calculated from the percentage of digestible nutrients found.

The fat content of the milk was unaffected when extra concentrates in cube form were given with a reduced amount of hay. There was a loss of over 30 per cent. in the yield of fat when the cubes were replaced by the concentrate mixture in period 3; at the same time there was a rise in the solids-not-fat content of the milk, owing to an increase in milk protein. Butterfat and solids-not-fat of the milk returned to normal when the normal diet was restored.

Digestibility trials indicated that the fall in fat content was not due to changes in the amounts of

dry matter, crude protein, ether extract, crude fibre, cellulose, cellulose or pentosans or in cellulose digested. The main difference between the diets in periods 2 and 3 was that the concentrate mixture provided a large intake of starch and lacked the physical property of "fibreousness". It was concluded that a combination of these affected the physical and biochemical processes of the reticulo-rumen and thus indirectly caused a depression of milk fat.

It was found that hay remained for an abnormally long time in the reticulo-rumen when the low-hay diet was given. There was a fall in the digestibility of crude fibre when the concentrate mixture was given with a limited amount of hay.

Throughout the period of the trial starch equivalent intakes were close to standard requirements but there was a surplus of digestible crude protein.

J. N. Aitken.

2901

MARTIN, T. G., STODDARD, G. E. and ALLEN, R. S.

The effects of varied rates of hay feeding on body weight and production of lactating dairy cows. *J. Dairy Sci.*, 1954, 37, 1233-1240. [Iowa Agric. Exp. Stat., Ames.]

Twenty Holstein cows were used in 2 trials to compare 4 levels of hay feeding. The hay was fed at rates of 0.50, 1.17, 1.83 and 2.50 lb. daily per 100 lb. liveweight. A concentrate mixture of ground maize, ground oats, soya bean oilmeal and steamed bonemeal was given in amounts sufficient to supply 100 per cent. of Morrison's recommended standard at each level of hay feeding. There was no significant effect of level of hay feeding on body-weight or on milk production when total digestible nutrients or estimated net energy was held constant. The digestibility of protein and dry matter fell as the hay content of the ration increased.

J. N. Aitken.

2902

BURT, A. W. A., BARTLETT, S. and ROWLAND, S. J.

The use of seaweed meals in concentrate mixtures for dairy cows. *J. Dairy Res.*, 1954, 21, 299-304. [Nat. Inst. Res. Dairying, Univ. Reading.]

In an experiment with 18 Ayrshire cows the effects on milk composition and yield of 3 concentrate mixtures were compared. Seaweed meal made from *Ascophyllum nodosum* or *Laminaria cloustoni* was incorporated in 2 mixtures so as to supply 10 per cent. of the total. The third mixture was similar except that the seaweed meals were replaced by 8.75 per cent. of an oatmeal by-product plus 1.25 per cent. NaCl. The basal ration of all cows consisted of 30 lb. marrowstem kale and 18 lb. hay. The concentrate mixtures were given at the rate of 3½ lb. per gal. over the first gallon and a half, for periods of 3 weeks. No effect on milk yield or butterfat percentage was

seen. When the oatmeal by-product was given the milk had a higher solids-not-fat content. It is concluded that the use of seaweed meals in dairy rations can have only a limited value.

J. N. Aitken.

2903

MARSHALL, S. P., SANCHEZ, A. B., SOMERS, H. L. and ARNOLD, P. T. D. Value of pearl millet pasture for dairy cattle. *Florida Agric. Exp. Stat. Bull.* No. 527, October 1953, pp. 20. [Gainesville, Fla.]

The feeding value of pearl millet (*Pennisetum glaucum*) for lactating Jersey and Guernsey cows and growing heifers under the dairying conditions of Florida was ascertained from trials extending over 3 summers. Estimates of the total digestible nutrients per acre and of the seasonal distribution of the feed supply from the grazings were also made.

In the spring of each year three 2-acre pastures were sown after winter oat grazing on the areas had finished. The pastures were maintained in good order by rotational grazing, mowing the stubble and top dressing with nitrogen fertilisers. In the third season forage samples were analysed for crude protein and dry matter. A concentrate mixture was given at the rate of 1 lb. per 3.5 lb. of fat-corrected milk produced.

The length of the grazing season ranged from 100 to 123 days and was influenced by the date on which grazing began. The productivity of the pastures began to decline at the end of August and grazing was discontinued by mid-September in each year. The dry matter content of the samples ranged from 12.3 to 15.8 per cent. and the crude protein from 2.88 to 3.69 per cent. on a fresh basis. The average carrying capacity of the pastures over the 3 seasons was 2 cows per acre. The average production of total digestible nutrients was 2112.7 lb. per acre. Bodyweights of the cows were maintained with only slight fluctuations. Milk production even at high levels was also maintained during grazing.

To ascertain the feeding value of millet for growing heifers a similar trial was made over the same period as in the first trial. The pastures were established on poorly drained land. The average yield of total digestible nutrients per acre was only 1660.1 lb. It was shown that heifers over 10 months of age in good condition gained at rates above normal for their ages. Small or thin heifers in the same age group grew at subnormal rates. A discussion of the economic aspects of the trials showed that millet pastures could, with profit to the farmer, be fitted into the farm rotation.

J. N. Aitken.

2904

VAN KOETSVELD, E. E. and SWART, F. W. J. Suikerpulp vergeleken met gewone droge pulp in het rantsoen voor melkkoeien. [Sugar

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pulp compared with ordinary dried pulp in the ration of milk cows.] *Inst. Moderne Veevoeding "De Schothorst"*, S43, pp. 7. English summary.

Sugar pulp is either the dry residue of the Steffen process, or ordinary pulp mixed with juice containing sugar and dried. Both contain 35 to 40 per cent. sugar and keep very well. Or, according to the official definition, dried sugar pulp is dried slices from which less than the usual amount of sugar has been removed; it contains not less than 25 per cent. sugar. Wet pulp is the residue from the leaching of sugar beet slices, with 90 per cent. water and 0.3 per cent. sugar. If lime has been added, the dried product (11 to 13 per cent. moisture) may contain 2.68 per cent. Ca. The K content is low. It is greedily eaten. Many farmers believe that sugar pulp improves both milk yield and percentage fat in milk, and is worth its higher price.

A feeding trial was made with 16 milk cows and 2 heifers in 2 matched groups. The ration for the cows was 5 kg. hay, 3 kg. dried pulp, 30 (later 25) kg. ensiled mangolds with leaves, and, according to milk yield, a concentrate mixture of oilseed meals, cereals, minerals and a preparation of vitamins A and D₂. The heifers had 2 kg. pulp and 20 kg. mangold silage.

The average milk yield in kg. and percentage fat in milk of the 8 cows given sugar pulp, in the pre-period, experimental (40 days) and post-period were: 19.1 and 3.61, 17.3 and 3.70 and 16.0 and 3.88; in the control group, 18.7 and 3.63, 17.6 and 3.70 and 16.2 and 3.85. There was no apparent difference between the ordinary and sugar pulp.—I. Leitch.

2905

LUSH, R. H., VAN HORN, A. G. and WHITAKER, W. M. Hay crop silage vs. silage and hay for milk production. *J. Animal Sci.*, 1954, 13, 1009-1010. *Proc.* [Univ. Tennessee.]

2906

HILL, D. L., WALKER, B. J. and LUNDQUIST, N. S. Grass silages as the only source of nutrients for milking cows. *J. Animal Sci.*, 1954, 13, 1008-1009. *Proc.* [Purdue Univ.]

2907

PRATT, A. D. Limited vs. liberal grain with adequate roughage in successive lactations. *J. Animal Sci.*, 1954, 13, 1011. *Proc.* [Ohio Agric. Exp. Stat.]

2908

SCOTT, I. W. and WILSON, G. B. Effect of month of calving on production. *N.S.W. Dept. Agric. Sci. Bull.* No. 74, 1954, pp. 19.

The data relate to complete lactations of 29,044 Jerseys and 9388 Australian Illawarra Shorthorns. For this purpose New South Wales dairying districts were divided into 5 zones. Data for each zone and for each breed within each zone are given separately. Tables show for each month the average length of lactation of all cows calving, the average production of butterfat and the percentage of cows calving. The data thus presented are compared with graphs showing the percentage chances of receiving rainfall equal to or greater than the effective amounts for each month.

Cows calving in the 2 months preceding the highest seasonal rainfall had the longest lactations and highest production. It was estimated that increasing the percentage of cows calving in those months would greatly increase total butterfat production.—J. N. Aitken.

2909

SUNDARESAN, D., ELDRIDGE, F. E. and ATKESON, F. W. Age at first calving used with milk yield during first lactation to predict lifetime production of Indian cattle. *J. Dairy Sci.*, 1954, 37, 1273-1282. [Dept. Dairy Husb., Kansas State Coll., Manhattan.]

2910

FASSEBENDER, J. P. Futterbeschaffung und Fütterung in den Abmelkwirtschaften des linksrheinischen Bezirks Köln. [The supply of feed for and the feeding of flying herds in the District of Cologne on the left bank of the Rhine.] *Arch. deutsch. Tierzucht*, 1954, No. 32, pp. xii + 136. Josef Vienerius, Münster, Westphalia. [Inst. Tierzucht Tierfütterung, Univ. Bonn.]

The subject of this thesis (*Univ. Bonn*, 1953) is dairy farming in the part of the Cologne *Bezirk* on the left (west) bank of the Rhine. The survey is based on 204 of 250 farms studied. Of the 204 herds, 98 were flying herds (*Abmelkbetriebe*) retained for one lactation only (on the average 11 months) and sold for slaughter (average size of holding, 71 ha.: 1 ha. = 2.47 acres). Six were *Abmelk-Mastbetriebe* (124 ha.), i.e., of cows bought non-pregnant in declining lactation and fed lavishly so that their milk would pay for their feed. Seventy were *Durchhaltebetriebe* (54 ha.), i.e., of young cows bought in full milk and carried through several lactations (on the average 2½ years). Eighteen were *Durchhalte-Nachzuchtbetriebe* (71 ha.), in which calves from the best cows are reared, but not enough for replacement (cows in milk on the average for 2½ years).

After introductory sections on the soils and climate of the region and the distribution of the different types of herd, a detailed analysis is made

of farm practices: crops grown for fodder, proportion of land devoted to these, pasture and its management, fodder conservation and purchased feeds. The economics of the different systems is discussed. Finally, feeding practices are described and a number of typical rations are given and others are suggested. The results are presented in 63 tables, 28 diagrams and 4 maps, and the summary occupies 5 pages.—W. M. Deans.

2911

KHISHIN, S. S. and EL-ISSAWI, H. F. The Jersey in Egypt. *Empire J. Exp. Agric.*, 1954, 22, 121-127. [Dept. Animal Husb., Fac. Agric., Ibrahim Univ., Shebin el Khom, Egypt.]

The performances of pure and grade Jersey cows under Egyptian conditions were compared. The grades were obtained by using a Jersey bull on native cows and back-crossing the F₁ generation to Jersey bulls to obtain higher grades. Data from 155 lactations of 34 pure Jersey cows and from 141 lactations of 31 grade Jersey cows were used.

Milk production of both types was found to be superior to that of native cattle when the average lactation yield of a well managed group of native cattle was taken to be 3000 lb. Total milk yield, 305-day yield and 70-day yield of the F₁ Jersey × native crosses approached that of the pure Jerseys. Length of lactation increased as the amount of Jersey blood increased. The breeding efficiency of both pure and grade Jerseys was high. The performance of the animals used in this study was superior to that of Friesians, Shorthorns and their grades as reported by other investigators. It was concluded that crossing the native cattle with Jerseys was more beneficial than with Friesians or Shorthorns.—J. N. Aitken.

2912

LENKETT, W. Zur Calcium-Phosphorversorgung während der Laktation. [Supply of calcium and phosphorus during lactation.] *Arch. Tierernährung*, 1954, 4, No. 4, Beihefte, 11-18. [Inst. Tierphysiol., Univ. Göttingen.]

The Ca and P requirements of dairy cows are discussed in relation to the mineral reserves. It is estimated that in a cow of 500 kg. bodyweight, with total body Ca and P stores of about 8500 and 4500 g., about 17.4 and 17.7 per cent. of these amounts may be regarded as mobilisable reserves. With 50 per cent. utilisation of feed Ca and P the gross requirements are estimated to be 30 to 32 g. Ca and 20 to 25 g. P daily for maintenance and 2.5 g. Ca and 1.8 g. P for each kg. milk of 4 per cent. butterfat. For practical purposes values of 5 to 6 g. Ca and 4 to 5 g. P per 100 g. digestible crude protein of the ration are suggested.

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The feeding of dairy cows on 8 farms in South Hanover was studied, on 5 of these farms for a year. Crude protein, starch equivalent, Ca, Mg, P, K and crude fibre values are tabulated. All the rations supplied ample Ca on the basis discussed above, but few supplied enough P, in spite of the relatively high P content of the concentrates used. The values were usually about 2.4 to 3.5 g. P per 100 g. digestible crude protein. A mineral mixture with a Ca:P ratio of about 1.5:1 is recommended.—D. Duncan.

2913

HARRIS, L. E., STODDARD, G. E., GREENWOOD, D. A., SHUPE, J. L., BATEMAN, G. Q. and BINNS, W. Effects of feeding various levels of fluorine, defluorinated phosphate and grain to dairy heifers. *J. Animal Sci.*, 1954, **13**, 986. *Proc.* [Utah Agric. Exp. Stat.]

2914

ASKER, A. A., RAGAB, M. T. and HILMY, S. A. Longevity in Egyptian cattle and buffaloes. *Indian J. Dairy Sci.*, 1954, **7**, 135-138. [Dept. Animal Breeding, Fac. Agric., Univ. Cairo, Giza.]

2915

LINKOUS, W. N., HARDISON, W. A., GRAF, G. C. and ENGEL, R. W. Fecal chromic oxide concentration in 12 dairy cows as related to time and frequency of administration and to feeding schedule. *J. Animal Sci.*, 1954, **13**, 1009. *Proc.* [Virginia Agric. Exp. Stat.]

See also Abst. 2455.

REPRODUCTION

2916

RICE, F. J., KELLEY, A. M. and LASLEY, J. F. Length of gestation in Hereford cows and its relation to performance. *J. Animal Sci.*, 1954, **13**, 961-962. *Proc.* [Univ. Missouri.]

2917

JOUBERT, D. M. The influence of high and low nutritional planes on the oestrous cycle and conception rate of heifers. *J. Agric. Sci.*, 1954, **45**, 164-172. [Sch. Agric., Univ. Cambridge.]

This investigation was made with heifers of the Shorthorn, Afrikaner, Friesian and Jersey breeds. Within each breed the heifers were divided into related pairs of the same age. Some of the pairs were dizygotic twins. One member of each pair was reared on a continuous high plane of nutrition and received supplementary feeding during winter when the supply of nutrients from natural pasture was insufficient for their needs. The other members of each pair were maintained on natural pasture and received no supplement. The Afri-

kaner and Shorthorns were treated as beef types and the Friesian and Jersey as dairy types. Within each type all animals received the same treatment after calving. Sexual activity was studied by recording oestrus data. There was no significant difference between high- and low-plane animals in the length of the dioestrous cycle. Friesian heifers tended to have longer cycles than those of the other breeds. In both groups 95.6 per cent. of the cycles fell within the normal range of 17 to 23 days.

The majority of the high-plane heifers reached sexual maturity in winter; 85.7 per cent. of the low-plane heifers came on heat for the first time in the summer. Onset of puberty in the low-plane groups was delayed on the average by 9.6 months. Even after puberty was reached low-plane animals tended to show anoestrus during subsequent winters. After calving high- and low-plane beef type animals required, respectively, 266 and 414 days before resuming normal sexual activity. High-plane dairy type heifers showed oestrus approximately 3 months after calving; the low-plane heifers required a slightly longer interval. Conception rates of the low-plane heifers were better than those of the high-plane.—J. N. Aitken.

2918

FLIPSE, R. J. and ALMQUIST, J. O. Effect of dehydrated young grass as a supplement in dry lot feeding on the reproductive efficiency of dairy bulls. *J. Dairy Sci.*, 1954, **37**, 1123-1127. [Dairy Cattle Breeding Res. Centre, Pennsylvania State Univ., State College.]

The substitution of 2 lb. dried grass meal for a similar quantity of hay in a hay and concentrate ration had no effect on the reproduction performance of bulls as measured by the 60 to 90-day non-returns to first service, semen volume, spermatozoa numbers and initial motility.—J. L. Corbett.

2919

DYER, I. A., OLIVE, F. R. and NUNEZ, E. A comparison of elephant, para, pangola and guinea grass pastures for native and Native × Brahman yearling bulls. *J. Animal Sci.*, 1954, **13**, 1007-1008. *Proc.* [Centro Nac. Agronom., El Salvador.]

2920

CARNEIRO, G. G. and LUSH, J. L. Reproductive rates and growth of purebred Brown Swiss cattle in Brazil. *J. Dairy Sci.*, 1954, **37**, 1145-1157. [Dept. Animal Husb., Iowa State Coll., Ames.]

Data for this study were obtained from the Brazilian Brown Swiss Herd Book and from detailed records kept at 5 state experimental or demonstration farms. In Brazil the cattle are

reared almost wholly on grass. The general practice is to hand-feed only during the dry season. The feeds consist of silage, grass hay, chopped sugar cane and small amounts of concentrates. The general standard of management is low.

At 2 of the publicly owned farms 80 per cent. of the calvings occurred during the dry season. At the other 3 farms the cows were mated to calve at all seasons. Herd book records showed that of 863 purebred calves born 52.1 per cent. were males. Mortality records showed that 40 to 50 per cent. of the calves born did not reach breeding age. The most important causes of death were abortion, stillbirths, tick fever, pneumonia, congenital debility and foot-and-mouth disease.

Sires and dams were 61.5 and 77.3 months of age, respectively, when their offspring were born. From this the generation interval was calculated to be 5.75 years. The annual replacement rate for cows was 21 per cent. The average age of heifers at first calving was 44 months. The growth rates of Brazilian Brown Swiss were below the generally accepted U.S. standard.—J. N. Aitken.

2921

JOHANSSON, I. An analysis of data from the Danish bull progeny testing stations. *Ztschr. Tierzücht. Züchtungsbiol.*, 1954, 63, 105-126. [Inst. Animal Breeding, Royal Agric. Coll., Sweden.] German summary.

This paper is based on the data from Danish bull progeny testing stations over several years, relating to the progeny of 174 Danish Red bulls. The efforts made to reduce environmental differences are described, but in spite of these, differences between years and stations account for large proportions of the differences between groups with respect to bodyweight, milk yield and butterfat percentage. It is suggested in this connection, referring to an analysis made of weight: girth index, that probably the largest error in the Danish progeny test is due to differences in the nutritional status of the groups on their arrival at the stations.

It is also pointed out that the method of comparing bulls directly on the performance of their daughters, without reference to their dams, may be misleading if there has been selection of the daughters to make up the progeny groups; this is

particularly true of selection with respect to their dams' butterfat percentage. This appears to be present to a certain extent.

The question of selection of the bulls also arises in considering whether the 174 tested can be considered a random sample of the breed. The high variability between progeny groups tested in the same year, and at the same station, does not indicate any selection of the bulls on the basis of their ancestors' performances. The lack of correlation between butterfat yield of the bulls' dams and of their daughters further indicates that effect of bull selection on variation in yield between progeny groups may be neglected.

Analyses of bodyweight and the yield of 250 days' lactation indicate that bodyweight, milk yield, butterfat percentage and butterfat yield are heritable characteristics. The degree of heritability of milk and butterfat yield are higher than the results obtained from field data. While some of this is considered to be due to the standardisation of environment mentioned above, it is felt that the results here may have been exaggerated somewhat by including differences due to nutritional status on arrival along with the true genetic differences between progeny groups. The magnitude of this error cannot be estimated.

In addition, it was found that the better the state of nutrition at calving, then the higher would milk and butterfat yield be, on the average. On the other hand, the best milkers lost most weight during lactation, and vice versa.

Finally, it was demonstrated that it was almost twice as efficient to test bulls simultaneously at the same station as to do so in different years and at different stations.—A. W. Boyne.

2922

STONAKER, H. H. Observations on reproduction, growth, feed utilization and grades of inbred and outbred Hereford cattle. *J. Animal Sci.*, 1954, 13, 963. *Proc. [Colorado Agric. and Mech. Coll.]*

2923

CARMAN, G. M. Interrelations of milk production and breeding efficiency in dairy cows. *J. Animal Sci.*, 1954, 13, 956. *Proc. [Iowa State Coll.]*

SHEEP

2924

CHARLET-LERY, G., LEROY, A. M. and ZELTER, S. Z. Élevage artificiel de l'agneau précocement sevré. Essai de détermination de ses dépenses de croissance. [Artificial rearing of the prematurely weaned lamb. Estimation of growth

requirement.] *Ann. Zootech.*, 1954, 3, 169-187. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

In 2 experiments 12 purebred Île-de-France lambs were used, 4 males and 2 females in each experiment. Each animal was a twin and the

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other twin was left with the ewe, though it could not serve as control because it now received more than the usual amount of milk. In the first experiment the 6 lambs, born between 3 and 16 November, were gradually weaned in the first week of December and studied until they were 82 days old. The other group, all born on 17 April, were weaned abruptly when 17 days old and studied until 100 days. The diet which replaced the ewe's milk consisted of chopped alfalfa hay of excellent quality and a granular concentrate mixture containing, per cent., barley 48.4, oats 11.4, bran 7.6, linseed cake 9.1, soya bean cake 5.3, dried distiller's yeast 7.6, dried skimmed milk 7.6 and salt mixture 3. Towards the end of the experiment the lambs received soaked beet pulp. In the first experiment the concentrate ration was mixed with 25 per cent. rolled oats during the week of weaning, to reduce the protein intake. Vitamins A and D were given separately by mouth.

There was no digestive upset. Growth was retarded in the first 2 weeks and the lambs weaned abruptly even lost a little weight, but after this it was not significantly slower than the recorded mean for the breed.

The initial setback was much worse in the males than in the females, and it is recommended that males intended for breeding should not be weaned prematurely.

Group digestibility trials made in the second experiment indicated that the growth requirements of these lambs were of the same order as those of normally fed lambs.—D. Duncan.

2925

LARGE, R. V. and TAYLER, J. C. *Studies on the growth of Clun lambs.* *Empire J. Exp. Agric.*, 1954, 22, 141-147. [Grassland Res. Inst., Hurley, Berks.]

Weights of 54 Clun lambs and skeletal measurements of 36 of these were recorded from birth to 20 weeks of age. Ram singles were heavier and of greater skeletal size than ewe singles at birth and 20 weeks. Ram twins were heavier than, but almost the same size as, ewe twins. From birth to 20 weeks, late maturing parts increased greatly in size: width of hooks 139 per cent., depth of chest 86 per cent., length of pelvis 93 per cent. and width of hips 98 per cent. Early maturing parts such as length of hind cannon and circumference of fore cannon increased by 44 and 34 per cent., respectively. Ewe lambs tended to reach better conformation at an earlier age than wethers. Sixteen of the lambs were reared on a low-plane diet indoors and the ratio

$$\frac{\text{width of hooks}}{\text{length of hind cannon}} \times 100$$

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shows the effect of this on conformation at 20 weeks. [Width of hooks is the horizontal distance between the 2 *tuber coxae* of the pelvis and length of hind cannon the distance between the condyles of the metatarsals and the posterior end of the heel bone.] The ratio in the low-plane lambs increased from 48 at birth to 76, compared with an increase of 45 to 81 in the high-plane.—J. C. Gill.

2926

WILLIAMS, S. M. *Fertility in Clun Forest sheep.* *J. Agric. Sci.*, 1954, 45, 202-228. [Univ. Coll. Wales, Aberystwyth.]

Fertility of Clun sheep was recorded in a 2-year detailed study of 3 flocks under different conditions of environment and management, with fertility and management statistics from over 100 flocks. In 1950 barrenness in ewes was 3.5 per cent., tending to be highest in small flocks, and in ewe lambs 43.8 per cent., rising with flock size. Including abortions the figures were 4.6 and 51.4 per cent., respectively. In 1951 barrenness in ewes was 3.3 per cent. and in ewe lambs 32.1 per cent. Multiple births in all flocks for the 2 years were as follows: twins 52.5 and 58.7 per cent. in ewes, 12.7 and 28.9 per cent. in ewe lambs; triplets in ewes 3.9 and 6.7 per cent. There was a highly significant correlation between percentage of twins in 1950 and in 1951 and between percentage triplets in 1950 and 1951 for ewes but no significant correlations between twinnings in successive years for ewe lambs. In ewes' lambs, mortality showed much more seasonal variation than flock variation. In ewe lambs' lambs the opposite was the case. There appeared to be a negative correlation between flock size and flock fertility. Flushing affected the fertility of ewes but not of ewe lambs. It did not affect barrenness. The most important fertility component in influencing lambing percentage in ewe lambs was barrenness, and in ewes, percentage twins. In most Clun flocks no selection of ewe lambs before mating is made, and although this early breeding tends to depress subsequent fertility it does not affect the liveweight of the ewe lambs and has resulted in a certain amount of selection for earlier sexual maturity and greater fertility.—J. C. Gill.

2927

SLEN, S. B. and WHITING, F. *Further observations on the effect of source of protein on the lamb and wool production of mature range ewes.* *J. Animal Sci.*, 1954, 13, 999. *Proc.* [Alberta Exp. Stat.]

2928

RICHARD, R. M., LIGHT, M. R., BOLIN, D. W., DINUSSON, W. E. and BUCHANAN, M. L.

- Protein requirements of pregnant ewes. *J. Animal Sci.*, 1954, 13, 997. *Proc.* [N. Dakota Agric. Coll.]
- 2929
REPP, W. W., HALE, W. H. and BURROUGHS, W. The value of several non-protein nitrogen compounds as protein substitutes in lamb fattening rations. *J. Animal Sci.*, 1954, 13, 997. *Proc.* [Iowa State Coll.]
- 2930
MAGRUDER, N. D. and KNOTT, C. B. *In vivo* utilisation of non-protein nitrogen by sheep. *J. Animal Sci.*, 1954, 13, 1025. *Proc.* [Pennsylvania State Univ.]
- 2931
BENTLEY, O. G., HERSHBERGER, T. V., KUNKLE, L. E. and BELL, D. S. The nutritive value of acetate, propionate, and lactate for lambs. *J. Animal Sci.*, 1954, 13, 976-977. *Proc.* [Ohio Agric. Exp. Stat.]
- 2932
CATE, H. A., LEWIS, J. M., WEBB, R. J., MANSFIELD, M. E. and GARRIGUS, U. S. The effect of pelleting rations of varied quality on feed utilization by lambs. *J. Animal Sci.*, 1954, 13, 979. *Proc.* [Univ. Illinois.]
- 2933
TREFT, C. W., TILLMAN, A. D., SIENY, R. J. and MACVICAR, R. The effect of alfalfa ash and certain of its mineral constituents on the utilization of cottonseed hulls by sheep. *J. Animal Sci.*, 1954, 13, 1001. *Proc.* [Oklahoma Agric. Exp. Stat.]
- 2934
WOOLFOLK, P. G., THOMPSON, C. M. and GRAINGER, R. B. Alfalfa silage preserved by various methods for pregnant-lactating ewes. *J. Animal Sci.*, 1954, 13, 1014. *Proc.* [Univ. Kentucky.]
- 2935
HATFIELD, E. E., GARRIGUS, U. S. and NORTON, H. W. Antibiotic supplements in rations for growing and fattening lambs. *J. Animal Sci.*, 1954, 13, 715-725. [Dept. Animal Sci., Univ. Illinois, Urbana.]
Aureomycin hydrochloride added to rations in 3 feeding trials with 190 lambs improved average daily gains by 0.055 ± 0.014 lb. Feed efficiencies and carcass grades were higher in the aureomycin groups than in the controls. A supplement of Aureofac proved almost as effective as aureomycin hydrochloride; supplements of TM-5 (terramycin and P-2 (diamine penicillin) did not significantly improve performance over that of the controls. Enterotoxaemia was not eliminated by giving aureomycin hydrochloride at the rate of 7.2 mg. per lb. ration.—J. C. Gill.
- 2936
JORDAN, R. M. Lamb responses to antibiotics and pelleted rations. *J. Animal Sci.*, 1954, 13, 1009. *Proc.* [S. Dakota State Coll.]
- 2937
MURPHREE, R. L., CANNON, C. L., ODOM, J. A. and HOBBS, C. S. The influence of sex hormones on the fattening of utility and cull spring lambs. *J. Animal Sci.*, 1954, 13, 1027. *Proc.* [Univ. Tennessee.]
- 2938
TAYLOR, B., HALE, W. H. and BURROUGHS, W. Some effects of adding synthetic androgens to the fattening ration of ewe lambs. *J. Animal Sci.*, 1954, 13, 1032-1033. *Proc.* [Iowa State Coll.]
- 2939
BELL, T. D., SMITH, W. H., ERHART, A. B. and HOLLAND, L. A. The effect of stilbestrol and stilbestrol-progesterone implants upon the feed lot performance, carcass qualities, and reproductive organs of ewe and wether feeder lambs. *J. Animal Sci.*, 1954, 13, 966-967. *Proc.* [Kansas State Coll.]
- 2940
HALE, W. H., STORY, C. D., CULBERTSON, C. C. and BURROUGHS, W. Responses of lambs fed varied levels of diethylstilbestrol. *J. Animal Sci.*, 1954, 13, 985. *Proc.* [Iowa State Coll.]
- 2941
LUTHER, H. G., ADAMS, C. R., DOWNING, H. E., REYNOLDS, W. M. and HAWLEY, G. E. Steroids in lamb fattening. *J. Animal Sci.*, 1954, 13, 1025. *Proc.* [Chas. Pfizer and Co., Inc.]
- 2942
BROWNIE, W. M. The wintering of Blackface mountain ewe lambs. *Brit. Vet. J.*, 1954, 110, 447-459. [Dept. Res., Div. Vet. Sci., Boots Pure Drug Co., Ltd., Thurgarton, Notts.]
The performance of 24 Blackface ewe lambs wintered off the farm on lowland grassland from October to April was compared with that of a similar group wintered on unimproved hill grazings. The lambs wintered away gained 6.8 per cent. in weight and the home wintered lambs lost 14.8 per cent. over the 6-month period. Both groups

were run on the hill grazing from April to November and at the end of this period there was no significant difference in weight between the groups. The 7 lightest sheep of the group wintered away were, however, significantly heavier ($P < 0.05$) than the 7 lightest of the home wintered group. An inverse relation was found between the original weight of the lambs wintered away and their weight gain during the winter. There was a difference of only 7 per cent. in fleece weight in favour of the lambs wintered away. It is suggested that it might be of advantage to winter away only the lightest lambs and at least 15 per cent. weight increase is required to raise the average size of the lambs wintered away permanently above that of those wintered on the hill.—J. C. Gill.

2943

MEHROTRA, P. N., MULLICK, D. N. and KEHAR, N. D. Seasonal variations in the feed and water intake of sheep. *J. Animal Sci.*, 1954, 13, 1026-1027. *Proc.* [Indian Vet. Res. Inst.]

2944

ASKER, A. A., RAGAB, M. T. and BASTAWISY, A. E. Effect of season of lambing on body weight and measurements of lambs in Egypt. *Indian J. Vet. Sci.*, 1954, 24, 137-142. [Dept. Animal Breeding, Fac. Agric., Giza, Egypt.]

Seventy-three lambs of the Rahmani and Ossimi breed born between October and March proved superior in all respects to 67 lambs born during summer. Differences in both weight and body measurements at birth and weaning were statistically significant. These findings are explained by the fact that the ewes lambing during winter are in better condition before lambing time and thereafter than those lambing in summer.

J. C. Gill.

2945

DASSAT, P. and MASON, I. L. Heritability of milk yield in sheep. *Caryologia*, 1954, pp. 5. [Osservatorio di Genetica Animale, Turin.]

An investigation involving 3 Upper Visso flocks totalling 212 dam and daughter pairs showed the heritability of milk production in sheep to be about 30 to 35 per cent. Consistency of milk yield was judged by the correlation between first and second lactations of the same ewe, which was found to be 0.68. Yields of dams were on the average 70 kg. per lactation.—J. C. Gill.

2946

MASON, I. L. and DASSAT, P. Milk, meat and wool production in the Langhe sheep of Italy. *Ztschr. Tierzücht. Züchtungsbiol.*, 1954, 62, Vol. 25, No. 2

197-234. [Inst. Animal Genetics, Edinburgh.] German summary.

A study of the heritability of economic characters and recommendations on breeding methods for their improvement is reported. The chief products are surplus lambs and milk; the average milk yield in 442 recorded lactations with a mean length of 250 days was 231 kg. The main feeds are roadside and other rough grazing in summer, and hay, vine haulms and straw in winter when the sheep are housed.—J. L. Corbett.

2947

RENDEL, J. De viktigaste produktionssegenskaperna hos får-variation och nedärvning. [The most important characteristics relating to productivity in sheep, their variation and inheritance.] *Kgl. Lantbruksakad. Tidskr.*, 1954, 93, 282-319. [Lantbrukshögsk. Inst. Husdjursgenetik.] English summary.

The review is in 3 main sections, reproduction, birthweight and growth of the lamb and yield and quality of wool. Points discussed under the first are: the time and length of the reproductive season, the reproductive cycle, duration of pregnancy, fertility and milk production. Fertility depends on the proportion of infertile ewes, which is high in the first year and averages about 5 or 6 per cent. in later years. The number of lambs born depends chiefly on the age of the ewe, her weight, her food supply, and her genetic make-up. Apart from inheritance the progress of lambs depends on birthweight and milk supply, and the yield and quality of wool depend also on feeding and age.—I. Leitch.

2948

JAYARAMAN, S. and MAHAL, G. S. Relationship of clean wool yield with body weight and body size in Bikaner ewes. *Indian J. Vet. Sci.*, 1954, 24, 143-150. [Govt. Livestock Farm, Hissar.]

In a trial with 341 Bikaner ewes ranging from yearlings to 7-year-old ewes significant positive correlations were found between bodyweight and clean wool yield (adults 0.257, yearlings 0.587) and between body size (length \times chest girth) and clean wool yield (adults 0.225, yearlings 0.201). It is concluded that selection of replacement stock at 15 to 18 months for bodyweight will lead to higher wool yields.—J. C. Gill.

2949

LABBAN, F. M. The effect of orally administered L-thyroxine on fleece growth in sheep. *J. Endocrinol.*, 1954, 11, v-vi. [Sch. Agric., Univ. Cambridge.]

- 2950
HULET, C. V., EL-SHEIKH, A., POPE, A. L. and CASIDA, L. E. The effects of shearing and level of feeding on fertility in sheep. *J. Animal Sci.*, 1954, 13, 1022-1023. *Proc.* [Univ. Wisconsin.]
- 2951
EPSTEIN, H. The fat-tailed sheep of Arabia. *Ztschr. Tierzücht. Züchtungsbiol.*, 1954, 63, 381-396. [Jerusalem.]
- The sheep of Arabia are of 2 types: a short-haired fat-rumped type and a fat-tailed type which

is now restricted to the north and centre of the Peninsula. There are 2 breeds, Nejd and Hejáz. The Nejd sheep from the central steppe and desert weigh about 42 (rams) or 40 (ewes) kg., or in the poorest areas as little as 35 kg. A well fed ram may weigh 75 kg. Dressing percentage is 35 to 40 and the mutton is of poor quality. The Hejáz sheep weigh even less, 32 or 30 kg., but they fatten readily, to produce mutton of poor quality with the fat in compact layers. The fleece is hairy, in the Hejáz silky, but not wool. [Yield of fleece is not given.]—I. Leitch.

See also Abst. 1908.

PIGS

- 2952
PEO, E. R. (JR.), ASHTON, G. C., SPEER, V. C. and CATRON, D. V. Protein and fat requirements of baby pigs. *J. Animal Sci.*, 1954, 13, 995. *Proc.* [Iowa State Coll.]
- 2953
ALLEN, A. D. and LASLEY, J. F. Influence of season of birth on growth rate and survival of pigs. *J. Animal Sci.*, 1954, 13, 955. *Proc.* [Univ. Missouri.]
- 2954
McMILLAN, F. A. and WALLACE, H. D. Palatability studies on creep feed formulations for suckling pigs. *J. Animal Sci.*, 1954, 13, 993-994. *Proc.* [Florida Agric. Exp. Stat.]
- 2955
REYNOLDS, W. M., PENDERGRASS, G. P. and LUTHER, H. G. Antibiotics and method of feeding for baby pigs. *J. Animal Sci.*, 1954, 13, 997. *Proc.* [Chas Pfizer and Co., Inc.]
- 2956
STEVENSON, J. W., ELLIS, N. R. and DAVEY, R. J. Effects of gestation and lactation diets on livability of pigs. *J. Animal Sci.*, 1954, 13, 1000-1001. *Proc.* [U.S. Dept. Agric.]
- 2957
WUSSOW, W. and WIENIGER, J. H. Die Ausbildung des Magen- und Darmkanals beim Schwein unter dem Einfluss verschiedenartiger Ernährung und die Beziehungen zur Futerverwertung. [Development of the stomach and intestinal canal in the pig as affected by diet and in relation to feed utilisation.] *Arch. Tierernähr.*, 1954, 4, No. 4, Beihefte, 151-181. [Inst. Tierzucht, Martin Luther Univ., Halle, Wittenberg.]

Lehmann (1919) initiated the theory that the ability of pigs to use more fibrous feeds efficiently may be improved by increasing the intestinal capacity by accustoming them early to "ballast". Literature since Lehmann is briefly reviewed. A modified form of the theory is that a diet chiefly of animal feedingstuffs would give a relatively well developed small intestine and an underdeveloped large intestine and a diet of plant feeds the reverse.

In all, 130 pigs were fed and slaughtered in this study, 9 as they attained the weight of 30 kg. on a sucking-pig ration of barley meal and steamed potatoes with fishmeal and yeast; and 30 pigs as they reached the weight of 130 kg. They were of 3 breeds, Veredeltes Landschwein, deutsches Edelschwein and Cornwollschwein. Of the larger group 11 were reared on barley to appetite and meatmeal; 11 on 850 g. barley, meatmeal, and potatoes to appetite; and 8 on 400 g. barley, meatmeal, 2 kg. potatoes, and rye bran to appetite.

The techniques used to measure the intestines are described; for the small intestine length and weight; for the large, weight and volume measured with air.

The results are presented in 5 tables, of which the last is a summary. With the diets in the order barley, potato, bran, the average daily intakes in g. were: ballast 416, 209 and 516; dry matter 2386, 2325 and 2200; total nutrients 1911, 2018 and 1548. The chief measurements of the gut, means in the order of diets above, were: weight of stomach in g. 859, 934 and 950, small intestine 1583, 1862 and 2414, and large intestine 2110, 2082 and 2905; volume of large intestine in litres 9.54, 10.63 and 16.27.

No difference was found between the breeds. The conclusions are that weight and volume of the intestine can be increased by bulky diet and that, if the pigs did not succeed in getting the same amount of nutrients from bran as from barley and potatoes or barley alone, they got more than

if they had not been "accustomed" to bran. Experiments are in progress to show whether still earlier feeding with bran would improve its use.

I. Leitch.

2958

STORZ, H. Stickstoff- und Schwefelansatz nach reiner Gerstenfütterung bei wachsenden Schweinen, ermittelt durch 10-tägige, in Zeitabschnitten wiederholte Bilanzversuche im Ablauf der Mastzeit. [Retention of nitrogen and sulphur on a diet of barley alone by growing pigs, estimated in 10-day balance experiments at intervals during fattening.] *Arch. Tierernährung*, 1954, 4, No. 4, Beihefte, 38-50. [Inst. Tierphysiol., Univ. Kiel.]

Two littermate Landrace barrows (castrated males) were used for nine 10-day balance trials during 224 days. At first they received barley meal and bran, later barley meal alone, except for 15 days when some fishmeal was added. S and N balances are tabulated.

The mean S : N ratio in the ration was 1 : 11.17 ; the ratios retained by the 2 pigs were 1 : 10.87 and 1 : 11.14, respectively. The percentage N retention tended to rise in the course of the experiment. There was no better utilisation of protein in the period when fishmeal was given.

The results are considered to show that short term N balances are of little value for the study of N metabolism.—D. Duncan.

2959

COEY, W. E. and ROBINSON, K. L. Some effects of dietary crude fibre on live-weight gains and carcass conformation of pigs. *J. Agric. Sci.*, 1954, 45, 41-47. [Queen's Univ., Belfast.]

Five experiments are described, the general object being to study the effects of dietary fibre on carcass conformation independently of its effects through changes in growth rates. In experiments 1 and 1A diets containing 3.5 and 5.5 per cent. of crude fibre were given to pigs on 2 planes of energy intake. Within each plane the effect of fibre on digestibility was compensated for by giving the diet higher in fibre according to a higher scale. In experiments 2, 3 and 4 the "low-fibre diets" contained 3.5 per cent. crude fibre and the high-fibre diets given before and after 150 lb. liveweight contained 8 or 9 and 11.5 or 11.0 per cent. crude fibre, respectively. In these 3 experiments the pigs were on one plane of energy intake ; there was a negative control where the high- and low-fibre diets were fed at the same rate.

In experiments 1 and 1A the small difference between the high- and low-fibre levels caused no significant difference in most carcass measurements, although there were carcass differences between pigs on the 2 planes of nutrition. Pigs

on the high fibre diets had the lower killing-out percentages.

In experiments 2, 3 and 4 pigs fed on the high-fibre diet but on the same level of feeding as others on the low-fibre diet had, in comparison, thinner backfats and lower killing-out percentages. They grew more slowly, and the thinness was, in part, a reflection of slow growth, and the lower killing-out percentage a reflection of younger physiological age. Pigs fed on the high-fibre diet but at the higher rate and therefore on the same plane of energy nutrition as the pigs on the low-fibre diets also had, in comparison, thinner and softer backfat and lower killing-out percentages. These could not have been a reflection of slower growth or younger physiological age. In this case it is suggested that the lower killing-out percentage was due to greater development of gut size in order to deal with the greater bulk of fibre, and that the thinner backfat was in part related to the lower carcass weight.

Raising the level of dietary crude fibre thus caused a change in the distribution of liveweight gains so that at the same slaughter weights pigs on the high-fibre diets had the heaviest offal and lightest dressed carcass weights.

Data from experiments 2 and 3 were recalculated to show the liveweight gains which pigs on the high-fibre diets would have made if their offal weights had been as low as pigs on the low-fibre diets. These calculated gains were much less than the observed gains and showed that the extra feed given to compensate for the fibre content of the diet was largely unremunerative.

I. A. M. Lucas.

2960

LASSITER, J. W., TERRILL, S. W., BECKER, D. E. and NORTON, H. W. Protein levels for pigs as studied by growth, self-selection and nitrogen retention. *J. Animal Sci.*, 1954, 13, 992. *Proc.* [Univ. Illinois.]

2961

DYER, I. A. and VELASQUEZ, A. Protein levels for pigs in the sub-tropics. *J. Animal Sci.*, 1954, 13, 982. *Proc.* [Centro Nac. Agronom., El Salvador.]

2962

SPEER, V. C., CATRON, D. V., ASHTON, G. C. and CULBERTSON, C. C. Protein requirements of growing-finishing swine on legume pasture. *J. Animal Sci.*, 1954, 13, 1012. *Proc.* [Iowa State Coll.]

2963

PFANDER, W. H. and TRIBBLE, L. F. Amino acid supplements for swine rations. *J. Animal Sci.*, 1954, 13, 996. *Proc.* [Univ. Missouri.]

2964

- BECKER, D. E., NESHEIM, M. C., TERRILL, S. W. and JENSEN, A. H. Factors in the formulation of a semi-synthetic diet for amino acid studies with the pig. *J. Animal Sci.*, 1954, 13, 975-976. *Proc.* [Univ. Illinois.]

2965

- MERTZ, E. T., HENSON, J. N. and BEESON, W. M. Quantitative phenylalanine requirement of the weanling pig. *J. Animal Sci.*, 1954, 13, 927-932. [Dept. Biochem., Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Twelve male pigs averaging 25 lb. were divided into 4 groups and fed individually for a 28-day experimental period. The basal diet was of maize, cerelose, 9 essential amino-acids, minerals, diammonium citrate, liver extract, terramycin and vitamins. It contained 12.6 per cent. crude protein, 0.23 per cent. phenylalanine and 0.14 per cent. tyrosine. Supplements of 0.09, 0.19 and 0.29 per cent. DL-phenylalanine were added to the diet of 3 of the groups. On the assumption that tyrosine replaces phenylalanine on a weight for weight basis the 4 groups thus received in their diets the equivalent of 0.37, 0.46, 0.56 and 0.66 per cent. phenylalanine, respectively. The daily liveweight gains of the groups were 0.55, 0.85, 0.80 and 0.76 lb. and the amount of feed eaten per lb. gain was 3.26, 2.75, 2.78 and 3.01 lb. These figures indicated that the phenylalanine requirement of the weanling pig is 0.46 per cent. of the ration.—I. A. M. Lucas.

2966

- STEPHENSON, E. L., NOLAND, P. R., MINER, J. J. and CLOWER, W. B. Methionine, lysine and tryptophan supplementation of growing fattening rations for swine. *J. Animal Sci.*, 1954, 13, 1000. *Proc.* [Univ. Arkansas.]

2967

- HAYS, V. W., CATRON, D. V., ASHTON, G. C., SPEER, V. C. and LIU, C. H. The utilization of non-protein nitrogen by growing-fattening pigs. *J. Animal Sci.*, 1954, 13, 987-988. *Proc.* [Iowa State Coll.]

2968

- PLUMLEE, M. P., THRASHER, D. M., BEESON, W. M., ANDREWS, F. N. and PARKER, H. E. The effects of a manganese deficiency on the growth and development of swine. *J. Animal Sci.*, 1954, 13, 996. *Proc.* [Purdue Univ.]

2969

- CHAPMAN, H. L. (Jr.), KASTELIC, J., ASHTON, G. C. and CATRON, D. V. A comparison of phos-

phorus from different sources for growing-fattening swine. *J. Animal Sci.*, 1954, 13, 979. *Proc.* [Iowa State Coll.]

2970

- STAHL, W. and LEMCKE, B. Futterbedarf und Schlachtleistung bei Schweinen mit verschiedenem Endgewicht. [Feed requirement and carcass yield in pigs of different slaughter weights.] *Arch. Tierernährung*, 1954, 4, No. 4, Beihefte, 240-255. [Inst. Tierzucht., Dummerstorf, Berlin.]

The 6 pigs were all of one litter and 84 days old when the experiment began. One pig (A) was fed to reach 300 kg., 2 (group B) to 150 kg. each and 3 (group C) to 100 kg.

Pig A received for a year a mixture of 10 parts fishmeal, 10 meatmeal, 10 dried yeast and 70 barley and oatmeal, increasing to 2 kg. daily and made up with roots and chaff or chopped green food to appetite. Fattening was completed with a ration of, per cent., barleymeal 57, potato flakes 38 and protein feeds 5, given to appetite.

Group 2 received for 112 days 0.5 kg. per head daily of the concentrate mixture first given to pig A, 1 kg. potato silage, and roots and chaff or green food to appetite. The concentrates were then increased to 1 kg. daily and potatoes were given to appetite. Group 3 received throughout the experiment 1 kg. concentrates per head daily and potatoes to appetite.

The final total weights of the 3 groups and the times taken to reach them were: pig A, 313 kg., 483 days; group B, 322 kg., 241 days; group C, 329.5 kg., 155 days. The mean daily weight gains were 591, 570 and 594 g.

Pig A gained during the experiment 10 kg. more than the other groups, but groups B and C consumed 73.4 and 65.8 per cent. of the total nutrients and 72 and 76 per cent. of the protein taken by pig A. For each 100 kg. weight gain the 3 groups required, respectively, 567.8, 418.0 and 372.3 kg. dry matter, 42.14, 31.55 and 33.14 kg. digestible protein, and 393.8, 298.9 and 268.2 kg. total nutrients. The total nutrients for production were most economically used by group C, least by pig A, but the most economical use of protein was made by group B and the least by pig A.

Details of the carcasses are given. The ratios of fat to lean in the 3 groups were A, 1:1.86; B, 1:2.36; and C, 1:2.74. For a unit of digestible protein the carcasses of groups B and C yielded 38 and 42 per cent. more fat-free meat than pig A, while for a unit of N-free feed they yielded 10 and 18 per cent. more fat. The value of rapid fattening is thus greatest when judged by carcass criteria and economy in feedingstuffs.—D. Duncan.

2971

PECHT, G. Untersuchungen über die Herstellung von Fischsilagen nach verschiedenen Verfahren und mit verschiedenen Zusatzmitteln sowie die Verwertung von Fischsilagen durch Mast-schweine mit besonderer Berücksichtigung der Schlachtqualität. [Preparation of fish silage by different processes and with different additions and utilisation of fish silage by fattening pigs with special reference to carcass quality.] *Arch. Tierernährung*, 1954, 4, 34-70. [Inst. Tierzucht., Univ. Kiel.]

The history of fish silage is briefly reviewed. Experimental silage was made in 14-litre jars with fish or fish refuse and the following amounts per 10 kg. fish were found to be minima: crude formic acid (85 per cent.) 154 ml., sulphuric acid (sp. gr. 1.84) 162 ml., molasses 500 g. with sulphuric acid 125 ml., and aureomycin 0.4 g. with formic acid 100 ml. Fine subdivision of the fish, to pass a 7-mm. sieve, gave improved quality with less acid. The storage temperature should be low. If the silage is to be used for foxes, the fish should first be steamed.

With sulphuric acid the pH of the silage may be as low as 2.8 and it should be neutralised with chalk. A.I.V. solution has the same disadvantage and is not recommended. Aureomycin alone is unsuitable on account of the growth of mould.

Feeding experiments were made with young pigs given fish silage with some cereals, and potatoes and beet to appetite, or fish silage with cereals to appetite; controls had fishmeal instead of silage. The first lot had commercial silage chiefly of herring refuse, and the pork and bacon tasted of fish even when the silage was left off 4 to 6 weeks before slaughter. The second was half of herring and mackerel waste and half of cod. There was no taste of fish. A white-fish silage was compared with white-fish meal and frozen white fish. The frozen fish was much too expensive and the silage was more expensive than fishmeal. The last experiment was with the amount of protein greatly reduced, to reduce the cost of pork. Rates of weight gain were not satisfactory.

A warning is added that herring refuse must not be used, unless it be for young stock or sows.

I. Leitch.

2972

KRÜGER, L. and HINRICHSSEN, J. K. Versuche zur Frage der Eiweissgaben, Eiweissformen und Ergänzungstoffe in der Schweinemast. [Experiments on levels of protein, types of protein and supplementary substances in pig fattening.] *Züchtungskunde*, 1954, 25, 141-150; 26, 13-35. [Inst. Tierzucht, Justus-Liebig-Hochsch., Giessen.]

Fattening trials with groups of 3 or 4 Veredeltes Landschwein or cross pigs, 390 in all, at Oberer

Hardthof between 1949 and 1953 are reported. Full details of the rations are given. The results were analysed statistically and are given in tables.

The first report covers 6 trials on basal rations of potatoes and sugar or high-sugar fodder beet, with different mixtures of cereals and fishmeal or other protein, and minerals. In the first 3 trials, the effects of halving the percentage of total protein which was of animal origin, generally by substituting soya grits for some of the fishmeal, or of omitting animal protein altogether, were tested. Complete omission gave poor weight gains and feed utilisation, but in trial 3 the group with 16 per cent. of the protein of animal origin did almost as well as that with 32 per cent. animal protein. In the last 3 trials different proteins were tested against fishmeal. Dried whey, equal parts of dried whey and dried buttermilk, or whey protein gave results comparable with those of fishmeal; the concentrate mixture included alfalfa meal to make up for the low vitamin A content of the milk residues. The general conclusions were that for safety animal protein should form from 30 to 35 per cent. of the total protein and that success in fattening depends on the proper balancing of the ration.

The second report covers 13 trials with rations based on cereals, potatoes and beet, or a mixture of these, in which vitamin B₁₂ by mouth or by injection, or fish solubles, or preparations containing vitamin B₁₂ and aureomycin, penicillin or terramycin, were given along with full or restricted rations, or with rations containing restricted amounts of animal protein or none. The results are summarised in 2 pages of diagrams as well as in tables. Among the findings were the following. Restriction of total feed to 80 per cent. of that freely consumed was economically advantageous. Vitamin B₁₂ alone was without effect. Fish solubles, 3 per cent., improved a potato-beet ration with 27 per cent. of the protein of animal origin so as to equal one with 46 per cent. animal protein. Similar results were obtained with combinations of vitamin B₁₂ and antibiotics; 20 mg. antibiotic plus 20 µg. vitamin B₁₂ per pig daily sufficed. There was no advantage in adding these supplements to rations high in animal protein; if animal protein exceeded 40 g. and total protein 200 g. daily, rate of gain and feed utilisation were determined by the basis of the ration and cereals were superior to potatoes and beet. There were slight breed differences in responses to the supplements.—W. M. Deans.

2973

KRÜGER, L. and BIEDERMANN, F. Hackfrucht-schnellmast unter Verwendung von Molkeneiweiss. [Rapid fattening on roots with whey protein.] *Futter und Fütterung*, 1953, No. 29,

pp. 4. [Inst. Tierzucht, Justus-Liebig-Hochsch., Giessen.]

A fuller account of the trials with whey protein already reported (see preceding Abst.). It was concluded that whey protein at about 11 DM. is competitive if fishmeal costs 64 DM. per dz.

W. M. Deans.

2974

FÉVRIER, R. Valeur alimentaire des levures. 2. Influence du mode de séchage de quelques levures de distillerie. [Food value of yeasts. 2. Effect of method of drying of some distiller's yeasts.] *Ann. Zootech.*, 1954, 3, 219-221. [Stat. Recherches Élevage, Jouy-en-Josas (S.-et-O.).]

The first paper was by Ferrier *et al.* (*Ann. Zootech.*, 1952, 1, No. 4, 1-10), and described the technique.

In the second experiment the pigs received 8 to 9 per cent. yeast, providing the same proportion of the N in each ration. Five yeast samples were compared. A molasses yeast dried at high temperature gave the best growth for the lowest feed consumption. Considerable differences in the riboflavin and vitamin PP contents of the yeasts were not reflected in the growth of the pigs.

D. Duncan.

2975

SEIDLER, S. Zastosowanie siana w tuczu mięsnym. [The use of hay in fattening pigs for bacon.] *Rocz. Nauk rol.* [B], 1954, 87, 411-433. [Inst. Zootech., Oddział Doświad. Żywni.] Russian and English summaries.

Sixty pigs were given a ration of skimmed milk, cereal and steamed potatoes. They were divided into 3 groups and given supplements of hay, 150 to 250, 200 to 500 or 300 to 700 g. daily. The hays were of 5 kinds, meadow, clover and alfalfa, and clover and alfalfa dried mechanically. Average daily increase in weight exceeded 500 g. in all groups and carcass analyses showed no difference between them. The average amounts of feeds consumed by the groups were: potatoes 238-57, 247-78 and 308-52 kg.; concentrates 149-97, 111-03 and 105-88 kg.; milk 230-07, 204-86 and 226-64 litres; hay 21-42, 34-53 and 51-80 kg., respectively. The data for the 2 higher rates showed that by giving hay and increasing the amount of potatoes, savings could be made in concentrates and milk. (From summary.)

D. Harvey.

2976

BIELIŃSKI, K. Zastosowanie suszu z cykorii w żywieniu bekonowym trzody chlewnej. [The use of dehydrated chicory in the fattening of pigs for bacon.] *Rocz. Nauk rol.* [B], 1954, 87, 435-448. [Inst. Zootech., Zakł. Doświad. Kółka Wielka.] Russian and English summaries.

Three groups each of 8 pigs were used. First a control group got a concentrate mixture containing from 34 to 38 per cent. potato flakes; for the second dried chicory formed 17 per cent. of the mixture and replaced half of the potato flakes; the third got no potato flakes and chicory constituted from 25 to 29 per cent. of the mixture. Average daily gains in weight for the groups were 729, 724 and 702 g., respectively, between which differences were not statistically significant. The amounts of digestible protein eaten per kg. weight gain were 468, 505 and 480 g. At slaughter no difference was found between the groups in carcass length, proportion of fat to lean, loin fatness or fat thickness.

The findings are of importance in view of the higher yield obtained per hectare from chicory than from potatoes. (From summary.)

D. Harvey.

2977

FOWLER, S. H. and ROBERTSON, G. L. Some effects of source of protein and an antibiotic on reproductive performance in gilts. *J. Animal Sci.*, 1954, 13, 949-954. [Dept. Animal Husb., Texas Agric. Exp. Stat., College Station.]

Four groups, each of five 3-month-old gilts, were self-fed on a ration of milo, ground limestone, salt and vitamin B₁₂ supplemented with either animal- and vegetable-protein feeds, or animal- and vegetable-protein feeds plus chloromycetin mycelial meal, or vegetable-protein feeds, or vegetable-protein feeds plus chloromycetin mycelial meal. All grazed on Sudan pasture at night. The gilts were served at their second oestrus and were slaughtered 25 days after breeding.

Gilts fed on animal-protein foodstuffs reached puberty 16-9 days earlier than those on vegetable proteins only. This difference was statistically significant. Gilts receiving chloromycetin reached puberty 3-9 days earlier than those receiving no antibiotic, but this difference was not significant. There was an indication that antibiotic had a greater effect in advancing puberty in the vegetable protein groups, but this interaction was not significant.

Gilts receiving animal protein shed on an average 0-9 more ova at second heat than those receiving vegetable protein, but the difference was not significant. The difference caused by the antibiotic was even smaller and not significant.

There were advantages of 0-5 in number of normal embryos in favour of animal protein as compared with vegetable protein, and 0-6 in favour of chloromycetin as compared with no antibiotic, but these differences were not significant.

There was little difference between sources of protein in the percentage of ova shed which resulted in normal embryos, but there was an

advantage of 12.5 per cent. in favour of gilts receiving chloromycetin. This difference was not significant but suggested a favourable effect of antibiotic.

There was no apparent detrimental effect of chloromycetin on the Hb values of gilts.

I. A. M. Lucas.

2978

HORVATH, D. J. and VANDER NOOT, G. W. Effect of three levels of a new antibiotic, tetracycline, in a swine ration. *J. Animal Sci.*, 1954, 13, 899-903. [New Jersey Agric. Exp. Stat., New Brunswick.]

Five groups each of 6 pigs were fed from weaning to slaughter at between 199 and 207 lb. average liveweight. The basal diet, given to the control group 1, was of maize, barley, soya bean oilmeal, meat scraps, alfalfa meal and mineral and vitamin supplements. Groups 2, 3 and 4 received the basal diet supplemented with 10.85, 15.03 and 19.21 g. tetracycline per ton, respectively. Group 6 received the basal diet supplemented with 18 g. chlortetracycline and 18 mg. vitamin B₁₂ per ton.

From about 45 to 100 lb. liveweight diets containing 15 g. tetracycline and 18 g. chlortetracycline resulted in a 3.3 per cent. increase in rate of gain over the controls. From 100 to 200 lb. liveweight group 3 pigs grew slightly faster than other groups receiving antibiotic, but 3 per cent. slower than the controls. Over the whole experimental period the fastest growth was by the controls, group 1. No difference in growth rate was significant at the 5 per cent. level.

For feed per lb. gain groups 1 and 6 were similar before 100 lb. liveweight, but supplementation with 15 g. tetracycline per ton of feed improved efficiency by 31 per cent. over the controls. From 100 to 200 lb. liveweight this level of tetracycline again promoted the most efficient growth, 5 per cent. better than the controls and 9 per cent. better than the chlortetracycline group. Over the whole experimental period 15 g. tetracycline per ton of feed promoted the most efficient growth, 6 per cent. better than the group given 19 g., 11 per cent. better than the controls, and 14 per cent. better than the chlortetracycline group.

It is suggested that the relatively rapid gains and lack of scouring in all groups indicated adequate nutrition and good health and precluded to some degree the possibility of stimulation of growth by antibiotic.—I. A. M. Lucas.

2979

BRIDGES, J. H., HALE, F., KUNKEL, H. O. and LYMAN, C. M. The effects of bacitracin, penicillin and arsenic acid on growth rate and feed efficiency in swine. *J. Animal Sci.*, 1954, 13, 912-917. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., College Station.]

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Two experiments are reported, each on 6 groups of 7 pigs which were housed individually and self-fed from weaning to about 200 lb. liveweight. The basal diet, given to group 1 in both experiments, was of milo, soya bean oilmeal, alfalfa meal, and supplementary minerals and vitamins. In experiment 1 the supplements added to each ton of basal diet were: group 2, 10 g. bacitracin; group 3, 10 g. bacitracin and 2 g. penicillin; group 4, 1 oz. arsenic acid; group 5, 5 g. bacitracin and 1 oz. arsenic acid; group 6, 10 g. bacitracin and 1 oz. arsenic acid. The treatments were the same in experiment 2, except that the supplement for group 5 was 2 g. penicillin.

In neither experiment did any supplement result in significantly faster growth, although in experiment 1 the 3 groups receiving arsenic acid all grew 5 per cent. faster than the controls and group 3 grew 14 per cent. faster than the controls. In experiment 1 all groups receiving bacitracin took less feed per lb. gain than the controls, but these differences were not significant. In experiment 2, groups 3, 4 and 5 took significantly less feed per lb. gain than the controls, the saving in all groups being at least 6 per cent.

After slaughter, estimations were made of the arsenic content of liver, kidney and muscle of 2 pigs from each control group and from each group receiving arsenic.

The accumulation of arsenic was greatest in the liver, and reached on the average 5.2 p.p.m. in pigs from experiment 2. If arsenic was withdrawn from the diet for 5 days before slaughter, liver values did not exceed 1.0 p.p.m.

I. A. M. Lucas.

2980

ROBINSON, K. L., COEY, W. E. and BURNETT, G. S. The use of antibiotics in the food of fattening pigs. *J. Sci. Food Agric.*, 1954, 5, 541-549. [Dept. Agric. Chem., Queen's Univ., Elmwood Av., Belfast.]

The results are summarised of several experiments made in Northern Ireland between 1951 and 1954. In these experiments growth responses to dietary antibiotics were small after 100 lb. liveweight, but there was usually a positive response before 100 lb. liveweight.

In the preliminary trials an all-vegetable diet and a diet containing fishmeal were given with and without 2 mg. procaine penicillin per lb. A feeding scale based on liveweight was followed, and although the antibiotic caused a 23 per cent. improvement in growth rate before 100 lb. liveweight on the all-vegetable diet and a 16 per cent. improvement on the fishmeal diet, it was thought that pigs on the vegetable-protein and animal-protein diets had been overfed and underfed, respectively.

The effects of scale of feeding on response to procaine penicillin were next examined. Before 100 lb. liveweight the growth response, as a percentage over the controls, was similar on 2 scales of feeding, although the low scale reduced the liveweight gains attainable. In this experiment the fishmeal diet was eaten more rapidly than the all-vegetable diet and the presence of dietary procaine penicillin increased the rapidity with which pigs ate both diets. When the ration was changed at 120 lb. liveweight and the pigs were deprived of both fishmeal and antibiotic there was a fall in appetite for a few weeks, but not if they were given either fishmeal or antibiotic.

In another experiment the removal of procaine penicillin from a fishmeal diet when the pigs reached 120 lb. liveweight caused a slight growth recession, but when Aurofac was removed from the diets of 2 pigs of this weight there was a marked growth check which was halted by the restoration of Aurofac to the diet. In this trial feed consumption during the first 4 weeks suggested that antibiotic stimulated growth more by inducing greater efficiency of feed utilisation than by increasing feed intake.

When pigs were self-fed on fishmeal diets dietary antibiotic did not stimulate appetite but the efficiency of feed utilisation was again better. When included in all-vegetable diets antibiotic did encourage increased food intake.

In one experiment there was no significant growth response to penicillin when included in a basal diet containing 10 per cent. fishmeal, but when 5 per cent. liver meal replaced half the fishmeal and when the basal ration was supplemented with vitamin B₁₂ there were positive growth responses to the antibiotic. These responses were not due to increased feed intakes.

When dietary procaine penicillin gave an early growth response but had little marked effect on overall growth rate it had no effect upon carcass quality, nor was there any effect on quality when Aurofac had produced a 30 per cent. response in overall weight gain.—I. A. M. Lucas.

2981

LASLEY, J. F., TRIBBLE, L. F. and HOGAN, A. G.
Value of antibiotics in swine rations. *Missouri Agric. Exp. Stat. Res. Bull. No. 543*, April 1954, pp. 55. [Columbia, Mo.]

The inclusion of antibiotics in maize and soya bean diets, supplemented with vitamins and minerals and self-fed in dry lot to weanling pigs until they reached 170 to 200 lb. weight, resulted in the following average percentage increases over the controls in growth rate and feed consumption per 100 lb. gain: aureomycin 17 and 9, procaine penicillin 10 and 3, chloromycetin 7 and 4, and streptomycin 5 and 7. The antibiotics were more

effective in stimulating growth rate during the early part of the feeding period, and smaller pigs responded more to antibiotic than heavier pigs, but it is suggested that this might be because smaller pigs are more susceptible to environmental conditions, and especially to infections.

Daily feed consumption was higher when antibiotics, other than streptomycin, were included in the diets, but this was probably due to the larger size of the pigs given antibiotic rather than to an increase in feed intake per unit of bodyweight.

When included in a maize and tankage ration, supplemented with minerals and vitamins, aureomycin resulted in increases in growth rate and feed conversion efficiency of only 3 and 6 per cent., respectively, while procaine penicillin resulted in no increase in growth rate but an 8 per cent. saving in feed.

When included in mineral- and vitamin-supplemented maize and soya bean diets, self-fed to pigs on pasture, the growth rate and feed conversion efficiency responses of 6 and 9 per cent., respectively, to aureomycin, and 0 and 6 per cent., respectively, to procaine penicillin in the diet were much less than when the diets were fed in dry lot. Also, when on pasture the antibiotic-fed pigs ate no more daily than the controls, unless they ate more forage.

In 2 experiments antibiotics were added to mineral- and vitamin-supplemented maize, soya bean and tankage diets containing either 18 or 12 per cent. crude protein. In the first experiment, when the pigs were scouring and unthrifty, the high-protein diet aggravated the scouring and the pigs on the low-protein diet grew faster. Aureomycin had the greatest beneficial effect when included in the high-protein diet. In the second experiment when there was no scouring, the situation was reversed, the high-protein diet being the better and aureomycin or procaine penicillin being more beneficial when added to the low-protein diet. Although pigs on the high-protein diet throughout the entire period of the experiment grew faster than others on the low-protein diet, feed conversion efficiency was better on the high-protein diet before 110 lb. liveweight and on the low-protein diet after 110 lb. liveweight.

I. A. M. Lucas.

2982

PERRY, T. W., BEESON, W. M. and ANDREWS, F. N. The effect of stilbestrol and testosterone on growth and carcass quality of swine. *J. Animal Sci.*, 1954, 13, 995–996. *Proc. [Purdue Univ.]*

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SEWELL, R. F., STRINGER, W. C. and CULLISON, A. E. An evaluation of cane molasses in

N.A. and E., April 1955

- swine rations with and without antibiotic supplementation. *J. Animal Sci.*, 1954, **13**, 998-999. *Proc.* [Univ. Georgia.]
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RUSSO, J. M., HANSON, L. E. and JEZESKI, J. J. The effect of aureomycin and arsanic acid on nitrogen balance in pigs. *J. Animal Sci.*, 1954, **13**, 998. *Proc.* [Univ. Minnesota.]
- 2985
SWENSON, M. J., BUCKNER, R. G., GOETSCH, D. D., AUBEL, C. E. and UNDERBERG, G. K. L. Growth of newborn pigs implanted subcutaneously with bacitracin pellets. *J. Animal Sci.*, 1954, **13**, 1032. *Proc.* [Kansas State Coll.]
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BOHMAN, V. R., HUNTER, J. E. and MCCORMICK, J. The effect of aureomycin upon utilization of graded levels of alfalfa by swine. *J. Animal Sci.*, 1954, **13**, 977. *Proc.* [Univ. Nevada.]
- 2987
GILLESPIE, L. and WALLACE, H. D. Ilotycin as a feed ingredient for growing-fattening swine. *J. Animal Sci.*, 1954, **13**, 984. *Proc.* [Florida Agric. Exp. Stat.]
- 2988
NOLAN, P. R., STEPHENSON, E. L. and MINER, J. J. The relationship of unidentified factors found in fish liver, fish solubles, and a fermentation product when added to an all-vegetable ration for growing and fattening swine. *J. Animal Sci.*, 1954, **13**, 994-995. *Proc.* [Univ. Arkansas.]
- 2989
DE ZEEUW, J. R., REYNOLDS, W. M., PENDERGRASS, G. P. and LUTHER, H. G. Unidentified growth factors in swine nutrition. *J. Animal Sci.*, 1954, **13**, 981. *Proc.* [Chas. Pfizer and Co., Inc.]
- 2990
GARD, D. I., TERRILL, S. W., BECKER, D. E., NORTON, H. W. and NALBANDOV, A. B. Sources of unidentified factors for the pig. *J. Animal Sci.*, 1954, **13**, 983. *Proc.* [Univ. Illinois.]
- 2991
BLUMER, T. N., BARRICK, E. R., BROWN, W. L., SMITH, F. H. and SMART, W. W. M. (Jr.) Influence of changing the kind of fat in the diet at various weight intervals on carcass fat characteristics of swine. *J. Animal Sci.*, 1954, **13**, 967. *Proc.* [N. Carolina Agric. Exp. Stat.]
- 2992
VERBEEK, W. A. Home-grown feeds in pig rations. *Farming in S. Africa*, 1954, **29**, 456-461; 472. [Coll. Agric., Potchefstroom.]
- 2993
TEAGUE, H. S. and ROBISON, W. L. The effect of ground sun-cured alfalfa on the dry lot re-productive performance of swine. *J. Animal Sci.*, 1954, **13**, 1001. *Proc.* [Ohio Agric. Exp. Stat.]
- 2994
HUTCHINSON, K. J. Further observations on the use of the Hammond system of pig carcass appraisal. *Queensland J. Agric. Sci.*, 1953, **10**, 207-213.
- Data were collected on body length, eye muscle thickness, backfat thickness and leg length of pigs from all Australian States, and regressions were calculated between these and carcass weights. There were differences between the regression coefficients calculated for the data from different States, but these were thought to be due partly to breed differences. In the appraisal of pig carcasses in Australia the corrections, used by Hammond, of scores based on certain carcass measurements for different carcass weights favour the lower carcass weight ranges. The data suggest that Hammond's "ideals" of backfat thickness in relation to weight need not be changed, but that in Australia his "ideals" for body length, thickness of eye muscle and leg length should be modified. The arguments for and against making these modifications are discussed.—I. A. M. Lucas.
- 2995
BRAUDE, R., CLARKE, P. M. and MITCHELL, K. G. Analysis of the breeding records of a herd of pigs. *J. Agric. Sci.*, 1954, **45**, 19-27. [Nat. Inst. Res. Dairying, Univ. Reading.]
- An analysis of data from 487 Large White litters born between 1934 and 1950 is reported.
- For both gilts (first litter) and sows the mean gestation period was 114 days, and most litters were born between 112 and 116 days. However, the extreme range was from 109 to 120 days.
- The average number of pigs born per litter was 12.6 for sows and 10.3 for gilts; 6.4 per cent. of the pigs in sow's litters were born dead and 2.2 per cent. in gilt's litters. There was no significant effect of season on either numbers born or numbers born dead. Despite the production of more dead-born pigs, sows retained their advantage over gilts in number of pigs per litter born alive, 11.8 for sows and 10.0 for gilts. The lower mean figure for gilts was attributable in part to their lower maximum litter number of 15 pigs, the comparable figure for sows being 21. Sows still retained their advantage

even if it was assumed that pigs in excess of 14 per litter had to be destroyed because of limited number of teats.

The percentage of pigs born alive which died before 8 weeks was 31 for sows and 23 for gilts. Losses during the unfavourable winter farrowing season (September to February) were 35.9 per cent. for sows and 32.5 per cent. for gilts. These figures were higher than during the remainder of the year, when losses were 26.7 per cent. for sows and 19.4 per cent. for gilts. Of the overall losses 50 per cent. were due to crushing by the dam, even though nearly all farrowings were attended. Most of these pigs were crushed within 48 hr. after birth. Losses through crushing were greater in sow than in gilt litters, and more were crushed during the winter than during the summer months. The causes of the remaining 50 per cent. of deaths are tabulated also and discussed.

The higher losses in sow than in gilt litters resulted in average numbers weaned per litter of 8.1 for sows and 7.7 for gilts, a difference which was not significant at the 5 per cent. level. For sow litters a greater number of pigs were weaned per litter during the summer than during the winter, but there was no significant seasonal effect for gilt litters. There was no significant difference between the numbers of males and females weaned.

The mean weaning weights of male and female pigs were 30.3 lb. and 29.5 lb., respectively, and the mean weaning weights per pig of sow and gilt litters were 30.0 lb. and 27.8 lb., respectively. For both sow and gilt, pigs reared during the summer months were heavier at weaning than those reared during the winter. During the

summer sows and litters were kept in huts on pasture, but during inclement winter weather they were often kept indoors in a "Danish-type" piggery.

There was evidence that there was a progressive increase in numbers born, but not in numbers weaned, between a sow's first and fourth litter. There was also some indication that mean weaning weight increased with successive litters, but no definite conclusion on this could be drawn.

Wherever comparative figures are given above they were significantly different, unless otherwise stated.—I. A. M. Lucas.

2996

SKINNER, R. L., KASTELIC, J., KLINE, E. A. and HOMEYER, P. G. Relationship between physical measurements and the fat and water content of hog carcasses. *J. Animal Sci.*, 1954, 13, 971. *Proc.* [Iowa Stat. Coll.]

2997

STRONG, C. L., PIERCE, J. C. and BEARD, F. J. Evaluation of basic factors for establishing grades for sow carcasses. *J. Animal Sci.*, 1954, 13, 972. *Proc.* [U.S. Dept. Agric.]

2998

VORKAPICH, M., HOEFER, J. A. and BRATZLER, L. J. Variation in feed efficiency and carcass characteristics of individually fed swine. *J. Animal Sci.*, 1954, 13, 972. *Proc.* [Michigan State Coll.]

See also Absts. 1858, 1910, 1911, 1936, 1978, 1979, 2026-29.

GOATS, RABBITS AND OTHER MAMMALS

2999

MARES, R. G. Animal husbandry, animal industry and animal disease in the Somaliland Protectorate. 1. *Brit. Vet. J.*, 1954, 110, 411-423.

The climatic and soil conditions of the 3 districts of Somaliland are described, with a brief sketch of the nomad Somali people. The most important domestic animal is the camel. Camel herds are grazed by the young unmarried men. Grazing has to be arranged in relation to the availability of salt, which is obtained from salt sand, salt plants or bought salt. Salt sand is eaten greedily by camels. The best salt plants are *Trianthema crystallina*, *Zygophyllum album* and species of *Suaeda* and *Salsola*. Camels grazed on the first 3 of these for 7 to 10 days get all the salt they need for a year. Other plants can supply enough salt for 2 months at a time. After salt grazing, camels must have water, unless there is very lush

pasture at hand. Camels acclimatised to living on the coast need a high intake of salt and frequent watering and cannot be used in high and cold districts. Customs concerned with the watering, breeding and working of camels are described.

Sheep are white with black heads and fat tails and goats are of the white Galla type. They are grazed near home by women and children. Salt is provided. Water is not needed when grass is green, but is provided about once a week in dry seasons.

Cattle are of Zebu type; there are few herds among the nomads, but they are commoner in the west, where they are crossed with Ankole cattle from Ethiopia and used for ploughing. They must be watered every second day at all seasons, so their grazing areas are limited. There is little horse breeding, and donkeys are used mainly in towns.—D. Duncan.

3000

WEITS, J., HOUTMAN, A. C. and ROBORGH, J. R.
The effect of a iodinated casein fraction on the milk yield of goats. *Netherlands J. Agric. Sci.*, 1953, 1, 39-43. [Biol. Lab., N.V. Philips-Roxane, Weesp.]

This experiment was designed to test the hypothesis that iodinated casein might contain 2 hormones, a thyroxine fraction A affecting metabolism and a thyroxine-free fraction B having a lactogenic effect. The thyroxine fraction A was precipitated from the hydrolysed iodinated casein as a barium salt. Fraction B was precipitated in the residual solution by bringing the pH to 5.0 by the addition of HCl and acetic acid.

A group of 8 goats received intramuscular injections of from 0.3 to 0.5 g. of fraction B daily during the declining phase of lactation. Iodinated casein was given to a second group of 4 goats at rates of from 2 to 3 g. daily. The effect of both treatments on milk yield was judged by comparing the yield during treatment with the yield before and after treatment. Butterfat yield, liveweight, body temperature and heart rate were recorded.

Both treatments increased metabolic rate and milk and butterfat yields. All animals lost weight during treatment. The assumption that the B fraction contained only a lactogenic factor was considered invalid.—J. N. Aitken.

3001

SEBASTIANO, C. Indagini sulla resa al macello, sul peso vivo e sulla distribuzione tra le diverse parti del corpo nella popolazione caprina somala. Studio delle correlazioni esistenti tra le diverse parti del corpo. [Slaughter weight, liveweight and weight of the parts of the body in the goat population of Somaliland. Correlation between different parts of the body. *Zootec. Vet.*, 1954, 9, 359-367. [Ist. Sierovacc. Somalo, Merca.]

3002

VORONOV, A. G. Osobennosti kormovogo ratsiona nekotorykh gryzunov. [Characters of the food rations of certain rodents.] *Zool. Zh.*, 1954, 33, 184-196. [Geograph. Fac., Moscow State Univ.]

An ecological study was made of 6 rodents classified according to their principal foods, which also determine the limits of their geographical

distribution. The rodents discussed were water rats, hamsters, house mice, wood mice, lemmings and voles.

Water rats showed a definite preference for more succulent foods. The moisture content of plants that were attractive to them varied between 67 and 87 per cent.; the parts of plants that were less eaten had a moisture content of less than 60 per cent. The food consisted of hygro- and hydrophytes.

The principal foods of voles were broad-leaved cereals and legumes. Green food rich in cellulose was the most important item.

Lemmings fed on narrow-leaved cereals and southern steppe grasses: *Poa*, *Festuca sulcata*, *Kochia* and *Artemisia*. The last was eaten much more in the autumn than in the spring and summer.

House mice preferred starchy seeds, green plants being a secondary food.

Wood mice, on the other hand, ate seeds, preferably oilseeds, Compositae, Rosaceae and green parts of plants.

Hamsters were omnivorous, food consisting of plants, seeds, fruits, small vertebrate animals, eggs and fledglings.

It is concluded that the kind of food eaten by these different animals is one of the main factors determining the distribution of rodents. The ecological optimum and ecological "centre of origin" are river valleys for water rats, southern steppes for lemmings, northern steppes for voles, broad-leaved woods for wood mice, northern steppes for house mice and forest-steppes for hamsters.—H. Scherbatoff.

3003

DICKINSON, C. D. and SCOTT, P. P. Effects of adding penicillin and aureomycin to the diet of cats. *Brit. J. Nutrition*, 1954, 8, 380-385. [Dept. Physiol., Sch. Med., Royal Free Hosp., London, W.C.1.]

The addition of penicillin and aureomycin to the basal diet containing 50 per cent. protein, vitamin A, vitamin B₁, riboflavin, nicotinic acid and liver concentrate given to young kittens kept in cages produced increased growth, increased intake of food and efficiency of feed conversion and an improvement in general health with the absence of respiratory and eye infections found in some of the controls.—A. Hepburn.

See also Abst. 1697.



POULTRY

GROWTH AND FATTENING

- 3004
BONADONNA, T. Il sistema "verticale" nella pollicoltura. [The "vertical" system in poultry rearing.] *Ital. Agric.*, April 1954, No. 4, pp. 15.
- 3005
KENNARD, D. C., MOORE, E. N. and CHAMBERLIN, V. D. The role of floor litter management in nutrition and disease prevention of chickens. *Poultry Sci.*, 1954, **33**, 1063-1064. *Proc. [Ohio Agric. Exp. Stat., Wooster.]*
- 3006
ROSS, E., STRITE, G. H. and YACOWITZ, H. Comparison of feed efficiency, water consumption, dry matter excretion, and oxygen consumption between slow and rapidly growing chicks. *Poultry Sci.*, 1954, **33**, 1079. *Proc. [Ohio Agric. Exp. Stat., Wooster.]*
- 3007
SHERWOOD, D. H. and MILBY, T. T. Restricted versus full-feeding for growing pullets. *Poultry Sci.*, 1954, **33**, 1080. *Proc. [Larro Res. Farm, Detroit, Mich.]*
- 3008
WILSON, P. N. Growth analysis of the domestic fowl. 1. Effect of plane of nutrition and sex on live-weights and external measurements. 2. Effect of plane of nutrition on carcass composition. 3. Effect of plane of nutrition on carcass composition of cockerels and egg yields of pullets. *J. Agric. Sci.*, 1952, **42**, 369-381; 1954, **44**, 67-85; **45**, 110-124. [Wye Coll., Univ. London.]
1. Chicks of a Rhode Island Red—Light Sussex cross were reared to 10 weeks on either a high or a low plane of nutrition. In the former case they received to appetite a ration of dried milk 15, fishmeal 7, dried grass 5, linseed meal 3, middlings 20, maize 30, wheat 14, cod liver oil and minerals; and in the latter they received restricted quantities of a diet low in crude protein (13.9 per cent.) and made up of fishmeal 3, pea meal 9, dried grass 5, linseed meal 8, middlings 38, potato meal 23, maize 10, together with cod liver oil and minerals.
- At 10 weeks of age each group was again divided into a high and a low sub-group with rations generally similar to those used in the first stage. In this way 4 differently shaped growth curves were obtained from the individual sub-groups.
2. Sample birds were killed from each sub-group at intervals up to 24 weeks of age, and the carcasses dissected. Of the organs weighed only the eyes and heart were unaffected at each age by the different treatments used. The organs of the endocrine and reproductive system were the most affected. There were significant differences in the proportions even of birds of the same weight that had been reared in different ways.
3. Retardation of tissue growth in the low plane group in the first 10 weeks was almost completely made up in the growing period by the sub-group that was then transferred to a high plane of nutrition. Extensive data are reported for organ and bone weights according to age and treatment.
- K. J. Carpenter.
- 3009
ASMUNDSON, V. S. and PUN, C. F. Growth of Bronze turkeys. *Poultry Sci.*, 1954, **33**, 981-986. [Dept. Poultry, Univ. California, Davis.]
- Data are reported from several hatches of 4 separate strains of Bronze turkeys. All the birds were reared alike and were weighed at 2, 4, 8, 12, 16, 20, 24 and 28 weeks of age. Rate of growth for each period was calculated from the formula
- $$\frac{100 (\log W_2 - \log W_1)}{t}$$
- where W_1 is the initial weight, W_2 the final weight and t the length of the period in weeks.
- Certain strains had faster growth rates than others to 8 weeks of age, with correspondingly slower growth afterwards. Rapid growth from 8 to 16 weeks was always followed by slower growth from 16 to 24 weeks of age. The correlations between percentage growth rates indicate that it may be possible with some strains to increase growth rate to 8 weeks of age with no effect on later growth.—M. J. Head.
- 3010
SMITH, R. M., GYLES, N. R. and GILBREATH, J. C. The influence of producing sexes separately on growth, feed utilization, and dressed grade of broilers. *Poultry Sci.*, 1954, **33**, 1082. *Proc. [Univ. Arkansas, Fayetteville.]*
- 3011
GOODMAN, B. L. and GODFREY, G. F. Sources and magnitude of variation in nine-week body weights. *Poultry Sci.*, 1954, **33**, 1056. *Proc. [Oklahoma Agric. Exp. Stat., Stillwater.]*
- 3012
MA, C. S. Mechanism of difference in growth rate between cockerels and pullets. *Poultry Sci.*, N.A. and B., April 1955

1954, **33**, 1028-1031. [Dept. Animal Husb., Coll. Agric., Nat. Taiwan Univ., Formosa, Republic of China.]

3013

BRIGGS, G. M. and SPIVEY, M. R. Growth stimulating effect of lactose in a complete synthetic diet for chicks. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 98-100. [Lab. Biochem. Nutrit., Nat. Inst. Health, Bethesda, Md.]

3014

ZNANIECKA, G. and KORZENIEWSKA, H. Ustalenie właściwego stosunku białka do węglowodanów w pierwszym tygodniu życia piskląt. [Determining the proper ratio of protein to carbohydrates during the first week of life of chicks.] *Rocz. Nauk rol. [B]*, 1954, **68**, 99-108. [Inst. Zootech., Z.Z.D. Pawłowie.] Russian and English summaries.

The giving to chickens of feeds containing 160 or 80 g. protein per Scandinavian feed unit showed that the higher rate resulted in greater weight at the fifth week with no difference in rate of utilisation of feed and no ill effect on the health of the birds. The use from the first day of life of a feed with a high protein content is recommended. (From summary.)—D. Harvey.

3015

MONSON, W. J., HARPER, E. A., BENTON, D. A. and ELVEHJEM, C. A. The effect of level of purified protein on the growth of chicks fed purified diets containing sucrose or dextrin. *J. Nutrition*, 1954, **53**, 563-573. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

In a series of 8 trials chicks were fed from hatching to 4 weeks of age on a basal ration of alcohol-extracted casein 18, gelatine 10, soya bean oil 5, salts 6, L-cystine 0.5, fortified halibut liver oil, all the crystalline vitamins and sucrose to 100. These chicks finished with a general mean weight of about 330 g.; the mean in single trials ranged from 266 to 351 g. Parallel groups that received the same ration with dextrin in place of sucrose in 5 of the trials were about 30 g. heavier. This increase could be obtained also, though not with complete consistency, by increasing the casein content of the "sucrose" ration to 22 or 25 per cent. No further increase was obtained by increasing the protein content of the ration containing dextrin.

In further trials in which 2.5 mg. bacitracin and 10 mg. penicillin were added to each 100 g. of ration, 18 per cent. casein with sucrose gave as good growth as rations of higher protein content or containing dextrin. Growth on the basal

ration also was improved by the addition of 10 per cent. of either fibrin or wheat gluten.

K. J. Carpenter.

3016

AITKEN, J. R., HUNSAKER, W. G., MORRISON, A. B. and GUTTERIDGE, H. S. The protein requirement of Pilgrim goslings. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 119-121. [Poultry Div., Central Exp. Farm, Ottawa.]

3017

ELLINGER, G. M. The evaluation of leaf protein concentrates in poultry rations. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 128-130. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

3018

JOHNSON, E. A. Protein and calcium intake on a free-choice diet. *Poultry Sci.*, 1954, **33**, 1063. *Proc.* [Poultrymens Cooperative Assoc. S. California, Los Angeles.]

3019

BALDINI, J. T. and ROSENBERG, H. R. Low protein diets for the turkey poults. *Poultry Sci.*, 1954, **33**, 1041. *Proc.* [E.I. du Pont de Nemours and Co., Inc., Newark, Del.]

3020

RINGROSE, R. C., POTTER, L. M. and HATCH, R. M. Protein requirements of meat type New Hampshire pullets. *Poultry Sci.*, 1954, **33**, 1078. *Proc.* [Univ. New Hampshire, Durham.]

3021

STEPHENSON, E. L. Amino acid supplementation of broiler diets. *Poultry Sci.*, 1954, **33**, 1083. *Proc.* [Univ. Arkansas, Fayetteville.]

3022

GRIMINGER, P., FORBES, R. M. and SCOTT, H. M. Studies on the methionine requirement of the chick. *Poultry Sci.*, 1954, **33**, 1057. *Proc.* [Illinois Agric. Exp. Stat., Urbana.]

3023

SNYDER, J. M., MORRISON, W. D. and SCOTT, H. M. A revaluation of the arginine requirement of the chick fed a purified diet. *Poultry Sci.*, 1954, **33**, 1082. *Proc.* [Univ. Illinois, Urbana.]

3024

RUNNELS, T. D. The value of animal fat in combination with various other ingredients in broiler rations. *Poultry Sci.*, 1954, **33**, 1090. *Proc.* [Univ. Delaware, Newark.]

- 3025
SUNDE, M. L. The effects of fats and fatty acids on feed conversion in chicks. *Poultry Sci.*, 1954, 33, 1084. *Proc.* [Univ. Wisconsin, Madison.]
- 3026
MARCH, B. E. and BIELY, J. The nutritive value of fats of different origin in chick starters. *Poultry Sci.*, 1954, 33, 1069. *Proc.* [Univ. British Columbia, Vancouver 8.]
- 3027
MCNALLY, E. H. Observations on the use of fats in the finishing diets of fryers. *Poultry Sci.*, 1954, 33, 1071. *Proc.* [Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]
- 3028
DONALDSON, W. E., COMBS, G. F. and ROMOSER, G. L. Results obtained with added fat in chick rations. *Poultry Sci.*, 1954, 33, 1053. *Proc.* [Univ. Maryland, College Park.]
- 3029
DARROW, M. I. and ESSARY, E. O. Influence of fats in rations on storage quality of poultry. *Poultry Sci.*, 1954, 33, 1053. *Proc.* [Swift and Co., Chicago, Ill.]
- 3030
CARVER, D. S., RICE, E. E., GRAY, R. E. and MONE, P. E. The utilization of fats of different melting points added to broiler feeds. *Poultry Sci.*, 1954, 33, 1048. *Proc.* [Swift and Co., Chicago, Ill.]
- 3031
AITKEN, J. R., LINDBLAD, G. S. and HUNSAKER, W. G. Beef tallow as a source of energy in broiler rations. *Poultry Sci.*, 1954, 33, 1038. *Proc.* [Central Exp. Farm, Ottawa, Ont.]
- 3032
YACOWITZ, H. and CHAMBERLIN, V. D. Further studies on the supplementation of broiler rations with fats. *Poultry Sci.*, 1954, 33, 1090. *Proc.* [Ohio Agric. Exp. Stat., Wooster.]
- 3033
CREEK, R. D., PARKER, H. E., HAUGE, S. M., ANDREWS, F. N. and CARRICK, C. W. The iodine requirements of young chickens. *Poultry Sci.*, 1954, 33, 1052. *Proc.* [Purdue Univ., Lafayette.]
- 3034
MOTZOK, I., ARTHUR, D. and BRANION, H. D. Utilization of phosphorus from various phosphate supplements by chicks. *Poultry Sci.*, 1954, 33, 1073. *Proc.* [Ontario Agric. Coll., Guelph.]
- 3035
WILCOX, R. A., CARLSON, C. W., KOHLMAYER, W. and GASTLER, G. F. The availability of phosphorus from different sources for poult fed purified diets. *Poultry Sci.*, 1954, 33, 1087. *Proc.* [S. Dakota Agric. Exp. Stat., College Station.]
- 3036
ALMQUIST, H. J. The phosphorus requirement of young chicks and poults. A review. *Poultry Sci.*, 1954, 33, 936-944. [Grange Co., Modesto, Calif.]
- 3037
O'ROURKE, W. F., BIRD, H. R., PHILLIPS, P. H. and CRAVENS, W. W. The phosphorus requirements of chickens. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 167-170. [Dept. Poultry Husbandry, Univ. Wisconsin, Madison.]
- 3038
OLSSON, N. Undersökningar rörande hönsens koksaltbehov och deras reaktion för olika stora koksaltmängder i fodret. [Studies of the salt requirement of poultry and their reaction to different amounts of salt in their feed.] *Kgl. Lantbrukshögsk. Statens Husdjursförsök Medd.* No. 55, 1954, pp. 29. English summary.
- Experiments made intermittently over a number of years are described. NaCl in amounts up to 1.6 per cent. of all-mash rations had no effect on the health or behaviour of chicks except to increase the amount of water drunk and the water content of the droppings; 10 per cent. killed all the chicks. The full requirement was met with cereal rations by 0.2 to 0.8 per cent. NaCl; no salt should be added if much fishmeal or meatmeal is used. Laying hens require 0.5 to 1 per cent. of all-mash ration; the amount added must be adjusted for the use of fishmeal and a grain mixture as part of the feed.—I. Leitch.
- 3039
ROMOSER, G. L., COMBS, G. F. and NICHOLSON, J. L. Effect of insoluble grit on weight and feed efficiency of broiler chickens. *Poultry Sci.*, 1954, 33, 1078-1079. *Proc.* [Univ. Maryland, College Park.]
- 3040
MARCH, B. E., BIELY, J. and TARR, H. L. A. The nutritive value of fish meal and condensed

fish solubles. 8. Interaction between unidentified factors in herring meal and in dehydrated green feed. *Fish. Res. Board Canada, Progr. Rep. Pacific Coast Stat.*, 1954, No. 99, 12-13. [Poultry Nutrit. Lab., Univ. British Columbia.]

In 2 chick growth trials the basal ration used consisted of "Drackett" protein 25, DL-methionine 0.4, ground cellulose 2, maize oil 3, minerals, vitamins, including folic acid and vitamin B₁₂, and cerelose to 100. After 1 week on the basal ration the chicks were allotted to experimental treatments. Those that continued to receive the unsupplemented ration in the 2 trials, which differed only in detail, finished with a mean weight of 370 g. at 32 days of age. Parallel groups receiving the same ration supplemented with 2 per cent. herringmeal and 5 per cent. "dehydrated green feed" were 15 per cent. heavier at this age.

There was no consistent growth stimulation in groups receiving either of these supplements alone. In a replication of one trial with the addition of ascorbic acid to all the rations no clear or consistent effect of this addition was seen.

K. J. Carpenter.

3041

JOHNSON, E. L. Growth promoting properties of dehydrated fish solubles in relation to time of rearing young stock. *Poultry Sci.*, 1954, **33**, 1063. *Proc.* [Univ. Minnesota, St. Paul.]

3042

KUDO, K. and ISOGAI, I. The effects of feeding cooked fish offals and supplementing with antibiotics on the growth of chicks. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 136-138. [Okazaki Livestock Breeding Stat., Minist. Agric. and Forest, Japan.]

3043

JONES, H. L., COMBS, G. F. and ROMOSER, G. L. The presence of unidentified chick growth factor activity in dried whey prepared with a minimum of bacterial fermentation. *Poultry Sci.*, 1954, **33**, 930-932. [Dept. Poultry Husb., Univ. Maryland, College Park.]

In a chick growth trial the basal diet was of α -soya bean protein 23, L-arginine hydrochloride 0.2, L-cystine 1.0, L-leucine 0.15, DL-lysine hydrochloride 0.5, DL-methionine 0.4, DL-tryptophan 0.1, L-tyrosine 0.3, iodinated casein (containing 1 per cent. of thyroxine) 0.03, maize oil 3.0, minerals 6.0, all the known crystalline vitamins and sucrose to 100. Two groups, each of 14 chicks, that received this ration alone from 1 to 4 weeks of age had mean weight gains of 164 and 174 g., respectively. Three further groups that received this ration supplemented with 3, 6 and 9 per cent. of a

commercial dried whey product, containing 50 per cent. of lactose, gained 189, 193 and 185 g., respectively.

Further groups that received 3 and 6 per cent., respectively, of a special casein whey, prepared from pasteurised whole milk, after acid-precipitation of the casein, without opportunity for fermentation, gained 199 and 195 g.

It is concluded that the property possessed by commercial wheys of stimulating chick growth under these conditions is present in the original material and not the result of a fermentation process.—K. J. Carpenter.

3044

WAIBEL, P. E., MORRISON, A. B. and NORRIS, L. C. Production of depleted chicks by feeding maternal diets deficient in unidentified growth factors. *Poultry Sci.*, 1954, **33**, 1085. *Proc.* [Cornell Univ., Ithaca, N.Y.]

3045

LAKSESVELA, B. Unidentified chick growth factor in herring meal and solubles. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 154-157. [Norwegian Herring Oil and Meal Indust. Res. Inst., Bergen.]

3046

ELAM, J. F., JACOBS, R. L. and COUCH, J. R. Unidentified factor found in autoclaved litter. *Poultry Sci.*, 1954, **33**, 1053-1054. *Proc.* [Texas Agric. and Mech. Coll. System, College Station.]

3047

COMBS, G. F., SWEET, G. B., JONES, H. L., ROMOSER, G. L. and BISHOP, R. W. Multiplicity of unidentified growth factors required by chicks and poults. *Poultry Sci.*, 1954, **33**, 1050. *Proc.* [Univ. Maryland, College Park.]

3048

CAMP, A. A., CARTRITE, H. T., QUISENBERRY, J. H. and COUCH, J. R. Further information on unidentified chick growth factors. *Poultry Sci.*, 1954, **33**, 1047. *Proc.* [Texas Agric. Exp. Stat., Gonzales.]

3049

BLAYLOCK, L. G., VOHRA, P., PATTERSON, E. B. and MCGINNIS, J. Evidence for the production of chick growth factor(s) by *Escherichia coli*. *Poultry Sci.*, 1954, **33**, 1043. *Proc.* [State Coll. Washington, Pullman.]

3050

CHARLET-LERY, G., DE BALZAC, H. and LEROY, A. M. Variation de la valeur alimentaire

des levures de distillerie suivant leur origine et leur mode de préparation. [Variation in feeding value of distiller's yeasts according to origin and method of preparation.] *Ann. Zootech.*, 1954, **3**, 215-217. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

Four samples of beet yeast differently processed, one of "vinasse" yeast and 2 grown on molasses were compared. Each was given to 25 chickens from hatching to 6 weeks of age in a ration containing yeast 7 and barley meal 7 parts and a commercial chick ration to 100.

The weight gain per kg. feed consumed was significantly greater on the 4 beet yeasts than on the other types, though the total N content of the yeasts did not differ significantly. There was some correlation ($r = +0.58 \pm 0.17$) between the amount of feed consumed per kg. weight gain and the K content of the yeast.—D. Duncan.

3051

ANDERSON, D. L. and HILL, F. W. Effects of fibrous bulk on the utilization of a high energy chick ration for growth. *Poultry Sci.*, 1954, **33**, 1038. *Proc.* [Cornell Univ., Ithaca, N.Y.]

3052

ANDERSON, J. O. and DRAPER, C. I. Value of alfalfa meal in chick and breeder hen rations. *Poultry Sci.*, 1954, **33**, 1038-1039. *Proc.* [Utah State Agric. Coll., Logan.]

3053

COUNÉ, F. L. and DRIGGERS, J. C. Citrus molasses distillers dried solubles in rations for growing chicks. *Poultry Sci.*, 1954, **33**, 1088-1089. *Proc.* [Univ. Florida, Gainesville.]

3054

WEST, J. W. Cottonseed oil meal as a substitute for soybean oil meal in poultry rations. *Poultry Sci.*, 1954, **33**, 1086. *Proc.* [Mississippi State Coll., State College.]

3055

TARVER, F. R. (Jr.) and PATRICK, H. Deficiencies in cottonseed meals. *Poultry Sci.*, 1954, **33**, 1084. *Proc.* [Univ. Tennessee, Knoxville.]

3056

CHANG, W. Y., LYMAN, C. L. and COUCH, J. R. Effect of free gossypol on chick growth. *Poultry Sci.*, 1954, **33**, 1048. *Proc.* [Texas Agric. and Mech. Coll. System, College Station.]

3057

KRATZER, F. H., DAVIS, P. N., WILLIAMS, D. E. and MARSHALL, B. J. Factors influencing the

growth of chicks and poult fed rations containing rapeseed oil meal. *J. Nutrition*, 1954, **53**, 407-418. [Dept. Poultry Husb., Univ. California, Davis.]

In preliminary trials the growth of chicks was found to be only 80 to 90 per cent. that of control birds when from 10 to 30 per cent. of soya bean oilmeal was replaced by rapeseed oilmeal in a good starter ration. No improvement of growth was obtained when either a water-treated meal was used, or when 37 p.p.m. pyridoxine were added to the experimental rations.

In view of a reported goitrogenic effect of rapeseed oilmeals (Abst. 742, Vol. 18) a study was made of the effect of adding up to 300 mg. per kg. of "Protamone", a thyroid-active preparation, to a practical ration containing 30 per cent. of rapeseed oilmeal. These additions had no effect on the growth of chicks, but reduced their thyroid mass from 16 to approximately 7 mg. per 100 g. bodyweight. The addition of 50 mg. potassium iodide per kg. ration had no effect on thyroid weight.

In further chick trials on a purified ration (Abst. 3486, Vol. 17) in which rapeseed oilmeal was the sole source of protein, the mean percentage daily gain ranged from 4.7 to 6.5 compared with gains of 6.2 to 7.9 for control chicks receiving a standard mash. The addition of a supplement containing lysine, arginine, cystine and tryptophan to the experimental ration had a small, but inconsistent, growth-stimulating effect. It was concluded that rapeseed oilmeal is itself an adequate source of amino-acids for the growing chick.

Chicks receiving a ration of rapeseed oilmeal 26, fishmeal 2.5, dried whey 2, alfalfa meal 2.5, wheat bran 5, aureomycin, mineral and vitamin supplements and cereals to 100 had a mean daily gain of 5.4 per cent. of their bodyweight. With a combined supplement of L-lysine 0.2, DL-methionine 0.1 and "Protamone" 0.01, the mean daily gain was 5.95 per cent. With only one or two of these additions the growth rate was intermediate between these values.

Poults receiving a similar basal ration, but with higher protein content, showed a mean daily gain in 22 days of 6.3 per cent. Other birds receiving this ration supplemented with 0.2 per cent. L-lysine had a daily gain of 6.7 per cent. The further addition of methionine and "Protamone" had only a small effect on growth. Poults receiving a standard mash had a daily gain of 7.3 per cent. There was a high incidence of "white-barred" feathers in the birds receiving rapeseed oilmeal without added lysine.—K. J. Carpenter.

3058

URI, D., BEN-ADAM, Z. and YIZHAKI, E. Carobs in poultry nutrition. *10th World's Poultry*

N.A. and R., April 1955

Congr. Sect. Papers, Edinburgh 1954, 117-119. [Poultry Sect., Dept. Animal Husb., Minist. Agric., Israel.]

3059

GERRY, R. W. and SMYTH, J. R. The value of feather meal in rations for poultry. *Poultry Sci.*, 1954, 33, 1089. *Proc. [Maine Agric. Exp. Stat., Orono.]*

3060

MILNE, F. N. J. The value of maize in poultry feeding. *Queensland Agric. J.*, 1954, 79, 113-118.

Experiments with day-old Australorp chicks showed that an all-mash starter ration containing up to 40 per cent. maize produced satisfactory weight gains up to 7 weeks of age. With rations containing a higher percentage, up to 70 per cent., the weight at 7 weeks was too low.

From 7 to 24 weeks of age up to 70 per cent. maize in an all-mash ration was satisfactory.

All-mash laying rations for pullets in their first year of egg production were satisfactory when they contained 55, 62.5 and 70 per cent. maize. For hens in their second year of production 62.5 per cent. maize was the maximum permissible for satisfactory production.

When 30 per cent. or more maize is included in the ration manganese sulphate must be added.

T. D. Bell.

3061

LINDLEAD, G. S., AITKEN, J. R. and HUNSAKER, W. G. Studies on the use of barley in chick rations. *Poultry Sci.*, 1954, 33, 1067. *Proc. [Central Exp. Farm, Ottawa, Ont.]*

3062

BEGIN, J. J., MACLAURY, D. W., RISNER, R. and INSKO, W. M. (Jr.) Breed, sex, and age variation among chicks in response to antibiotic supplementation. *Kentucky Agric. Exp. Stat. Bull.* No. 597, June 1953, pp. 12. [Lexington, Ky.]

A group of 220 meat-type chicks was reared on a ration of soya bean oilmeal 30, alfalfa meal 5, maize distiller's dried solubles 4, dried whey 2, condensed fish solubles 2, minerals 4, choline chloride, nicotinic acid, concentrates containing vitamins A, B₁₂ and D and riboflavin, and yellow maize meal to 100. At 10 weeks of age their mean bodyweight was 1220 g.

Further groups received the same ration with the following supplements (the corresponding finishing weights in g. are given in brackets): aureomycin, 22 p.p.m. (1306); 3-nitro-4-hydroxyphenylarsonic acid, 55 (1313); bacitracin, 22

(1278); penicillin, 22 (1265); terramycin, 22 (1294); aureomycin, 22, plus sulphaquinoxaline, 125 (1352). The control group used 3.11 g. feed per g. liveweight gain. For the supplemented groups the figures were 3.02, 2.98, 3.00, 2.96, 2.93 and 2.90, respectively. Each group was made up of both males and females, each from 2 breeds.

Detailed analysis of the results suggested that the relative potency of the antibiotic supplements in stimulating growth differed with both sex and breed of the birds and with the stage of growth. Mortality was less than 9 per cent. in every group.

K. J. Carpenter.

3063

COMBS, G. F., ROMOSER, G. L. and BISHOP, R. W. Influence of arsenic acid on dietary requirement of chicks for certain unidentified growth factors. *J. Nutrition*, 1954, 53, 511-522. [Dept. Poultry Husb., Univ. Maryland, College Park.]

A group of 100 chicks was reared from hatching on a ration of soya bean oilmeal 32.5, lucerne meal 2.5, dried whey 2, butyl molasses fermentation solubles 1, minerals 3.1, DL-methionine 0.05, choline chloride, riboflavin, nicotinic acid, pantothenic acid, vitamins A, B₁₂ and D, nitrofurazone, procaine penicillin and yellow maize meal to 100. Their mean weight at 8 weeks of age was 942 g. and the mean of a further group receiving the same ration supplemented with 120 p.p.m. arsenic acid was 918 g.

Further groups that received the original ration supplemented with 2 to 7 per cent. of fishmeal or fish soluble products finished with mean weights ranging from 936 to 988 g. The same treatments with the addition of arsenic acid gave mean weights ranging from 977 to 1020 g.

In 2 further trials, using slightly modified basal rations, it was again found that although arsenic acid gave no growth stimulation in the absence of fish products, and fish products alone had only a small effect, the combination of the 2 had a significant growth-stimulating action. As an overall result from 3 trials, the addition of a mixed supplement of 90 p.p.m. arsenic acid and 2 per cent. condensed fish solubles increased the growth rate of chicks by 6 per cent. in their first 8 weeks of life, and improved the feed conversion efficiency by 4 per cent., although the basal rations used contained all the known nutrients at levels believed to be adequate for rapid growth.—K. J. Carpenter.

3064

TARVER, F. R. (Jr.), PATRICK, H. and GOFF, O. E. Influence of arsenic and penicillin on dressing grades and quality of poultry. *Poultry Sci.*, 1954, 33, 1085. *Proc. [Univ. Tennessee, Knoxville.]*

3065

- HAUSER, M. M., ANDERSON, G. W., PEPPER, W. F. and SLINGER, S. J. Further evidence on the relation of coliforms to the growth response of chicks to antibiotics. *Poultry Sci.*, 1954, 33, 1058. *Proc.* [Ontario Agric. Coll., Guelph.]

3066

- YACOWITZ, H., ROSS, E., CHANG, T. S. and WINTER, A. R. Growth stimulatory effect of 2, 3-diphenyl indole in chicks. *Poultry Sci.*, 1954, 33, 1088. *Proc.* [Ohio State Univ., Columbus.]

3067

- PEPPER, W. F., HAUSER, M. M., ANDERSON, G. W. and SLINGER, S. J. Effect on chick growth and fecal flora of "switching" from one antibiotic to another. *Poultry Sci.*, 1954, 33, 1089. *Proc.* [Ontario Agric. Coll., Guelph.]

3068

- BERG, R. W. and SHOFFNER, R. N. The relationship between body measurements and meat yield in turkeys. *Poultry Sci.*, 1954, 33, 1042. *Proc.* [Univ. Minnesota, St. Paul.]

3069

- MILNE, F. N. J. The effect of benzene hexachloride in poultry feed on meat and egg quality. *Queensland J. Agric. Sci.*, 1953, 10, 214-221. [Div. Animal Indust.]

Cockerels, 12 weeks of age, were divided into groups, housed on sawdust litter and fed on a good commercial mash without supplement (Group 1) or with supplements of a commercial form of benzene hexachloride (BHC) containing 12.5 per cent. of the active γ -isomer, contributing 5 p.p.m. (Group 2) and 25 p.p.m. (Group 3). Further groups (4 and 5) received supplements of a deodorised BHC preparation containing 99 per cent. of the isomer; this was sprayed on the feed so as again to contribute 5 and 25 p.p.m., respectively, of the γ -isomer.

Birds were slaughtered and cooked for tasting tests at frequent intervals after the fifth week of the trial. After 11 weeks the flesh of birds from group 2 was inedible, and by 13 weeks that of group 3 was definitely tainted, the subcutaneous fat being the most affected. No off-flavour was recorded for birds from groups 4 and 5 even after 24 weeks of the deodorised BHC.

Similar experimental treatments were given to 5 groups of laying pullets. After 20 weeks of the experiments off-flavours were found consistently in the eggs from each of the groups receiving BHC, when the groups receiving deodorised BHC were only beginning to show this effect; eggs from

groups 2 and 3 were tainted after only 6 to 8 weeks of receiving the commercial BHC.

It is concluded that BHC is not a suitable insecticide for use with grain destined for poultry feeding.—K. J. Carpenter.

See also Absts. 1859, 1872, 1907, 1935, 1952, 1953, 1971, 1975, 1976, 1994, 2020, 2022-26, 2335, 2536.

EGG PRODUCTION

3070

- SINGSSEN, E. P., MATTERSON, L. D., KOZEFF, A. and STINSON, L. D. The effect of feeding high and low efficiency rations to growing pullets on their subsequent laying performance. *Poultry Sci.*, 1954, 33, 1081. *Proc.* [Univ. Connecticut, Storrs.]

3071

- HILL, F. W., ANDERSON, D. L. and DANSKY, L. M. Studies of the relation of dietary energy level to rate and efficiency of egg production. *Poultry Sci.*, 1954, 33, 1059. *Proc.* [Cornell Univ., Ithaca, N.Y.]

3072

- ZNANIECKA, G. and GÓRSKA, T. Organizowanie białka zwierzęcego w paszy kur niosek. [Restriction of animal protein in the diet of laying hens.] *Rocz. Nauk rol.* [B], 1954, 68, 87-97. [Inst. Zootech., Zakł. Doświad., Czech.] Russian and English summaries.

Two groups of 60 hens were given a ration containing 15 per cent. fishmeal or 30 per cent. sunflower seed meal. Within each group there were 4 pens of birds to which no vitamin supplement, 1 per cent. yeast, 1 per cent. fish oil or both of these were given. The sunflower seed group had lower bodyweight and lower egg production, egg weight and hatchability. Differences in bodyweight and egg production were significant at the 5 per cent. level and those in egg weight at the 1 per cent. level. Hatchability was greater in eggs from the hens receiving fishmeal. (From summary.)—D. Harvey.

3073

- CARPENTER, K. J. The evaluation of protein supplements for egg production. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 125-127. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

3074

- EVANS, R. J., BANDEMER, S. L., DAVIDSON, J. A., BAUER, D. H. and BUTTS, H. A. Transfer of protein in stored shell eggs produced by hens fed crude cottonseed oil. *J. Agric. Food Chem.*, 1954, 2, 1077-1080. [Dept. Agric. Chem., Michigan State Coll., East Lansing.]

N.A. and R., April 1955

A standard laying ration with 2.5 per cent. crude cottonseed oil added was given to 10 laying hens housed in a battery. Eggs were examined fresh, after 3 months' and after 6 months' storage at 1° C. From microbiological analysis of the yolk and white for methionine, cystine and serine it is concluded that ovalbumin selectively migrated from the white to the yolk during storage.

D. H. Shrimpton.

3075

HEYWANG, B. W. Suitability of cottonseed meal in diets for laying chickens. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 130-133. [Agric. Res. Serv., U.S. Dept. Agric., Bur. Animal Indust., Glendale, Ariz.]

3076

WORONICK, C. L. and GRAU, C. R. Evidence for a gossypol-cephalin compound in fresh eggs of hens fed cottonseed meal. *Poultry Sci.*, 1954, 33, 1088. *Proc.* [Univ. California, Berkeley.]

3077

MILLER, E. C., SUNDE, M. L., BIRD, H. R. and ELVEVEJEM, C. A. The isoleucine requirement of the laying hen. *Poultry Sci.*, 1954, 33, 1072. *Proc.* [Univ. Wisconsin, Madison.]

3078

STEPHENSON, E. L., DICKSON, C. and BARNETTE, B. D. An unidentified forage juice factor necessary for optimum reproduction in White Wyandotte hens. *Poultry Sci.*, 1954, 33, 1083. *Proc.* [Univ. Arkansas, Fayetteville.]

3079

BLACK, D. J. G., JENNINGS, R. C., MORRIS, T. R. and PALGRAVE, J. A. A depressant effect of a white fish meal on hatchability. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 121-125. [Dept. Agric., Univ. Reading.]

3080

SLINGER, S. J., MORPHET, A. M., HUNT, E. C. and PEPPER, W. F. Effect of penicillin and forage juice on reproduction and growth of turkeys. *Poultry Sci.*, 1954, 33, 944-951. [Dept. Poultry Husband., Ontario Agric. Coll., Guelph.]

Thirty Broad Breasted Bronze turkeys in their first year of egg production were divided into 3 pens, each with a tom, and given a ration of fishmeal 2.25, dried buttermilk 1.25, meatmeal 1, soya bean meal 7.5, grassmeal 2.5, minerals 2.75, vitamins A, D₃ and B₁₂, riboflavin and cereals (wheat, oats, maize and barley) to 100. Over 16 weeks 1600 eggs were set from these birds and 68 per cent. of the fertile eggs hatched.

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Parallel groups of birds received similar treatment, but with dietary supplements of either 1.5 mg. per lb. of procaine penicillin or 5 per cent. of forage juice, or both. Hatchability with these treatments was 72.8, 70.0 and 75.3 per cent., respectively. The supplements did not appear to influence either egg production, about 42 per cent. over the trial, or the number of infertile eggs, about 13 per cent. of the eggs laid. Daily feed consumption was 0.59 lb. in the control groups, and for the birds receiving the supplements 0.57, 0.60 and 0.57 lb., respectively.

Poulters hatched from the breeding trial were then used in a growth experiment for which the basal diet was fishmeal 2, dried buttermilk 2, meatmeal 2, soya bean meal 43, soya bean oil 1, minerals 4, DL-methionine, vitamins A, D₃ and B₁₂, riboflavin, nicotinic acid and cereals (wheat, maize and oat groats) to 100. At 32 days of age poulters receiving this ration unsupplemented had a mean weight of 600 g. Further analysis according to the diet of their dams showed means of 604 g. for the progeny of unsupplemented dams, and 579, 583 and 630 g. for the progeny of dams that had received penicillin, forage juice and penicillin plus forage juice, respectively. Other poulters that received their ration supplemented with both penicillin and forage juice at the same level as in the breeding rations had a mean weight at 32 days of 750 g. Further analysis of this figure, according to the diet of their dams, as above, showed means of 729, 767, 732 and 767 g. for the progeny of control and supplemented dams, respectively. In other groups poulters receiving either penicillin or forage juice alone grew at a rate intermediate between that of the control poulters and that of those receiving both supplements. It is concluded that, with the type of basal rations used, both penicillin and forage juice are of value in improving breeding performance and the growth of the young; but that for the latter the supplement received by the poult is of more importance than that included in the ration of the dam.—K. J. Carpenter.

3081

SHERWOOD, D. H. and MILBY, T. T. Further tests with antibiotics for laying and breeding hens. *Poultry Sci.*, 1954, 33, 1031-1033. [Larro Res. Farm, Detroit, Mich.]

In a series of 6 laying trials under different systems of management and with a variety of practical rations the overall mean production from 750 birds, on a hen-day basis, was 54 per cent. The mean production from parallel groups receiving similar rations with the addition of one or more antibiotics was also 54 per cent. The use of antibiotics was without effect on mortality, efficiency of feed conversion or hatchability of fertile eggs. Both light and heavy birds were

used, and the supplements, with their concentrations in the total ration in mg. per lb., were terramycin (5), aureomycin hydrochloride (6 and 50), terramycin and aureomycin mixed (11 and 18), and penicillin (2). In no case did a particular combination of feed, management and supplement give evidence of any response to the use of an antibiotic.—K. J. Carpenter.

3082

SIZEMORE, J. R., LILLIE, R. J., BIRD, H. R. and DENTON, C. A. Further studies on the influence of aureomycin in the chick diet upon subsequent reproductive performance of laying hens. *Poultry Sci.*, 1954, 33, 1081. *Proc. [Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]*

3083

CARLSON, C. W. and KOHLMAYER, W. Factors affecting the value of antibiotics in breeder diets. *Poultry Sci.*, 1954, 33, 1047-1048. *Proc. [S. Dakota Agric. Exp. Stat., College Station.]*

3084

HEYWANG, B. W. High levels of antibiotics in the diets of laying chickens. *Poultry Sci.*, 1954, 33, 1059. *Proc. [Agric. Res. Serv., U.S. Dept. Agric., Glendale, Ariz.]*

3085

MOREHOUSE, N. F. The effect of 3-nitro-4-hydroxyphenylarsonic acid on reproduction in laying hens. *Poultry Sci.*, 1954, 33, 1072-1073. *Proc. [Dr. Salsbury's Labs., Charles City, Iowa.]*

3086

ROSENBERG, M. M. A study of high levels of cane-fine molasses in laying rations. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 113-117. [Dept. Poultry Husb., Univ. Hawaii, Honolulu.]

3087

HØIE, J. and SANDVIK, Ø. Experiments with cooked potatoes, potato silage and dried potatoes as feeds for laying pullets. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 102-105. [Agric. Coll., Norway.]

3088

JAAP, R. G., GRIMES, J. F. and COLEMAN, T. H. Purebreds, crossbreds and incrossbreds for egg production in the U.S.A. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 42-45. [Dept. Poultry Sci., Ohio State Univ.]

3089

GLAZENER, E. W. and BLOW, W. L. Variations in hybrids for efficiency of egg production. *Poultry Sci.*, 1954, 33, 1055. *Proc. [N. Carolina Agric. Exp. Stat., Raleigh.]*

3090

WEBER, F. and LÖRTSCHER, H. Concerning the influence of environment on the fertility of White Leghorn cocks (S.C.W.) of different origin. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 37-41. [Swiss Fed. Inst. Technol., Animal Breeding Inst., Zurich.]

3091

GERICKE, A. M. and ERASMUS, J. Feather measurements, egg production and body weight. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 41-42. [Transvaal Reg., Univ. Pretoria, Union S. Africa.]

3092

BERG, R. W. and SHOFFNER, R. N. The relationship between 24 week body measurements and reproductive performance. *Poultry Sci.*, 1954, 33, 1043. *Proc. [Univ. Minnesota, St. Paul.]*

3093

HILL, J. F., DICKERSON, G. E. and KEMPSTER, H. L. Some relationships between hatchability, egg production and adult mortality. *Poultry Sci.*, 1954, 33, 1059-1060. *Proc. [Hy-Line Poultry Farms, Johnston, Iowa.]*

3094

HAFEZ, E. S. E. Organ development in relation to egg-laying capacity in the fowl. *J. Agric. Sci.*, 1954, 45, 148-155. [Fac. Agric., Univ. Cairo.]

3095

KARAPETYAN, S. K. Vliyaniye udlinennoi svetovoi ekspozitsii na prodlenie biologicheskoi i produktivnoi zhizni domashnikh ptits. [Influence of lengthening exposure to light on prolongation of biological and productive life of domestic birds.] *Dokl. Akad. Nauk SSSR*, 1954, 94, 585-588. [Inst. Animal Husb., Minist. Agric., Armenian SSR.]

In this experiment 30 laying hens, 15 native and 15 Leghorns, were used. Each group was divided into sub-groups, an experimental and a control. During the first 2 years they were all kept under natural light conditions. From the third year onwards the experimental sub-groups had supplementary (artificial) lighting, with a continuous light-day of 16 hr. for 4 years, while the control groups were kept under ordinary

lighting conditions. Feeding and all the other conditions were the same for all groups.

With longer light the hens were more lively, had a higher physiological activity and laid more eggs than the controls. There were $2\frac{1}{2}$ times more Leghorn hens laying in the fifth year in the experimental than in the control group. The effect of prolonged lighting on the native hens was even more pronounced. All 7 hens in the experimental group were laying in the fifth year, 2 laid into the sixth year and one into the seventh year. Of the control native hens only 4 out of 8 were laying in the fifth year and none later.

During the 6 years the experimental Leghorns laid 56.5 per cent. more eggs than the controls, and the native experimental hens 92 per cent. more than their controls.—H. Scherbatoff.

3096

SKALLER, F., ALLEN, T. E. and SHELDON, B. L.
The effect of intensity of daylight on egg pro-

duction of fowls in cages. *Austral. J. Agric. Res.*, 1954, 5, 578-583. [Div. Animal Health Prod., C.S.I.R.O., Poultry Res. Centre, Werribee, Victoria.]

The intensity of the light on individual birds in a normal battery house varies greatly according to their position relative to the source of light. An experiment was made to see if this had any effect on egg production.

Single Comb White Leghorn, Black Australorp and crossbred pullets were used. The intensity of light on the best and worst positions in the house was measured at 9.30 a.m. and 4.30 p.m. on at least 3 days each week of the laying year. It varied from 170 ft.-candles at 9.30 a.m. to 16 ft.-candles at 4.30 p.m. in the best lighted cages, i.e., those nearest the window, and from 11 to 1 ft.-candle for the worst lighted. Egg production of all birds was recorded. There was no significant difference between groups in the best and worst lighted cages.

T. D. Bell.

See also Absts. 1782, 1892, 1944, 3060.

FOOD ECONOMICS AND STATISTICS

3097

RIGG, T. Role of science in the development of New Zealand agriculture. *Proc. Austral. and N.Z. Assoc. Advancement of Science*, Canberra, January 13th 1954, pp. 35.
Presidential address.

3098

ZUNDEL, G. Amélioration des conditions économiques du commerce du lait. [Improving the economic conditions in the milk industry.] *Lait*, 1954, 34, 481-500.

3099

HEGGDAL, R. Norsk jordbruksproduksjon i nytt lys. [Norwegian agricultural production in new light.] *Tidsskr. norske Lundbruk*, 1954, 61, 306-316.

This is a lecture in which the changes in food production in Norway between 1939 and 1953 are summed up as follows: on a smaller area, with 170,000 fewer milk cows, with less imported concentrates and with about 22 per cent. less labour, plant and animal production has been increased by about 8 per cent. [It does not say how measured.] The population in the same time increased by about 15 per cent. The aim is to improve production still further and to regulate it so as to make the best adjustment to the Norwegian, Scandinavian, or possibly European markets. Details of production of individual

foods and groups of foods are discussed in relation to price, cost of production and habit. Policy must be defined, not in general terms but in terms of produce and in relation to subsidies.—I. Leitch.

3100

EHRICH, C. Welche tierärztlichen Leistungen tragen am meisten zur Steigerung der Erzeugung bei? [What veterinary measures contribute most to increase production?] *Berl. Münch. tierärztl. Wochenschr.*, 1954, 67, 306-308. [Münster.] English summary.

About 90 per cent. of Western Germany's meat requirements are met by home production. Pig meat amounts to 56 per cent. of total meat consumption, beef and veal to 34 per cent. About 38 per cent. of the total fat consumed comes from home animals. Further, 2,713,300 metric tons of liquid milk were produced and consumed during 1953. These figures indicate the importance of the veterinary expert's task of maintaining the health of the cattle and pig population. Prevention of animal diseases, advice on proper feeding to this end, and measures to prolong the useful life of cows (national average only $6\frac{1}{2}$ years) and to combat infertility and diseases of the udder are among their most important duties.—W. M. Deans.

3101

KRÜGER, L. Tierhaltung und Futtermittelbedarf in den Westzonen. [Animal husbandry and

fodder requirements in the West Zones.]
Schriftenreihe zur Fütterungslehre, No. 2,
pp. 34. [Giessen.]

This is No. 2 of a series of pamphlets on animal feeding, produced by the feedingstuffs manufacturers' association of Western Germany. It begins with a review of the position of agriculture before the war, with post-war comparisons. By the loss of the area east of the Oder Germany lost 25 to 30 per cent. of the acreage normally under cereals, potatoes and sugar. Part of this went to supply Berlin and the west. The population of the West Zones, compared with 1937, has increased by over 20 per cent. Per head of the present population the total food crop area has fallen by one-quarter, arable area by one-third and cereal and root areas by one-half. As a result, about 30 per cent. of food is imported.

The food and feedingstuffs positions, actual, potential and desirable, are discussed in detail in relation to purchasing power abroad, and the most economic use of feedingstuffs, with a plea for the benefits, especially in small-animal production and on small and medium sized farms, of ready-mixed feeds. There are 17 pages of tables and charts of pre-war and post-war production, targets for production and illustrative prepared feedingstuffs.—I. Leitch.

3102

HOPPE, A. Untersuchungen über Aufwand und Ertrag im Futterbau und in der Milcherzeugung des Oberen Hardthofes. [Studies of costs and returns in fodder production and in milk production on the Oberer Hardthof.] Inst. Tierzucht Milchwirtschaft, Justus-Liebig-Hochsch., Giessen, 1954, pp. 82 + 17 tables.

The first 18 pages of this report deal with standards for the feeding of dairy cows and the feed efficiency of cows in relation to milk yield and length of life in the dairy herd. Thereafter the farm, which is the experiment farm of the college, is described in detail, with charts of rainfall and temperature and a full account of cropping and crop yields for the small dairy herd for a complete year. The use of the crops is described and the state of health and production of the cows. Comparisons are made with statistics for the district of Hesse.

Conclusions include that the most generally useful and profitable sort of cow is one that gives 25 to 30 kg. milk daily with a flat lactation curve. In terms of yield of starch equivalent per unit area, most fodder plants surpass cereals and many equal or exceed potatoes. Fodder beet and other roots are valuable, especially when cows must be fed in stalls in summer. Green lucerne, and green maize, a most valuable carbohydrate-rich crop, are strongly recommended. Fodder crops provide

adequate or excess protein even for high milk yields; the danger in producing milk on fodder crops alone is of lack of starch equivalent.

I. Leitch.

3103

KRÜGER, L. Erzeugungskosten und Arbeitslöhne im Milchviehstall. [Costs of production and wages in the dairy stall.] Mitt. deutsch. Landwirts.-Gesellsch., 1952, No. 21, pp. 4. [Inst. Tierzucht Milchwirtschaft, Justus-Liebig-Hochsch., Giessen.]

In the author's view, small and medium farms in Germany are overstocked with cows by at least 10 per cent. and milk yields are uneconomically low. Better feeding of fewer animals would be more profitable, and additional liquid milk should be saleable seeing that the yearly milk consumption per head in Germany is only 64 kg., compared with 88 kg. before the war, and 180 kg. in the United States apart from that used in ice-cream.

The mean costs, other than feed, of producing milk are estimated at 21, 14, 10.5 and 8.4 Pfg. per kg. for annual yields of 2000, 3000, 4000 and 5000 kg. per cow, and the total costs at from 37 to 44, 26 to 31.5, 21 to 26 and 19 to 23 Pfg. according to the cropping system and the availability of pasture. With an annual yield of 3000 kg. per cow the farmer receives per hour's work in the dairy stall 0.69 DM. if the milk sells at 27 Pfg. (with return of skimmed milk) and only 0.30 DM. if the selling price is 24 Pfg. Paid labour at 1.25 to 1.40 DM. per hr. is economic only at a price of 26 to 27 Pfg. and with yields of 4000 to 5000 kg., or 3000 to 4000 kg. in regions with good pasture (average yield for Western Germany in 1951 was 2500 kg.).

These figures are borne out by a more detailed inquiry in January 1952 covering 230 farms in Hesse with 1580 cows and a mean annual yield of 3600 kg. milk; total costs, including 1 DM. per hr. for field work and 1.15 DM. for stall work, were from 23 to 37, mean 28 Pfg. or where there was summer grazing 21 to 28, mean 25 Pfg. Some data from other parts of Germany are also given.

W. M. Deans.

3104

BONADONNA, T. Considerazioni sulle specie e sulle razze di animali domestici produttrici di carne e sulle regioni di allevamento. [Species and breeds of domestic animals that produce meat and the regions in which they are bred.] Zootec. Vet., 1954, 9, 278-292. [Ist. Sper. Ital. "L. Spallanzani", Milan.]

The importance of a diet both balanced and palatable is stressed, with special reference to Italian cooking. Animal production is the basis of Italian agriculture and her greatest industry,

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but the production of meat is insufficient. The highest proportion is of beef, followed by pork, poultry, mutton (including goatflesh) and horseflesh. In 1953 about 24.2 per cent. of meat supplies was imported; in 1952 livestock and meat represented 2.7 per cent. of the total value of imports, and meat products represented 15 to 20 per cent. of total exports.

It is urgently necessary to raise the standard of living in Italy, which has the lowest food consumption of any country in Europe, 2400 Cal. against 2510 for Greece. The average yearly meat consumption of 17 kg. per head is the second lowest in Europe, that of fats, 10 kg., the lowest, that of liquid milk, 49 kg., the second lowest, and cereal consumption, 157 kg. per head, the highest.

Tastes in meat differ from one country to another and even from one district to another. Fat joints are preferred in much of Italy; in Lombardy milk-fed veal is esteemed, and in Central and South Italy more lamb is consumed. Breeds of stock are compared according to their value in different conditions. Specialised beef breeds are not suited to the Italian economy. Pigs go mostly for the making of sausages and other prepared products and little fresh pork is eaten. Poultry production is mostly domestic and there is little industrial organisation. The distribution of livestock by species and age in the different regions of Italy is tabulated, and the total meat production per head of population in each province.—D. Duncan.

3105

PATUELLI, C. and SIGNANI, F. Costo di produzione del vitellone da carne romagnolo. [The cost of producing fat Romagnola calves.] *Riv. Zootec.*, 1954, 27, 332-333.

A balance sheet indicates that the cost of producing a fat calf weighing 490 kg. at 20 months is 188,704 lire, and the net cost per kg. meat is 340 lire. The cost to the consumer is between 450 and 1000 lire and the reason for this is again shown in a balance sheet. It is concluded that earlier maturing animals of greater liveweight should be the aim of breeders of Romagnola cattle, as well as greater milk production.—D. Duncan.

3106

CAMBRIDGE UNIVERSITY SCHOOL OF AGRICULTURE, FARM ECONOMICS BRANCH. Profitable egg production. *Farmers' Bull.* No. 17, October 1954, pp. 24. Price 2s. 6d.

Now, more than ever before, prosperity in the poultry industry depends on efficiency of egg production. The trend of egg prices is discussed as an introduction to a general discussion on profitable management under existing conditions,

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and suggestions are made on the best policy and methods to be adopted.

Hatching dates should be carefully selected and good laying stock chosen. While avoiding heavy capital expenditure on specialised equipment, the most productive system of accommodation should be chosen. Production costs should be minimised by paying attention first to the major items of feedingstuffs and depreciation, and ways of doing this without reducing production itself are described.—T. D. Bell.

3107

VAN WYK, H. P. D. What are the possibilities for higher beef production? *Farming in S. Africa*, 1954, 29, 447-451. [Coll. Agric., Potchefstroom.]

3108

MARES, R. G. Animal husbandry, animal industry and animal disease in the Somaliland Protectorate. 2. Animal industry. *Brit. Vet. J.*, 1954, 110, 470-481.

The stock populations, animal products, butchering and marketing conditions, and infectious diseases encountered in the Somaliland Protectorate are discussed.—I. A. M. Lucas.

3109

DINNIS, E. R. Grass production costs. Results from a grassland management investigation, 1951 and 1952. *J. Brit. Grassland Soc.*, 1954, 9, 183-193. [Imperial Chemical Industries, Ltd., Central Agric. Control.]

Detailed cost accounts were obtained for 54 mainly grassland dairying farms. One- and 2-year leys and other special purpose pastures based on single pasture species made up 75 per cent. of the ley area. The average annual fertiliser dressing per acre of the total farms' area was equivalent to 52 lb. N, 34 lb. P_2O_5 and 28 lb. K_2O and the removal of the war-time fertiliser subsidy was mainly responsible for the increase in grass production costs from £7.7 per acre in 1951 to £8.8 in 1952. The average yield of hay per acre per cut was 1.46 tons costing £6.6 per ton and of silage 4.29 tons costing £2.2 per ton. The cost per ton of starch equivalent in these 2 products was approximately the same, £17.3 to £19.2. This was twice the cost of grazed starch equivalent but only one-third that in purchased dairy cake.

J. L. Corbett.

3110

JAWETZ, M. B. The relative costs and values of protein in purchased dried grass, dried lucerne and concentrates. *Farm Economist*, 1954, 7,

299-305. [Dept. Agric. Econ., University Coll. Wales, Aberystwyth.]

3111

FERRANDO, R., JACQUOT, R. and MÉRAT, P.
Réalizations nouvelles et perspectives d'avenir

pour les tourteaux oléagineux. [New views and future perspectives for oil cakes.] *Ann. Nutrit. Alimentation*, 1954, 8, 547-588. [Ecole Nat. Vet., Lyons.]

See also Abst. 2611.

DIET IN ETIOLOGY OF DISEASE

GENERAL

3112

HIGNETT, S. L. Infertility of cattle in Jamaica. A report on a visit to Jamaica, September-October, 1952. *Dept. Agric. Jamaica Bull.* No. 52 (New Ser.), pp. 20. [Wellcome Vet. Res. Stat., Frant, Tunbridge Wells, England.]

Conditions of heredity, infection and management likely to produce infertility are considered. Nutritional deficiencies thought possibly to be associated with infertility are those of phosphorus, vitamin A, copper and iodine. Lines of research on P deficiency and on "Manchester wasting disease" (see Abst. 2996, Vol. 20) are proposed.

D. Harvey.

3113

KENDALL, K. A., HAYS, R. L. and ROLLER, G. D. Impaired reproduction in the rabbit fed supplemented diets containing soybean hay. *J. Animal Sci.*, 1954, 13, 859-866. [Dept. Dairy Sci., Univ. Illinois, Urbana.]

In 3 experiments the rabbits received a basal diet with percentage composition finely ground soya bean hay 49.5, ground wheat 49.5, NaCl 1. The poor fertility of females on this ration was not improved by supplements of *DL*-methionine, 0.3 per cent.; choline chloride, 0.3 per cent.; steamed bone meal, 1 per cent.; carotene; vitamin A; α -tocopherol; progesterone; 2-methyl-naphthoquinone; or vitamin B₁₂. Autoclaving the hay was also ineffective. Abortions and haemorrhages occurred in several groups.—D. Duncan.

3114

SCHÖNHERR, S. Sterilität bei Ziegen und ihre volkswirtschaftliche Bedeutung. [Sterility in goats and its economic importance.] *Berl. Münch. tierärztl. Wochenschr.*, 1954, 67, 311-313. [Tierklin., Freie Univ., Berlin.]

The goat population of Germany has fluctuated considerably, partly but not wholly in response to economic conditions. In 1939 there were over 3,200,000, and in 1949 still more, but since then the number has declined. In 1953, over 53½ million kg. milk was produced by about 910,000 goats. According to Machens (*Deutsch. Landwirtsch. Tierzucht*, 1933, 53, 1035) the value of goat's

milk, butter and meat, and meat from pigs reared on skimmed goat's milk, was over 343 million RM.

The most serious disease of goats is sterility in males, discussed in the remaining two-thirds of the article. [There is no suggestion of any nutritional cause.]—W. M. Deans.

3115

LERCHE, M. Der deutsche Tierarzt in der Ernährungswirtschaft. [The German veterinary officer and the food supply.] *Berl. Münch. tierärztl. Wochenschr.*, 1954, 67, 295-297. [Inst. Lebensmittelhyg., Univ. Berlin.] English summary.

A general article pointing out the importance of the veterinary expert in the prevention and treatment of animal diseases.—W. M. Deans.

3116

BARRENTINE, B. F., SHAWVER, C. B. and WILLIAMS, L. W. Bloat studies and observations. *J. Animal Sci.*, 1954, 13, 1006. *Proc. [Mississippi Exp. Stat.]*

3117

BARKER, J. R. Bloat of cattle in Britain. *N.Z. Vet. J.*, 1954, 2, 90-92. [Hereford.]

3118

HANCOCK, J. Studies in grazing behaviour of dairy cattle. 2. Bloat in relation to grazing behaviour.

HANCOCK, J. and McMEKAN, C. P. 3. Rotational compared with continuous grazing. *J. Agric. Sci.*, 1954, 45, 80-95; 96-103. [Ruakura Animal Res. Stat., N.Z. Dept. Agric., Hamilton.]

Comparisons were made between interrupted periods of grazing on unrestricted pastures, interrupted grazing on restricted pastures, grazing for restricted times and normal rotational grazing. Only the third comparison, namely, restriction on a time basis, gave any protection against bloat. Long grass pastures proved to be less dangerous than short pastures. Cows tended to restrict their grazing periods voluntarily when the pasture was potentially dangerous: under these circumstances rumination times were also shorter. In

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the early stages of bloat ruminal movements and belching increase in frequency and intensity. Atony occurs only in advanced stages.

A. T. Phillipson.

3119

LINDAHL, I. L. and DAVIS, R. E. Some factors in feed lot bloat. *J. Animal Sci.*, 1954, 13, 1024. *Proc.* [U.S. Dept. Agric.]

3120

GREGORY, P. W. An analysis of wry calves in California beef herds. *J. Animal Sci.*, 1954, 13, 957-958. *Proc.* [Univ. California.]

3121

GREGORY, R. P. (Jr.), WISE, J. C. and SIKES, D. Experimental production of bovine hyperkeratosis with a feed concentrate exposed to vapors of a highly chlorinated naphthalene. *J. Amer. Vet. Med. Assoc.*, 1954, 125, 244-246. [Tennessee Agric. Exp. Stat., Knoxville.]

3122

SINGSEN, E. P., POTTER, L. M., MATTERSON, L. D., BUNNELL, R. H., KOZEFF, A. and JUNGHERR, E. L. Studies on encephalomalacia in the chick. 4. The influence of oil in fish meal and oils from various species of fish on the incidence of encephalomalacia. *Poultry Sci.*, 1954, 33, 1081. *Proc.* [Univ. Connecticut, Storrs.]

See also Absts. 1638, 1639, 1846, 1890.

DEFICIENCY DISEASES

3123

BINNERTS, W. T. and BROUWER, E. Analysis of milk in deficiency diseases and intoxications of cattle. *Nature*, 1954, 174, 974. [Lab. Animal Physiol., Agric. Univ. Coll., Wageningen.]

The analysis of milk is advocated for the study of deficiency of vitamins and trace elements like I and Cu and of excess of Mn, Zn, Mo, As, Pb, insecticides and other toxic substances.

A. Hepburn.

3124

NORDFELD, S., GELERSTEDT, N. and FALKMER, S. Studies on rape-seed meal and its goitrogenic effect on pigs. A nutritional and histopathological study. *Acta pathol. microbiol. scand.*, 1954, 35, 217-236. [Nat. Animal Exp. Stat., Upsala.]

Weanling pigs of the Swedish Landrace breed weighing 20 to 25 kg. were used. The basal ration was a mixture of oats 45, barley 45 and wheat bran 10 per cent. This ration was supplemented with different kinds of protein. In the control group skimmed milk was used and in the test groups rapeseed meal untreated or after extraction with hot water. Supplements of alfalfa, vitamin

D₃, CaCO₃, calcium phosphate and NaCl were given. Equal amounts of energy, protein, vitamins and minerals were supplied to the different test groups. The pigs were fed twice daily and weighed weekly. Antibiotics, vitamin B₁₂ and bacitracin were given to some groups and also an iodinated casein showing 2 per cent. of the activity of synthetic thyroxine.

Two experiments were made. In the first, the time necessary for the pigs to reach 100 kg. from a starting weight of 22.4 kg. was 125 days in the group on grain and skimmed milk; 127 days in the group on grain and rapeseed meal which was given at the levels of 13.0, 9.5 and 8.0 per cent. as the pigs reached a weight of 30, 40 and 50 kg.; 126 days in the group getting rapeseed meal and bacitracin; 125 days in the group getting bacitracin and vitamin B₁₂ and 125 days in a group getting soya bean oilmeal. Although daily growth rate was less in the group on rapeseed meal the difference was not statistically significant; the amount given was low and the meal was omitted after the pigs reached 75 kg.

In the second experiment both untreated and water-extracted rapeseed meal were tested. In groups not receiving wheat bran the percentage of rapeseed meal in the rations was 17.5, 10.0, 7.5 and 3.1 when the pigs weighed 30, 40 and 50 and 90 kg. The water-extracted meal had a significant effect on growth, and this effect was enhanced by the addition of 10 per cent. wheat bran. The addition of iodinated casein, 0.5 g. per 100 kg. bodyweight, did not affect growth, but reduced the thyroid enlargement caused by the unheated rapeseed meal. The water-extracted meal had no goitrogenic effect. The control group on skimmed milk reached 92 kg. in 106 days. The untreated rapeseed meal group took 131 days. The water-extracted rapeseed meal group took 123 days, but the addition of 10 per cent. wheat bran reduced this to 114 days. The untreated rapeseed meal at levels of 10 to 20 per cent. also increased the size of liver, kidney and thyroid. The addition of vitamin B₁₂ or bacitracin or both to these all-plant protein diets had no significant effect on growth under these experimental conditions.

B. W. Simpson.

3125

LANG, E. and UNDRITZ, E. Die Eisenbehandlung der alimentären Anämie in Gefangenschaft lebender Elefanten, ein Beitrag zum Problem der alimentären Anämie überhaupt. [Iron treatment of nutritional anaemia in captive elephants, a contribution to the problem of dietary anaemia in general.] *Schweiz. med. Wochenschr.*, 1954, 84, 1120-1122. [Zool. Garten, Basle.]

In 5 young captive African elephants the Hb value and weight increased greatly when Fe was

added to the diet. The Fe was given as gluconate (Ferronicum) in daily doses of from 0.1 g. to 1.3 g. Fe for an animal of about 300 kg. weight.

A. M. Copping.

3126

Cobalt deficiency in livestock. Mild and emergent deficiency is widespread determinable only by animal experiment. *N.Z. Agriculturist*, 1954, 8, No. 6, 1-2.

3127

CHUBB, L. G. Further observations on the feeding of manganese deficient diets to growing and breeding chickens. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 164-166. [Poultry Res. Stat., Animal Health Trust, Huntingdon.]

3128

ANDREWS, F. N., PARKER, H. E., HAUGE, S. M., CREEK, R. D. and CARRICK, C. W. The effects of manganese deficiency on the gross and microscopic anatomy of the tibia of the chicken. *Poultry Sci.*, 1954, 33, 1039. *Proc.* [Purdue Univ., Lafayette, Ind.]

3129

HUNT, J. R., BLAYLOCK, L. G. and MCGINNIS, J. Studies on a perosis-like condition in turkey poults. *Poultry Sci.*, 1954, 33, 1061. *Proc.* [State Coll. Washington, Pullman.]

3130

SCOTT, M. L. and HEUSER, G. F. Studies on leg weakness in turkeys, ducks and geese. *10th World's Poultry Congr. Sect. Papers*, Edinburgh 1954, 255-258. [Dept. Poultry Husb., Cornell Univ., Ithaca, N.Y.]

See also Absts. 1840, 1841, 1855, 1856, 1873, 1880, 1891, 1903, 1943, 1949, 1992, 1995.

DISEASES OF METABOLISM

3131

STEWART, J. Hypomagnesemia and tetany of cattle and sheep. *Scot. Agric.*, 1954, 34, 68-73. [Moredun Inst., Gilmerton, Edinburgh.]

3132

GILL, J. C. and THOMSON, W. (with PARK, G. T.) The production of ketonaemia and pregnancy toxemia in ewes through manipulation of the feeding level. *J. Agric. Sci.*, 1954, 45, 229-240. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Ewes were maintained on low and high planes of feeding throughout pregnancy; the high-plane ewes were checked by a sudden reduction of the food 7 weeks before lambing. Blood ketones were

estimated regularly in all animals. The trials extended over 2 years and involved 120 half-bred ewes.

Pregnancy toxemia occurred in only 2 ewes during the first season, one in the low-plane and one in the high-plane checked group. Eight ewes were affected in the second season, all in the high-plane checked group; 4 of these when the check in nutrition was imposed and the other 4 after a 48-hr. fast imposed 11 days before they were expected to lamb. A high concentration of ketone bodies in the blood was not always associated with pregnancy toxemia, and some ewes had high values for blood ketones without showing signs of the disease. It is concluded that ketonaemia is not responsible for the syndrome known as pregnancy toxemia. A check in the feeding is likely to produce ketonaemia, but the essential disturbance of pregnancy toxemia is more obscure.

A. T. Phillipson.

3133

PARRY, H. B. Induction of toxemia of pregnancy in sheep. *J. Physiol.*, 1954, 126, 40P. [Nuffield Inst. Med. Res., Univ. Oxford.]

3134

REBER, E. F., BAIN, L. R., HATCH, R. D., SCHOETTLE, C. E. and SAMPSON, J. The use of ketogestin and sodium ethyl oxalacetate in the treatment of hypoglycemia and ketonemia. *J. Animal Sci.*, 1954, 13, 1029. *Proc.* [Univ. Illinois.]

3135

WARD, G. M., HUFFMAN, C. F. and DUNCAN, C. W. Cobalt polycythemia in cattle. *J. Animal Sci.*, 1954, 13, 1003-1004. *Proc.* [Michigan State Coll.]

POISONS OCCURRING IN FOOD

3136

WEST, J. L. A classification for the clinical interpretation of bovine dental fluorosis. *Vet. Med.*, 1954, 49, 465-468. [Dept. Pathol., Kansas State Coll., Manhattan.]

The classification comprises 5 categories, based on the colour, opacity, staining and wear of each individual incisor and molar tooth.—W. A. Greig.

3137

BOHSTEDT, G. and GRUMMER, R. H. Salt poisoning of pigs. *J. Animal Sci.*, 1954, 13, 933-939. [Dept. Animal Husb., Univ. Wisconsin, Madison.]

Two groups, each of 6 pigs, were given a low-salt diet for 99 days. One group was full-fed and the second group was restricted to about 80 per cent. of full feeding. The trough space was limited in order to promote greed. On the 99th

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day the full-fed group was given a wet feed containing 6 per cent. NaCl on an air-dry basis, each pig consuming about 2.4 oz. salt during that day. The second group was given a wet feed containing 8 per cent. NaCl on an air-dry basis, each pig consuming about 3.2 oz. salt. For the next feed, on the following afternoon, both groups were given a wet feed containing 8 per cent. NaCl on an air-dry basis, but they were reluctant to eat it all. On the third day the pigs were fed and watered normally, but several pigs were found lying paralysed and semi-conscious. By the fifth day only one pig remained in the full-fed group and 2 in the restricted group.

The paralysis and death were attributed to NaCl poisoning or to stress due to change of concentration of dietary NaCl. The only gross anatomical change observed was in the liver. Serum Na and Cl values were normal.

The conditions favouring NaCl poisoning are listed. They include preliminary salt starvation, greed, salt in amounts of 1.5 or 2.0 per cent. of the wet feed, no additional drinking water, and more than one feed of a high-salt diet.

I. A. M. Lucas.

3138

WAHLSTROM, R. C., KAMSTRA, L. D. and OLSON, O. E. The effect of arsenic acid and 3-nitro-4-hydroxyphenylarsonic acid on selenium toxicity in pigs. *J. Animal Sci.*, 1954, 13, 1003. *Proc.* [S. Dakota State Coll.]

3139

EVANS, W. C., EVANS, E. T. R. and HUGHES, L. E. Studies on bracken poisoning in cattle. 3. Field outbreaks of bovine bracken poisoning. *Brit. Vet. J.*, 1954, 110, 426-442. [Dept. Agric. Chem., University Coll. N. Wales, Bangor.]

Two outbreaks of bracken poisoning are described. One, in Monmouthshire, affected Friesian heifers and 22 died, the other, in Montgomeryshire, involved 15 cattle and 6 died. The signs were like those seen in experimental bracken poisoning.

The etiology of the disease is discussed.

D. Duncan.

3140

PRIOUZEAU, M. Intoxications alimentaires à rentissement pulmonaire, chez les bovidés. [Nutritional intoxication with pulmonary consequences in cattle.] *Rec. Méd. vét.*, 1954, 130, 81-104. [Mareuil-sur-Lay, Vendée.]

A general account is given of the digestive and pulmonary signs, diagnosis, prognosis and treatment, of disturbances caused in cattle by eating too freely of certain plants not normally regarded as poisonous, or poisonous only at certain stages of growth. The plants thus considered are the leaves, stems and flower heads of fodder crucifers

of cabbage and mustard type, the water horseradish (*Roripa amphibia*), the wild cress (*Nasturtium sylvestre*), peppermint and thyme. Feeding on aftermath is considered especially dangerous. The nature of the substances causing the intoxication is briefly discussed.—E. M. Hume.

3141

KANYUKA, F. D. Otravlenie svinei na vypase. [Pasture poisoning of pigs.] *Veterinariya*, 1954, 31, No. 5, 56.

Poisoning due to eating roots of water hemlock is discussed.—H. Scherbatoff.

3142

GARDNER, C. A. and BIENNETTS, H. W. Poison plants of Western Australia—ironwood. *J. Agric. W. Austral.*, 1954, 3, 395-398. [Animal Health Nutrit. Labs.]

3143

JOCKOVIĆ, M. Toksično dejstvo divijeg bosiljka (*Stachys annua* L.). [Toxic effects of the hedge nettle, *Stachys annua* L.] *Acta vet. Belgrade*, 1954, 4, No. 3, 39-43. [Farmakol. Inst., Vet. Fakultet, Belgrade.] German summary.

3144

HIDIROGLOU, M. "Alchornea yambuyaensis" plante toxique pour le bétail au Congo belge. [Alchornea yambuyaensis, a poisonous plant for livestock in the Belgian Congo.] *Rev. Élevage Méd. vét. Pays trop.*, 1954, 7, 171-172.

3145

PACE, C. I pericoli per l'uomo e per gli animali delle farine e dei fieni infestati da segala cornuta. [The dangers for man and animals of cereals and hays infested with ergot.] *Riv. Zootec.*, 1954, 27, 253-255.

See also Abst. 3139.

IMMUNITY

3146

SMITH, H. W. Food as a vehicle of infection: the effect of variations in the diet on the induction of *Salmonella gallinarum* infection. *Brit. J. Exp. Pathol.*, 1954, 35, 447-458. [Animal Health Trust, Houghton Grange, Huntingdon]. Groups of 9-week-old cockerels from a salmonella-free flock, individually housed and fed on a basal diet of whole wheat and the following mash: wheat meal 12.5, barley meal 12.0, oatmeal 16.0, pea meal 3, maize meal 15, middlings 15, maize gluten feed 5, grassmeal 7.5, minerals 1.25, synthetic vitamin D 0.25, white fish meal (66 per cent. protein) 10, dried yeast 2.5 per cent., were used to test the effect of a single dose of known

numbers of *Salmonella gallinarum* given in different feeds. From survivors after 3 weeks blood and rectal swabs were examined; the chickens were then killed and the carcasses examined for infection.

Preliminary experiments showed that the pH of gizzard contents was significantly higher in chickens fed on mash than in those fed on whole wheat or coarsely or finely ground wheat. Grinding, or addition of middlings to finely ground wheat, did not affect pH; addition of 10 or 15 per cent. fishmeal, but not of 10 per cent. casein, to wheat raised the pH value to that with mash.

Groups of chickens were given infected mash; whole wheat with or without 20 per cent. alkali (powdered chalk 40, colloidal kaolin 43, magnesium trisilicate 17 per cent.); the 3 wheats plus 15 per cent. fishmeal; finely or coarsely ground wheat alone; or finely ground wheat plus 20 per cent. middlings. The chickens were killed after 2, 4, 6, 8 and 24 hr. and counts were made of *Salm. gallinarum* in contents of gizzard, duodenum, ileum and rectum. *Salm. gallinarum* counts were zero or negligible in the gizzard of chickens fed on any of the wheats. Destruction of *Salm. gallinarum* was much less with mash or diets containing fishmeal, and was prevented by alkali. There was no appreciable destruction of *Salm. gallinarum* in organs beyond the gizzard. Further experiments *in vitro* and *in vivo* confirmed the relation between gizzard pH and destruction of *Salm. gallinarum* therein.

Of 92 chickens given 50×10^5 *Salm. gallinarum* in mash, 63 became infected and 31 of these died; with whole wheat only 11 and 4. Addition of 20 per cent. alkali to both diets raised the infection and death rates. In groups of 36 birds given the same dose in wheat whole, coarsely ground or finely ground the respective numbers infected were 4, 11 and 18; when 15 per cent. fishmeal was added, 29, 29 and 30. Addition of 20 per cent. middlings to finely ground wheat did not raise the infection rate.

Finally, 10 heavily infected chickens were added to each of 2 groups of 50 chickens housed in identical outdoor arks and one group was fed on mash only and the other on whole wheat only. After 6 weeks 23 mash-fed chickens were infected and 8 of these had died, but only 7 and 4 of the wheat-fed chickens. Hence it is suggested that when a natural outbreak occurs in a flock, it would be worth while to alter the diet to whole wheat only.

It is concluded that both the consistency of a feed and its capacity to neutralise gastric acidity affect the bactericidal action of the gastric juice in the gizzard. This may lead to erroneous conclusions from experiments on host nutrition and resistance to infection and it is suggested that in such experiments animals should be fasted for 12 to 18 hr. and then be given the infective dose in an alkaline medium.—W. M. Deans.

3147

SPEDDING, C. R. W. Production of worm-free lambs at pasture. *Nature*, 1954, 174, 611. [Grassland Res. Inst., Hurley, Berks.]

Nine ewes and 15 newborn lambs were moved, every 2 days, on to a fresh area of newly sown ley on land which had been free of cattle and sheep for 2 years. Average egg count in ewes was 300 eggs per g. faeces but up to weaning was negligible in the lambs. A similar group of ewes and lambs followed the first over the pasture and the average count of these lambs was 90 eggs per g. Lambs on the worm-free pasture made quicker weight gains than those sub-clinically infected. It is believed that this is a truer comparison of the effect of worm burden than is possible in indoor trials where re-infection by grazing is not accounted for.—J. C. Gill.

3148

EMERICK, R. J., BEMRICK, W., SHUMARD, R., POPPE, A. L., HERRICK, C. A. and PHILLIPS, P. H. The protective effect of minerals on stomach worm infection for lambs on pasture. *J. Animal Sci.*, 1954, 18, 982. *Proc.* [Univ. Wisconsin.]

3149

BAIRD, D. M., VEGORS, H. H., SELL, O. E. and STEWART, T. B. Performance and parasitism of beef calves as related to level of protein and pasture feeding. *J. Animal Sci.*, 1954, 18, 1005. *Proc.* [Georgia Exp. Stat.]

3150

MARKHAM, F. S., PRICE, R. J., SEEGER, K. and WHITE-STEVENS, R. Dietary aureomycin and immune response to Newcastle Disease and infectious bronchitis vaccination. *Poultry Sci.*, 1954, 33, 1069. *Proc.* [Lederle Labs. Div., American Cyanamid Co., Pearl River, N.Y.]

7. BOOK REVIEWS

3151

CONNELL, V. (Ed.) **The application of results of research.** Butterworths Scientific Publ., London, 1954, pp. vii + 212. Price 21s.

This report was prepared at the request of the British Commonwealth Scientific Official Conference of 1946, presented to the 1952 Conference and at the request of that Conference extended to 1953. There is a short introduction and four short chapters outlining methods of conveying the results of research to those who have practical use for them. Conventional Methods include publication, abstracting services, press publicity, exhibitions, films, broadcasts and special developments of all these which are outlined under Special Methods and include agricultural extension services, the establishment and maintenance of standards, surveys of industry and liaison with industry. Among Obstacles to the Use of Information very rightly stands first the use of a "cryptic argot" thought to be "scientific", and second the difficulties of bridging the gap between discovery and factory.

There are Appendixes which outline chiefly the special methods used in the United Kingdom, Canada, Australia, New Zealand, South Africa, India, Ceylon and Southern Rhodesia, and finally "novel" methods in the United States, those chosen being the Tennessee Valley development, the Bureau of Agricultural and Industrial Chemistry of the U.S. Department of Agriculture with 4 Regional Laboratories that run demonstration pilot plants with local produce, and the Research Corporation and University Research Foundations.

This should be a useful guide in a general way. It might have been more useful overseas if addresses of at least the more important organisations had been given.—I. Leitch.

3152

GREENBERG, D. M. (Ed.) **Chemical pathways of metabolism.** Volume 2. Academic Press, Inc., New York, 1954, pp. viii + 383. Price 76s.

Considerable progress has been made in recent years in describing biosynthetic as distinct from degradative pathways of metabolism, mainly by the use of isotopic tracers and, to a less extent, biochemical mutants of micro-organisms. The previous volume, reviewed in Abst. 1546, Vol. 25, discussed non-nitrogenous compounds and their metabolism; this volume is concerned with nitrogenous substances.

A chapter on nitrogen metabolism of amino-acids by P. P. Cohen (pp. 46) is concerned more with the enzymes involved than with the biological significance of the reactions they catalyse, and

largely ignores those reactions where purified enzymes have not yet been obtained, which is a pity. Three chapters by Greenberg, on carbon catabolism of amino-acids (pp. 66), synthetic processes involving amino-acids (pp. 36) and the metabolism of sulphur-containing compounds (pp. 24) and a chapter on the enzymic synthesis of peptide bonds by H. Borsook (pp. 50) give a full account of the remainder of amino-acid metabolism, though omitting much of the recent speculation on mechanisms of protein synthesis.

M. P. Schulman discusses purines and pyrimidines (pp. 39), collecting some diverse information on their synthesis. Nucleotides and nucleosides are considered by L. A. Heppel (pp. 24) and the volume concludes with a description of the metabolism of haem and chlorophyll by S. Granick (pp. 56). There is an extensive bibliography, including a surprising number of papers dated well into 1954. Some of the chapters are followed by addenda reporting recent works, which are not included in the index.

Biochemically-minded nutritionists should look elsewhere for accounts of digestion, but they will find this book valuable for a clear, comprehensive and really up-to-date account of the synthetic and degradative reactions undergone by the products of digestion once they are absorbed. Biochemists will find the metabolism of micro-organisms and some of that of plants adequately discussed, particularly where the reactions concerned are shared with mammals.—C. Warner.

3153

ALBRITTON, E. C. (Ed.) **Standard values in nutrition and metabolism.** Wright Air Development Centre, Ohio, Tech. Rep. Nos. 52-301, December 1953, pp. xi + 380.

The Committee on the Handbook of Biological Data works in the United States of America under the American Institute of Biological Sciences and the National Research Council. The system under which this Technical Report has been produced was for the Committee to have the help, first of a number of contributors who prepared the material, and later of a number of reviewers who gave their comments. Seldom, outside the production of encyclopaedias, can a publication have had as many as the 800 collaborators who have played parts of varying degrees of importance in the preparation of this one. The aim was a corresponding weight of authority inherent in the information as presented.

Of its demy quarto pages 250 are taken up by the 13 Sections in which the 160 Tables are grouped and just over 100 pages are required for the

bibliography on which they are based. The values quoted can truly be said to be standards in nutrition and metabolism. Their variety can probably best be described by saying that something can be found about the needs of living organisms from the highest to the lowest orders, whether animal or vegetable in nature, multi- or unicellular in structure; something, too, can be found over the same range of species about pathways of metabolism and excretion of end products. Moreover, the arrangement of letters for designating columns and numbers for designating rows in the tables makes identification of an entry by 2 coordinates simple and the tracing of it in the bibliography need take only a few seconds. The diligence of those who have brought together so much information and arranged it so skillfully is indeed admirable. The principles that they have followed where ranges of values were available should ensure that the data are authoritative.—D. Harvey.

3154

ROWETT RESEARCH INSTITUTE. *Family diet and health in pre-war Britain. A dietary and clinical survey.* Carnegie U.K. Trust, Dunfermline, 1955, pp. 164.

In 1937 Lord Boyd Orr's hypothesis that much ill-health resulted from undernutrition consequent upon poverty was put to the test in a dietary and clinical survey which covered 1352 families in 16 districts of England and Scotland. It was a big and courageous enterprise which broke much new ground and gave rise to a lot of new thinking.

It is a pity that almost 20 years elapsed before the report was published, and Lord Boyd Orr himself tends to dismiss it in his preface as "mainly of historic interest". But this is misleading, because a part analysis and conclusions were passed to the Ministry of Food at the beginning of the war to form the basis of the country's food rationing programme and, as such, to father what remains the greatest and most successful feeding experiment of all time. Much of the thought behind the survey and many of the important conclusions which were based on the data in the report have already been recorded elsewhere (*e.g.*, *Abst.* 2946, Vol. 12 and Review Article, Vol. 24, p. 1).

Now that the meat has been distributed, only the skeleton remains for this report: the detail of the methods used, the tabulated results, the mathematical calculations; and Dr. D. Harvey is to be congratulated on his careful preparation of this immense quantity of data after the original survey team had dispersed. It is not easily digestible without more accompanying commentary and one is made too conscious, by the large proportion of space devoted to the description of methods, of the crudity of many of the tools available at the time. But if the detail is sometimes rough, the

picture is nevertheless very clear and it is sobering to look back only 18 years to see how high a proportion of people were eating less than they required to maintain their health while living in a country with one of the highest standards of living in the world.

There are a great many important lessons buried in the figures of this report, and for workers in the fields of human nutrition and sociology it will repay many hours of patient browsing. For those interested in child growth, there are the results of a large, and what must be unique, feeding experiment with children which is not published elsewhere. "Any investigation into modern conditions and relationships of food, health, and income would have much to learn from the Carnegie Survey by profiting not only from its mistakes but also from the boldness and simplicity of the concepts on which it was based."—F. E. Hytten.

3155

TROWELL, H. C., DAVIES, J. N. P. and DEAN, R. F. A. *Kwashiorkor.* Edward Arnold (Publishers), Ltd., London, 1954, pp. xii+308.

At the end of their description of the disease in children the authors of this book give a summary of their views. The 18 paragraphs which compose that summary are, according to the preface, the only part of the book which is the joint work of all 3 authors. Much consideration must have been given to its composition and, while only quotation in full would do justice to the authors' views, it seems that the first 2 paragraphs of that summary might safely be quoted apart from their context.

"1. Kwashiorkor is most frequently seen in children who have recently been weaned: that is, in children between the ages of 1 and 2 years.

"2. Lack of protein in the diet is probably an important cause. The lack may be due to poverty or to habits of growing and eating foods which supply adequate carbohydrate but little protein."

The first section of the book, on the history of the disease, is the work of the senior author, a specialist physician. Few diseases can have had so many different names, of which infantile pellagra, nutritional oedema, malignant malnutrition and multiple-deficiency dystrophy are some. Scarcely less numerous have been descriptions of the signs which appear in the skins of children with the disease: cracked skin, mosaic skin, crazy pavement dermatosis and enamel paint dermatosis. In adult life corresponding conditions may be called reptile skin or elephant skin. Misunderstanding has also arisen in connection with the English equivalents of the words in the Ga language from which the name kwashiorkor is

derived. It is now considered that *kwashi* means first and *orkor* second, a reference to the child being "deposed" by the next younger sibling and not to its having acquired a red colour in its hair or skin.

With polemics crowding the clinical literature, the unanimity which is reported by the second author as existing in the literature of its pathology makes more welcome reading. Fatty infiltration of the liver was an early finding in the histopathology; the facts that it is preceded by atrophy of the pancreas and accompanied by changes in enzyme-secreting cells throughout the body have been the particular contributions made by the second author.

The biochemical findings on which, more and more, final diagnoses seem likely to depend, and the system of treatment with preparations of skimmed milk or of vegetable foods rich in protein are described in detail in the section by the third author, a research worker.

The penultimate section deals with protein malnutrition in adults, and the book ends with a discussion of the implications for the general population of deficiencies of protein in the diets of children or adults.

The authors are under no illusion about the danger of attempting to explain too many of the differences between European and tropical populations as resulting from differences in the amounts of protein available to them. Their work has been centred at Mulago Hospital in Kampala. In the neighbouring territory of Kenya most reports of the disease have come from the Central Province where, as in Buganda, from which Mulago gets many of its patients, some form of banana is a common constituent of the diet. Between these two areas lies the Nyanza Province of Kenya where medical and hospital facilities are no scarcer, where bananas may be less abundant and whence reports of the disease are much less common. Frequently throughout the book there is mention of the need for further investigations. On the basis of the work reviewed it appears that field observations in some part of East Africa where the incidence of the disease is lower may provide replies to some of the questions that remain unanswered.—D. Harvey.

3156

VAN WERSCH, H. J. *Scurvy as a skeletal disease. A comparative study of scurvy and rickets, clinically, histologically, histochemically, biochemically and roentgenologically.* Dekker and Van de Vegt N.V., Utrecht, 1954, pp. xvi + 365. Price Fl. 28.50.

In many ways this is a remarkable book. The preface tells us that it is the work of a general practitioner and the autobiographical introduction describes its origin from, first, a study of calcium

and phosphorus metabolism in tetany for an M.D. thesis, and then the accident of having as patient a girl, aged 17 when first seen in 1935 with scurvy that had been diagnosed as sarcoma in 1931 and 1932. To the meticulous study of the girl at intervals over 12 years, add a brief history of scurvy and a quite extensive study of the bone histology and histochemistry of guinea-pigs, normal and scorbutic, and of rats, normal and with rickets, a chapter on man's requirement of vitamin C and a few odds and ends, and you have a very unusual book indeed.

The history of scurvy is brief. It does pick out the main highlights but makes no attempt to discuss the medical absurdities that flourished round the name scurvy, up to and even after the time of Lind. There are more recent items of considerable interest, such as the declaration by Benekamp and Hijmans Van den Bergh in 1899 that a diet of boiled milk gives a baby Barlow's disease because of the destruction of something in the milk, and the facsimile of the letter from Van den Bergh in which he says the fact was obvious if the mind could be diverted from bacteriology.

Part 2 of the book, one chapter of 17 pages, gives the astonishing history of the patient, who possibly had scurvy in infancy and certainly had it severely, with subperiosteal haemorrhage, from 1931 to 1935, and intermittently between 1936 and 1945, with 2 fractures that would not unite and more subperiosteal haemorrhage. Yet her vitamin C requirement as estimated by van Eekelen's method does not seem to have been abnormal and her blood ascorbic acid at saturation was normal. Certainly her diet was deficient; boiled milk in infancy, when first seen bread and butter, tea, coffee, chocolate and occasionally a very little fruit. There was great difficulty in getting her to take milk, cheese, fruit or vegetables and treatment had to be with ascorbic acid. There is throughout the history the further extraordinary fact that there is no mention of petechiae, swollen gums (although her teeth were yellow with white spots), or changes other than in the bones. The picture throughout suggests that of "infantile" scurvy. The question is inevitable whether perhaps more than one substance required for structure and repair was not lacking.

The view on vitamin C requirement is: although little is needed to prevent or cure scurvy, saturation is probably the best condition since it is that found in animals that synthesise their own.

The final chapter is on the effects of germination and of sunshine on the vitamin C content of plants.

The book is well produced and profusely illustrated with X-ray photographs and photomicrographs. On the whole, it is a most interesting medical document, such as is too seldom produced nowadays.—I. Leitch.

3157

BEEZIN, Ya. M. Znachenie solei kobal'ta i medi v kormlenii sel'skokhozyaistvennykh zhivotnykh. [Significance of the salts of cobalt and copper in the nutrition of domestic animals.] Acad. Sci. Latvian S.S.R., Zootech. and Zool. Inst., Riga, 1952, pp. 124.

This is a study of "sukhotka" which occurs on cobalt-deficient soils in Latvia. It is a disease resembling osteomalacia and "licking disease" and affects lambs and kids, sheep and goats, calves and adult cattle in that order, particularly pregnant animals and highly productive cows, but is rarer in pigs and horses. The signs are loss of appetite, constipation and dry skin, and in ruminants cessation of rumination. A map is included showing differences in intensity of the disease in Latvia. A review of Soviet and foreign literature seems to show that the signs of "pining", "coast disease" and "sukhotka" are similar.

In Latvia the worst affected animals were on soils with an available Co content of 1.5 to 2 mg. per kg. With a Co content of 2 to 2.3 mg. per kg. there was less sickness. On soils with a Co content of 2.3 to 2.5 mg. per kg. animals were free of the disease. Fertilisers and agricultural technique as well as the type of plant affected the amount of Co in plants. The soils with the highest Co content were turf-carbonate leached soils and heavy clay loams. Light podsolised and sandy soils, also boggy soils, had a low Co content.

Experiments with Co supplements were made with sheep, calves, cows, pigs and chickens and anatomical, histological, chemical and haematological investigations of the carcasses of the control animals not receiving Co, all of which died, were made.

Only brief mention is made of vitamin B₁₂, which is a complex containing about 4.5 per cent. Co.

Administration of Co to cattle, pigs and chickens increased Hb, and vitamins A, E and C and Fe in the organs were also increased.

Although copper is mentioned in the title of this paper not much reference is made to it in the text, the main emphasis being upon cobalt. Where soils lack Cu a combination of Cu and Co is recommended for ruminants with "sukhotka".

Prophylactic daily doses of cobaltous chloride are given as: cows and horses 10 to 20 mg., pigs, calves and foals 5 to 10 mg., sheep and goats 1.5 to 2.5 mg. Therapeutic doses, in the same order, are: 20 to 40 mg., 10 to 20 mg., 2.5 to 5 mg.

H. Scherbatoff.

3158

MRAK, E. M. and STEWART, G. F. (Eds.) *Advances in food research*. Volume 5. Academic Press Inc., New York, 1954, pp. x + 538.

3159

CLIFTON, C. E., RAFFEL, S. and STANIER, R. Y. *Annual review of microbiology*. Volume 8. Annual Reviews, Inc., Stanford, Calif., 1954, pp. 536.

3160

BURLEW, J. S. (Ed.) *Algal culture from laboratory to pilot plant*. Carnegie Institution of Washington Publ. No. 600, 1953, pp. ix + 357.

This collective work is in the nature of a progress report. It consists largely of accounts of experiments on the culture of *Chlorella* spp. under the auspices of the Carnegie Institution of Washington and other bodies in the United States, but includes also accounts of some in the United Kingdom, Holland, Germany, Venezuela, Israel and Japan. Unfortunately, apart from the rather later Japanese work, the story is carried only to the end of 1951, by which time some 100 lb. of *Chlorella* had been grown in a transparent polyethylene plastic tube holding about 1000 gal. in a pilot plant at Cambridge, Massachusetts, and it was clear that the new "crop" had interesting possibilities but that many practical difficulties in the growing and harvesting of it had still to be overcome.

Of the 5 parts, the first and the last are most likely to appeal to the non-specialist reader. Part 1 consists of a general introduction and summary; part 5 includes chapters on the chemical composition of green unicellular algae in general, the nutritional value of *Chlorella*, and possible non-food uses of algae. The intervening parts are much more technical and detailed. Part 2 consists of 6 chapters on the biology of algae and the physical and chemical conditions favouring the growth of *Chlorella*. In part 3 experiments in several countries on the mass culture of *Chlorella*, indoor and outdoor, on an intermediate scale, are described, and in part 4 the construction and working of the pilot plant mentioned above and of a smaller installation in Japan, with photographs. There is a select bibliography.—W. M. Deans.

3161

REGISTRAR-GENERAL. *Statistical review of England and Wales for the year 1953*. 1. Medical. H.M.S.O., London, 1954, pp. x + 365. Price 10s. net.

8. FOOD AND AGRICULTURE ORGANIZATION (AND OTHER ORGANIZATIONS) OF THE UNITED NATIONS

Monthly Bulletin of Agricultural Economics and Statistics.

Vol. 3, No. 11, November 1954, pp. 44. Price \$0.50.

No. 12, December 1954, pp. 48. Price \$0.50.

Key problems of agricultural development in the Near East.

Vol. 4, No. 1, January 1955, pp. 48. Price \$0.50.

No. 2, February 1955, pp. 48. Price \$0.50.

Development Paper No. 45. Factors affecting rice production. Rome, Italy, December 1954, pp. v + 45. Price \$0.50.

Information was obtained by questionnaire from over 30 countries and has been both summarised in text and presented in tabulated form. Large variations in yields were recorded in the different territories. It is concluded that the rice plant requires a warm temperate climate with long periods of sunshine, a 5-month growing period in soil neutral or acid rather than alkaline in reaction and good irrigation. The tables give the data under 10 headings.

Report of the special technical meeting on the economic aspects of the rice industry, Rangoon, 11-18 November 1954. Rome, Italy, 1954, pp. v + 30. Price \$0.25.

Delegates attended from 17 countries exporting and importing rice. They considered the situation as it was affected by the rise in rice production reported in 1953 and 1954 from territories other than China and the U.S.S.R. Governments appeared still to be encouraging production. The recommendations were that increases in consumption should be encouraged in areas where the energy requirements for sustained work cannot be supplied or where the prewar level of consumption has not yet been regained. The creation of larger stocks in both exporting and importing countries would have a steady effect on prices.

Commodity Reports. Rice No. 5. Rome, Italy, December 1954, pp. 38. Price \$0.25.

The work of FAO 1953/54. A progress report. Rome, Italy, July 1954, pp. 60 (mimeographed).

The report, with a preface by the Director-General, describes the Organization's work and the many confer-

ences and regional meetings which it has arranged. There are chapters on Agriculture, Economics, Fisheries, Forestry and Nutrition. The report of the Committee on Calorie Requirements (see p. 517, Vol. 20) is under review and the possibility of relating agricultural production to nutritional requirements is thought to be nearer attainment.

The disposal of surpluses in such a way as to benefit the vulnerable groups was studied in association with UNICEF. In the Near East and in Libya and Iraq the feeding of Arab refugees and of pupils in schools has been arranged and similar help has been given to schools in Central America and Panama. In Brazil the question of protein malnutrition, with signs in children similar to kwashiorkor in Africa, was examined. The need for protein-rich foods prompted work on the preparation of fish flour and on the collection of information from many areas on local foods which are rich in that nutrient. The processing in India of fruit that formerly went to waste, increasing the efficiency of canning practice in Yugoslavia and improvement of baking methods in Chile and Israel are examples of problems in food technology which were examined. The addition of chemicals to foods was studied in association with WHO.

Activities of FAO under the Expanded Technical Assistance Program 1953/54. Rome, Italy, December, 1954, pp. 84 (mimeographed).

This report should be read in conjunction with the Progress Report (see above). It gives, mainly on a regional basis, a description of the work undertaken by FAO for the Technical Assistance Board and the numbers and fields of study of FAO Fellowships awarded in connection with projects which are included in the Programme. In addition four selected projects are described in greater detail; improvement of processing of hides and skins in Libya, irrigation schemes in East Pakistan, development of fisheries in Chile and ground water development in Syria.

Report of the Council of FAO, Twentieth Session, 27 September-8 October 1954. Rome, Italy, November 1954, pp. vii + 100.

9. DEPARTMENTAL AND OTHER REPORTS

AUSTRALIA.

Department of Agriculture and Stock, Queensland. Annual Report for the Year 1953-54. Pp. 109.

Fluorine, copper and phosphorus status of Queensland soils.

Feeding bush hay and Sudan grass silage to sheep during drought.

Effect of buttermilk powder in chick mash on growth-promoting action of penicillin.

Grain sorghum for laying hens.

Vol. 25, No. 2

Effect of protein content of a mash on antibiotic response in chicks in "old" and "new" premises.

Effect of type of ration on severity of caecal coccidiosis in chickens artificially infected.

The Institute of Medical and Veterinary Science, S. Australia. Fifteenth Annual Report of the Council, July 1952-June 1953. Pp. 111.

Toxicity of *Oxalis corniculata* (sheep).

Effect of storage on the estimation of amino-acids in sera.

Setum and urinary amino-acids in normal women.
Alteration in serum and urinary amino-acids pattern in pregnancy.
Serum amino-acids in diabetic ketosis.
Sugar and amino-acid chromatography.

CANADA.

Report of the Minister of Agriculture for the Year ended March 31, 1954. Pp. 151.

Residual oestrogen in lamb carcasses.
Vitamin B₁₂ for pregnant sows.
Lard for suckling pigs.
Dried brewer's and wood yeasts for pigs.
Chemical estimation of vitamin D.
Raising calves on a limited amount of milk.
Hay in roughage combinations for milk production.
Fresh daily grazing *versus* free-range grazing (cattle).
Relation of body weight to clean fleece weight (sheep).
Effect of hormone injections on number of lambs born.
Maize silage *versus* grass silage for fattening bullocks.
Linseed oil meal as supplement for wintering long-yearling bullocks.
Hay to grain ratio in rations of beef bulls.
Consumption of pine needles and abortion in pregnant cows.
Dry meal starter ration for pigs weaned at 10 days.
Mouldy cereal grains in pig feeding.
Alfalfa in ration of pregnant sows.
Measurement of pasture production affected by animal weight variations.
Response to growth stimulants in poultry feed affected by environment.
Surplus fish as poultry feed.
Goosings intolerant to excess protein in the ration.
Use of inedible fat in poultry rations.
Sunflower seed oil meal for poultry.
Effect of iodinated casein on fertility (poultry).

INDIA.

Indian Council of Medical Research. Nutrition Research Laboratories, Coonoor. Annual Report for the Year 1953-54. Pp. 27.

Stability of vitamin A to domestic cooking procedures.
Mode of action of vitamin D in relation to carbohydrate metabolism (rat).
Nutritive value of duck egg white (rat).
Metabolism of animal and vegetable protein: rate of excretion of urinary N; blood sugar and urinary N (rat).
Body composition of normal Indians and changes in undernourished subjects during rehabilitation; cell solids as reference standard for B.M.R.; electrocardiographic changes in severe undernutrition.
Kwashiorkor: treatment with Bengal gram; blood chemistry; pathogenesis of liver injury.
Metabolic interrelations of folic acid, vitamin B₁₂ and citrovorum factor in anaemia.
Vitamin B₁₂ and growth of children.
Vitamin B₁₂ and protein metabolism (children).
Growth and skeletal growth of Indian children.

FEDERATION OF MALAYA.

Institute for Medical Research. Annual Report for the Year 1953. Pp. 104.

Losses of nutrients during the washing and cooking of parboiled rice by different methods (ash, Ca, P, Fe, phytic acid P and vitamin B₁).
Estimation of vitamin B₁ in rice and rice products.
Kwashiorkor.
Protein and methionine levels in blood and human milk.
Study of poor Chinese diet.
Vitamin B₁ in human milk.
Anaemia in South Indian labourers and role of folic acid and vitamin B₁₂.

NEW ZEALAND.

New Zealand Dairy Board. 30th Annual Report for the Year ended July 31, 1954. Pp. 102.

SOUTHERN RHODESIA.

Annual Report of the Nutrition Council (Southern Rhodesia) for the Year 1954. Pp. 9.

Tempe (fermented soya bean) production.
Fortification of maize meal with calcium, riboflavin and nicotinic acid.
Addition of sorghum, bulrush millet and/or maize to wheat bread.
Investigations on kwashiorkor.
Incidence of endemic goitre.

UNITED STATES OF AMERICA.

University of Florida, Agricultural Experiment Stations. Annual Report for the Fiscal Year ending June 30, 1953. Pp. 354.

Mineral requirements of cattle (Ca, P, Cu, Co, Fe).
Biological analyses of pasture herbage.
Beef yield and quality from various grasses and clovers and grass mixtures: effect of fertilisers.
Effect of aureomycin on sows during reproduction and lactation.
Transfer of minerals through the placenta and their distribution in the foetus (rat, rabbit, guinea pig).
Citrus meal for pigs.
Supplements to low-gossypol cottonseed meal for pigs.
Effect of reducing and discontinuing aureomycin during the growing-fattening period (pig).
Effect of aureomycin on protein requirement and carcass characteristics (pig).
Sunflower seed meal for fattening pigs.
Antibiotic implants for baby pigs.
Ammoniated citrus pulp for cattle.
Interrelation of copper, molybdenum and phosphorus (rat, rabbit).
Sunflower seed meal as protein supplement for bullocks.
Waste beef fat for growing-fattening pigs.
Content of B complex vitamins in the tissues of sows receiving radio-active Ca and Mo prior to slaughter.
Protein level and aureomycin supplementation: their influence on B complex vitamins in pig tissues.

N.A. and R. April 1955

Post partum development of bovine stomach compartments and observations on characteristics of their contents.

Effect of aureomycin on performance of dairy calves.

Effect of dietary pyrimidine ribose nucleic acid and some of its probable precursors on dairy calves.

Effect of dietary practices and previous illnesses on carpal development of children.

Effect of carotene or vitamin A deficiency in young rats on subsequent life pattern.

Nutritional deficiency in young rats in relation to subsequent malformation of bones.

Effect of dietary habits on composition of blood in the aged.

Utilisation of calcium and phosphorus by poultry as determined with radio-active isotopes.

Iowa State College. A Report of the Division of Agriculture, Research, Resident Instruction, Extension, for the Year July 1, 1953 to June 30, 1954. Pp. 58.

Effect of different antibiotics on weight gain and health of calves.

Beef production on low-quality roughage.

Antibiotics of less advantage to older dairy heifers.

Antibiotics for runt pigs.

Effect of antibiotics on vitamin requirements (pig).

Effect of different protein levels with or without antibiotics on growth of pigs.

Fats in the ration of poultry.



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THE PHYSIOLOGICAL BASIS OF OBESITY AND LEANNESS

PART I

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INTRODUCTION

THE development of the literature on the regulation of food intake presents idiosyncrasies almost unique in the history of physiology. In the course of the past thirty years, an enormous mass of writing, on the psychology of normal and abnormal appetite has appeared. By contrast, advances on the physical side have been few and often unnoticed. It is as though, to compare the regulation of food intake with another basic regulation, that of oxygen intake, thousands of articles had been written dealing with the psychological components of "air hunger", with only occasional allusions to desultory studies on the humoral, nervous and muscular machinery which day in and day out provides our organism with the required oxygen.

It is true that the conscious compulsive effects of hunger are striking. One may recall, for example, the stories of North American pioneers crossing the continent in wagon convoys, driven by want of food to cannibalism, and of fights for food between fellow inmates of concentration camps systematically starved by their jailers for the express purpose of breaking their spirit. These and similar examples illustrate the fact that hunger is one of the most irresistible stimuli to human action. Keys and his co-workers (1950) have analysed the progressive deterioration of attitudes as starvation progresses. It would seem that the very compulsiveness of these urges should have been taken more generally as a proof of the potency of the underlying somatic mechanism.

The fact that the giving of food by the mother to her children and the partaking of food with family and friends have become such strong symbols of personal relations, is evidence of the universal, primary importance of satisfying calorie requirements.

The emphasis on the psychological side of the regulation of food intake is doubtless due largely to intense professional and popular interest in the problem of obesity, particularly in the United States. Because of the prolonged failure of physiologists to study the etiology of obesity more deeply than by establishing the presence of a positive energy balance, it has been assumed and repeatedly proclaimed that obesity is fully explained by habitual overeating, due to lack of self-control. Such a view, exemplified by the classic article of Newburgh (1944), is still widely held. Any possible search for deeper causes was frowned upon, if not discouraged, because it might allow the obese to diminish the blame with which they were stigmatised, if it was once conceded that genetic factors, or hormonal imbalance, or an inactive mode of life imposed by the environment, could be made to share the blame with gluttony. The old view of medicine, still to be found in many primitive groups and in some western sects as well, that patients are sick because of their sins, including their lack of self-restraint, has been in great part abandoned in the western world. Even in alcoholism, it has long been felt that simply to state that habitual over-drinking is due to lack of

self-restraint is not a sufficient explanation. But a stern, censorious attitude to over-eating, or a pitying superior one, is still frequently encountered and is disappearing only as the search for deeper causes progresses.

One would expect that the general failure of therapeutic methods based on appeals to the mind would have led to a questioning of the purely psychological theories of obesity. A recent Boston study by Bowser *et al.* (1953) clearly demonstrates the dismal long-term failure of psychological approach. Three years after four large groups of obese patients had been characterised as obese and, respectively, left untreated, referred to a hospital diet clinic, subjected to group psychotherapy or subjected to individual psychotherapy, the trends of weight changes in the groups were compared. No difference was apparent and, on the average, little improvement was noted. Short-term effects of the treatments had had no lasting value. Similar experiences are reported by Aldersberg and Mayer, M. E. (1949), Danowski and Winkler (1949), and Wolfson (1954). In the paediatric field the prominent psychiatrist, Hilde Bruch (personal communication), has remarked on the near impossibility of permanently reducing the weight of children who have progressed steadily along an "obese" channel of the Wetzel grid. These facts lead one to suspect that perhaps many obese patients are effectively, indeed compulsively, "regulated" for an excessive intake or weight. The generally derided statement of the obese, "... but I eat like a bird", may not imply any attempt at deceiving others or himself but may show that the patient, far from being conscious of "stuffing himself" is all the time failing to satisfy his appetite fully. To defy the "regulation" for long would be as difficult for such patients as for normal persons to starve themselves in the presence of available food. Such a view is strengthened by the difficulties encountered in trying to increase the weight of abnormally thin subjects (Rony, 1940) and even, sometimes, of obese subjects as well, for instance, the 98 kg. subjects of Nadal and co-workers (1954) who, try as they might, never succeeded in qualifying for the "Club des 100 Kilos". Rather than hasten into premature moral judgments, it seems more appropriate to seek to understand the mechanism of normal regulation of food intake before its abnormalities are explained or made a moral issue. While palliative starvation methods may work as long as equally strong instincts, such as overriding fear of death or intense desire for sexual reward, counterbalance the drive to eat, only systematic and rational research can lead to lasting cures for the resistant forms of obesity. This review is an attempt to sum up the present knowledge of the physiological aspects of the etiology of obesity.

REGULATION OF CALORIE INTAKE AND WEIGHT: EXISTENCE AND CHARACTERISTICS

Leaving aside, at least temporarily, the conscious aspects, such as the sensations of hunger and appetite complex, let us examine the nature of the physiological problem confronting us. A previous definition of the problem (Gasnier and Mayer, A., 1939; Mayer, J., *in press*) can be re-formulated into the fourfold question: (1) Is there a regulation, or are there regulations? (2) What is regulated? (3) How well is it regulated? (4) How is it regulated? In short, what are the mechanisms in terms of structure and function? That order will be followed in reviewing the available evidence.

IS THERE A REGULATION?

Gasnier and Mayer (1939) first showed that the question whether a regulation exists is most easily answered not by considering the food intake but by observing the constancy, within a given environment, of total bodyweight, water content, reserves other than water, nitrogen balance and fat content. Their evidence, obtained on a large group of rabbits carefully studied for a long period, is highly conclusive that a regulation does exist. Similarly Kennedy (1952-53) showed that the hypothalamic-hyperphagic rat in the static phase is regulated for weight in the same way, and we have demonstrated a similar persistence of regulation in other forms of experimental obesity.

WHAT IS REGULATED?

It has been shown (Gasnier and Mayer, A., 1939; Mayer, J., *in press*) that three types of regulation could be defined.

BIOMETRIC REGULATION

The term biometric regulation was first introduced by Gasnier and Mayer (1939) and applied to the regulation of energy exchange. The regulation is not, properly speaking, a mechanism, but is the result of a necessity imposed by the structure of the animal itself, of its cells, organs and systems. It simply sets limits both upwards and downwards to energy exchange, the limits for expenditure being as a maximum, the "summit metabolism" of Giaja (1925), and as a minimum, basal metabolism and its variations. For food intake, the upper limit has since been explored by Kennedy (1952-53), who showed that, in the rat, lactation, not hypothalamic hyperphagia, represents the peak of intake and that intake is not further increased by superimposing hypothalamic hyperphagia on lactation, although intake in lactation can be increased by superimposing cold.

The concept of biometric regulation can be applied also to weight and to the fat content of the organism. The lower limit is set by the minimum protein and fat content compatible with life, the "éléments constants" of Terroine and Sorg-Matter (1920; 1928). The upper limit is set fairly rigidly as far as the protein content of the body is concerned, and can be raised only slightly by high-protein diet and exercise. As far as fat is concerned there may be a limit also set by the number of adipose cells in the body (Tanner, 1954, in press). Recent work from this laboratory (Mayer and Silides, to be published) shows that progressive accumulation of fat in obesity eventually reduces the rate of lipogenesis from acetate and from glucose. The two probably related facts, limited number of adipose cells and slowing down of fat deposition as obesity develops, may combine to impose an upper limit to the amount of fat which can be carried by a given individual. In the rare disorder known as histiodiuresis (Lawrence, 1946), the organism is incapable of depositing fat. Such a condition represents a pathological reduction of the upper biometric limit of fat content.

If the margin of variation of these biometric regulations of calorie intake and body fat were small, there would be no need for any additional regulation. In fact, however, the margins are large, thus allowing the animal to adapt itself to variable environmental conditions. Regulations, properly speaking, operating within the biometric limits are thus necessary to maintain a steady state.

ADAPTATION OF ENERGY INTAKE TO ENERGY OUTPUT (SHORT-TERM, GENERALLY DAY-TO-DAY, REGULATION OF ENERGY INTAKE)

Adaptation of intake to output appears to be the most important mechanism; it adjusts intake to requirements. Gasnier and Mayer, (1939) exemplified it by showing that when a large number of animals were followed for a long time under varying conditions of energy expenditure there was a high degree of correlation between daily intake and output. They used rabbits made to live at 30°, 18° or 0°, or shaved and made to live at 18° or 8° C.

CORRECTIONS OF THE ERRORS IN THE SHORT-TERM MECHANISM OF REGULATION OF FOOD INTAKE BY SUCCESSIVE COMPENSATIONS: LONG-TERM REGULATION OF RESERVES, CLOSELY RELATED TO REGULATION OF BODYWEIGHT

If in the experiment of Gasnier and Mayer just recalled the energy balance was strictly in equi-

librium each day, all points would be on the straight line at a slope of 45° going through zero. Actually, it was found that the points were not strictly on the line, but in a band spread on both sides of it. It follows from the existence of such a range that the day-to-day regulation is not sufficient to ensure constancy of bodyweight and of body reserves.

If there is oscillation of weight and reserves round a constant value, the "error" of the day-to-day regulation is in itself evidence of a supervening regulation. When for a series of 24-hour periods the percentage change of dry bodyweight in each period is plotted against the value at the beginning of that period, a distribution is obtained which lends itself to the following conclusion: on a given day, the farther away from the modal change the amount of reserve acquired, the greater are the chances that, during the next twenty-four hours, (a) if the change is in the same direction it will be small, or (b) if the change is in the opposite direction it will be large enough to approach or pass the mode. There is thus a long-term mechanism which in effect, under constant environmental and physiological conditions, tends to maintain the constancy of bodyweight.

HOW WELL DO THESE REGULATIONS FUNCTION?

Given a regulatory mechanism, it is useful to characterise its efficiency. The scope of this review does not allow for a detailed discussion of this topic. In summary four parameters have been defined which permit the quantitative description of how well both the day-to-day adjustment of intake to output, and the long-term regulation of bodyweight, function. These parameters are: precision, reliability, sensitivity and rapidity. Rigorous definitions have been given elsewhere (Gasnier and Mayer, A., 1939; Mayer, J., in press). For the short-term regulations, functional definitions of these parameters would be as follows:

1. Precision; inversely proportional to the difference between energy intake and energy output.
2. Reliability; whatever the precision, if day by day the ratio was the same, the mechanism would be reliable.
3. Sensitivity; if the precision is dependent on the size of energy intake and energy output, then the sensitivity is variable.
4. Rapidity; this is measured by capacity to adjust energy intake to output in, say, 24 hours.

Corresponding definitions have been evolved for the long-term regulation. It has been shown that it is possible to ascribe precise numerical figures

to these parameters. Furthermore, when the effect of different conditions, such as temperature, exercise, calorie dilution, state of hydration, change in the nature of the diet, is considered, it becomes possible to determine with precision not only the mean intake and bodyweight corresponding to a new equilibrium, but also the extent to which the regulatory mechanisms as characterised by their precision, reliability, sensitivity and rapidity have been disturbed. For example, such a detailed study has been conducted on the effect of environmental temperature on the long-term and short-term regulation (Gasnier and Mayer, A., 1939; Mayer, J., in press). In adapted animals, as the temperature falls, both energy output and energy intake increase; the reliability of the short-term regulation adjusting intake to output increases, its precision remaining the same. As regards the long-term regulation, body reserves increase, the precision and reliability of regulation increase, but the sensitivity and rapidity decrease with increasing metabolic intensity. Analogous, though less thorough, studies have been made of the effect of environmental temperature on regulatory mechanisms in hypothalamic obesity (Kennedy, 1952-53) and of enforced exercise on regulatory mechanisms in normal and obese animals (Mayer *et al.*, 1954) and in man (Mayer, 1955b, in press).

HOW DO THE REGULATIONS WORK?

The answer to the question, What are the mechanisms of these regulations? is still tentative. Let us review briefly first what is known of the morphological support of the regulation, then some of the possible modes of integration of the mechanisms. It should be unnecessary to note again that, when speaking of mechanisms of regulations, time is all-important. As underlined by Kennedy (personal communication) short-term tests demonstrate the influence of a multiplicity of conditions on appetite and emphasise instability. The long-term reactions, be they for one day or longer periods, emphasise stability. It is, in a sense, the mechanism of this stability which is under consideration.

It should be equally unnecessary to point out at the outset that all investigators whose theories are about to be reviewed have recognised the weakness of any general theory of appetite founded on response to only one stimulus, and they have not attempted to erect such systems. Their problem has been to find a means of expressing the underlying continuity as a force which, at a given time, would compete with other influences successfully enough to impose long-term stability. The mechanisms about to be reviewed are thus concerned with the control of food intake and its role in determining feeding pattern.

REGULATION OF CALORIE INTAKE AND WEIGHT: MORPHOLOGICAL SUPPORT AND POSSIBLE MECHANISMS

MORPHOLOGICAL SUPPORT

GASTRO-INTESTINAL TRACT

The earliest correlation reported between the state of hunger and objective physiological phenomena was the finding by Cannon and Washburn (1911-12) that sensations of hunger appeared simultaneously with contractions of the stomach. The hunger contractions were further investigated by Carlson (1914), who found that in starvation the tonus and the frequency and intensity of the contractions of the empty stomach became progressively more pronounced in the course of the fast, at least until the fourth day. Until that time, too, the appetite for food increased. On the fourth day both hunger contractions and desire for food decreased. These stomach hunger contractions are relatively powerful, occurring in series of from twenty to seventy, and lasting usually between half an hour and one hour and a half; they alternate with periods of quiescence. The contractions are seen in new-born babies before the infant has had any experience of food. Their presence is general in land vertebrates, whether homoiotherms or poikilotheims.

Hunger contractions are present even when some food is present in the stomach. The only time when the fundus does not exhibit them is immediately after a large meal. They occur after isolation from the brain and spinal cord, though at longer intervals and with less vigour. They are inhibited by a variety of stimuli, the tasting or chewing of a palatable food, or even of an inert substance like paraffin wax, unless the contractions have become tetanic in nature; swallowing movements, even without food in the mouth; stimulation of the gastric mucosa by ice-cold water, acid, alcohol, smoking, tightening of the belt, vigorous muscular exercise, sudden applications of cold, emotions such as fear or rage, adrenaline, glucose infusion under conditions of normal utilisation (Stunkard and Wolff, in press). Inhibition of gastric contractions can be brought about also by irrigation of the duodenum with glucose. A counteracting humoral factor, a chalone, has been postulated on the basis of studies on dogs with a completely denervated stomach or a completely denervated autotransplanted gastric pouch (Quigley and Phelps, 1934). Carlson considered that the vagi were the main, if not the only, afferent pathway for the gastric hunger impulses and that the "primary hunger center" must therefore be the "sensory nuclei of the vagi" in the medulla (fasciculus solitarius). Interesting modifications

of gastric tone take place in disease; duodenal ulcer and diabetes cause an increase, pulmonary tuberculosis and vitamin B₁ deficiency a decrease.

The possible relation of intestinal phenomena to hunger has attracted some attention. The forward movement of food in the small intestine has been studied by Cannon (1901), Carey (1921), Quigley and Lindquist (1930), and Reid *et al.* (1934). The character of the peristaltic movement has been shown to be connected with the chemical composition of the chyme, with acid, alkali and some of the products of digestion which may have an effect on the contraction of the muscle. As is well known, the small intestine, like the stomach, obtains its supply of extrinsic nerve fibres from two sources, a bulbar autonomic (parasympathetic) supply by way of the vagi and a thoracic autonomic (sympathetic) supply by way of the splanchnic nerves and the superior mesenteric ganglia. Stimulation of the vagi causes contraction or increased tonus in the musculature of the intestine; stimulation of the splanchnic nerves generally inhibits its tonus. Psychological states and stimulation of portions of the cerebral cortex may produce contraction or relaxation of the walls of the small and large intestines. Adrenaline, like splanchnic stimulation, inhibits intestinal movements; oxygen, organic acids and bile increase them. The sensory fibres from the intestine are carried by the vagus and the splanchnic nerves.

CENTRAL NERVOUS SYSTEM

Pathological studies of patients with hypothalamic obesity first established the importance of this part of the central nervous system in the control of food intake. Experimental work by investigators on both sides of the Atlantic clearly eliminated pituitary lesions from the possible causes. The early development of our knowledge of this syndrome has been reviewed previously by Brobeck (1946) and Mayer (1953c). Identification of the regions in which discrete lesions will cause obesity has been advanced by surgical exploration as well as by the use of stereotaxic instruments. The rat has been studied particularly by Hetherington and Ranson (1940; 1942) and by Brobeck and co-workers (1943). They found that bilateral involvement of the ventromedial nuclei caused hyperphagia. Mayer and Barnett (1955) have since found that in the rat unilateral destruction of the ventromedial nucleus caused slow development of obesity. Hypothalamic obesity in the mouse has been produced by Mayer, French *et al.* (in press), who found that in that species bilateral involvement of the ventromedial nuclei was necessary. In the monkey, Brooks *et al.* (1942) found that obesity follows superficial lesions of the base of the anterior hypothalamus. In the dog,

Heinbecker *et al.* (1944) produced obesity by lesions caudal to the paraventricular nuclei. Development of the condition appeared to depend on the interruption of descending fibres leaving the ventromedial nuclei. Conversely, Anand and Brobeck (1951a) found in rats that bilateral destruction of more lateral parts of the hypothalamus was followed by complete cessation of eating. Teitelbaum and Stellar (1954) confirmed this finding, although they found that inhibition was usually temporary. The areas destroyed included the extreme parts of the lateral hypothalamic nucleus at the same rostro-caudal level as the ventromedial nucleus.

Stimulation of hypothalamic structures has proved equally informative. Brugger (1943), who compiled the results of electrical stimulation in the hypothalamus reported by Hess (1949), found that stimulation in the vicinity of the mamillothalamic tract produced morbid appetite not only for edible but also for indigestible material. Delgado and Anand (1953), working on monkeys, found that temporary increases in food intake followed electrical stimulation of the lateral hypothalamus at the level of the ventromedial nucleus.

Larsson (1954) made a particularly careful study of the results of electrical stimulation of the hypothalamus and the medulla and of intrahypothalamic injections in sheep and goats. He found that stimulation of the hypothalamus, just caudal to the optic chiasma backwards throughout the hypothalamus, lateral to the sagittal level through the columna fornx descendens and the mamillothalamic tract, resulted in hyperphagia. The most pronounced effect was obtained by stimulation of the region of the lateral hypothalamic nucleus, anterior to the columna fornx descendens or at the same transverse level as this tract. Rumination was seen on electrical stimulation of the same structures as gave hyperphagia. Of particular interest was the fact that, as was previously observed by Magoun (1940) and by Hess (1948; 1949), mastication, licking and swallowing could be elicited as single effects without the simultaneous occurrence of hyperphagia. Larsson (1954) felt that the concept implicitly or explicitly presented by Brugger (1943) and by Anand and Brobeck (1951b) of the existence of a feeding centre in the mamillothalamic area, or in the antero-lateral hypothalamus, was not strictly supported by his findings; although electrical stimulation of both these areas, particularly the latter, caused hyperphagia, the fact that extra masticatory and licking movements as well as hyperphagia were obtained diffusely in other areas support the conclusion that while the feeding pattern is closely related to regulation of food intake, the two mechanisms rest on centres which are in part differentiated. Similarly, it had been

shown previously by Ström and Uvnäs (1950) that inhibition or activation of movements of the stomach and intestine could be caused by electrical stimulation of different hypothalamic areas.

Besides the hypothalamus, the thalamus appears to be involved in the regulation of food intake. Ruch and co-workers (1941) showed that in the monkey damage to the ventromedial portion of the thalamus and rostral mesencephalic tegmentum caused obesity. The optic nuclei have been implicated by Rogers and Hardt (1915), who showed that normal feeding habits were upset by destruction of the optic nuclei. Separation of the frontal lobes from their thalamic connections also has been shown by Richter and Hawkes (1939) to lead to obesity in rats. Similar findings obtained on lobotomised patients have been reviewed previously (Mayer, 1953c). Finally, the importance of cortical phenomena in the regulation of food intake hardly needs to be emphasised. Kirschbaum (1951) has shown that selective decortication may lead to hyperphagia.

MECHANISMS

GASTRIC CONTRACTIONS AS A BASIS OF HUNGER AND REGULATION OF FOOD INTAKE (CARLSON)

The views of Carlson (1914) on the relation between gastric pangs, hunger and the regulation of food intake have been summarised in his book, and are well known. They constitute the oldest attempt to account *experimentally* for these phenomena. For Carlson, the consciousness of gastric sensations, carried by the vagi, is the kernel of the problem. Hunger is defined by him as "a more or less uncomfortable feeling of tension or pressure and pain referred to the region of the stomach". Like Cannon and Washburn (1911-12), he considers that an explanation of the hunger pangs is an explanation of "the control of hunger in health and disease". He does recognise, however, that "many apparently normal persons experience in hunger, besides the gnawing pressure-pain sensation in the stomach, a feeling of weakness, 'emptiness', headache and sometimes nausea", but calls those states or symptoms "accessory hunger phenomena" because "they are not always present in hunger and their relative preponderance depends on the length of starvation and on some individual peculiarity in the person. It must be admitted, however, that in some individuals, these accessory hunger phenomena appear to overshadow, if not entirely to suppress, the pressure-pain sensations from the stomach." In turn, Carlson, struck by the fact that insulin hypoglycaemia leads to gastric contractions and hunger feelings, postulated that blood glucose levels were involved in the occurrence of hunger.

This theory received wide, although temporary, acceptance. Besides Carlson, it was expounded by Cannon (1901), Quigley and co-workers (1929), and Templeton and Quigley (1930). Although the existence of hunger pangs has been abundantly confirmed, accumulating facts led observers to doubt whether gastric movement provided a sufficient basis for Carlson's generalisation. For example, Adolph (1947) showed, by diluting the ration of experimental animals with inert material, that differences in the bulk of the diet had only a very transient influence, and Morgan and Morgan (1940), working with rats, and Grossman and co-workers (1947) with dogs, demonstrated that complete bilateral vagotomy, which abolishes the gastric motor response to insulin hypoglycaemia, does not prevent or even impair the augmentation of food intake produced by insulin administration. The existence of patients in whom bilateral vagotomy had been performed for the treatment of peptic ulcer enabled Grossman and Stein (1948-49) to extend these findings to human subjects; they found that the sensations of hunger induced by insulin continued to occur after complete vagotomy. The sensations included feelings of emptiness and weakness. In those persons in whom epigastric pangs of distress associated with individual gastric contractions were a part of the sensation-complex of hunger, vagotomy, by abolishing the contractions, eliminated that particular part of the sensation. Though the removal of that component of the sensation-complex was recognised by the subject, it did not cause a significant change in the general effective response to hunger.

Disagreeing with Carlson (1914) and Quigley *et al.* (1929), Grossman and Stein (1948-49) state that in most of their subjects the gastric component of the hunger sensations was absent or negligible both before and after vagotomy, and vagotomy caused no detectable change in the hunger response to insulin. Thus, while both gastric and extra-gastric stimuli contributed to hunger sensations in man, it appeared that in most persons the extra-gastric components predominated in the sensation complex of hunger. Elimination by vagotomy of the gastric component of the hunger-sensation complex had no significant effect on the manifestations of the extra-gastric components, the feelings of weakness and emptiness associated with the desire for food.

Actually, Grossman and Stein differed from Carlson not only about the significance of gastric contractions but on their mode of perception as well. While Carlson, following Miller (1911), had claimed that "the vagi nerves are the main, if not the only, afferent pathway for the gastric hunger impulses", Grossman and Stein found that in two patients who had undergone sympathectomy persisting gastric contractions were no longer

associated with a feeling of distress. On the basis of this finding they concluded that the splanchnic nerves are the afferent pathways for the distress associated with gastric hunger contractions and that no such pathway exists in the vagus nerves.

With the decrease of the significance of hunger pangs, interest in their causation died down. Scott alone and with his co-workers (1938) could find no correlation between absolute blood sugar levels and the onset and prevalence of hunger contractions.

It appears legitimate to conclude that while hunger pangs exist and in many individuals are the basis for the gastric component of hunger, a mechanism of regulation of food intake can hardly be based exclusively on their perception. On the other hand, any theory purporting to represent regulation of food intake which cannot account for the occurrence of hunger pangs is doomed at the outset.

THERMOSTATIC THEORY (BROBECK)¹

Brobeck (1948) was struck by the fact that the hypothalamus appeared able to deal with a number of different stimuli which affect feeding behaviour and to make a suitable adjustment of food intake. The common characteristic of these factors seemed to him to be that they affected the heat balance of the body. He accordingly advanced a "thermostatic" hypothesis which postulated that "animals eat to keep warm and stop eating to prevent hyperthermia". The actual experimental evidence for his view rested first of all on the observation that short-term exposure to high environmental temperature is followed by reduction of food intake. Kennedy (1952-53), however, claimed that under the extreme conditions in which Brobeck's animals were placed, dehydration and

pyrexial tissue breakdown played a major part in the weight loss following acute exposure to heat. Acute exposure to cold also caused depression of food intake at first. Working with hypothalamic-hyperphagic rats he demonstrated that in the long run, and as long as his animals stayed within the range of adaptation, they showed similar rates of weight gain at high temperatures and at low temperatures. Perhaps an even more serious objection to a thermostatic scheme was the finding by Mayer and Greenberg (1953) that the internal temperature of rats is raised when they are fasted.

Another piece of evidence used by Brobeck (in press) in support of a thermostatic scheme is the fact that a change from a high-carbohydrate to a high-fat diet usually increases food intake, and a change from a high-carbohydrate to a high-protein diet decreases it. The specific dynamic action of proteins is greater than that of carbohydrates, which in turn is greater than that of fat. He felt that this observation enabled him to postulate that modifications of intake follow perceptions of differences in specific dynamic action. However, it has been repeatedly shown that the differences in intake following changes from high-carbohydrate to high-fat diet are transient. Their impermanence has been demonstrated in particular by Cowgill (1928) and by Lundbaek and Stevenson (1947). Fenton and Dowling (1953) and Lyon *et al.* (1953) have found that in mice the situation could be complicated by genetic idiosyncrasies. In some strains, both intake and output go up on a high-fat diet, in others intake alone goes up. In experimental obesity, results of changes of diet vary with the type of obesity considered. For instance, Marshall and Mayer (1954) found in goldthiogluco obese mice and Mayer, French *et al.* (in press) in hypothalamic obese mice that spontaneous food consumption, measured as calories, was highest on a high-fat diet, high on a high-carbohydrate diet, and almost normal on a high-protein diet. In the hereditary obese-hyperglycaemic syndrome of mice, spontaneous consumption was lowest on a high-fat diet and highest on a high-carbohydrate diet (Mayer and Jones, 1953).

Finally, it would appear that the validity of a thermostatic theory would be limited to homeotherms. It may be pointed out also that, though the theory raises the important problem of integration between various physiological regulations, it gives little consideration to the equally necessary integration between the regulation of food intake and that of intermediary metabolism. It fails to account for the frequency of meals or for gastric hunger pangs. It does not account for the effects on appetite of disturbances of carbohydrate metabolism; for example, diabetes and hyperinsulinism affect appetite without being accompanied by disturbances of body temperature. A

¹ The reviewer hopes he is not misrepresenting Brobeck's attitude when synthesising some of his recent papers into a "thermostatic theory". He would like to add that if he is guilty of such a misrepresentation, the responsibility is his own, all the more so that he admits that the position of Brobeck is often obscure to him. Short-term reactions, which Brobeck (in press) has studied, permit a listing of factors influencing food intake. These can be obviously integrated in a Sherringtonian concept and made to interpret feeding behaviour at a given time. Such a "synthesis", however, gives no clue to the possible mechanism of homeostasis. In some of his writings (*e.g.*, 1948) Brobeck has postulated such a regulating, or at least limiting, mechanism, based on his thermostatic concept. This point of view is summarised here. In other writings (*e.g.*, in press), he has either denied the existence of a homeostatic mechanism adapting intake to output, because, at a given time, factors other than the energy content of food determine its intake, or postulated an "energy memory" which has yet to be given material substance.

thermostatic mechanism would logically lead one to predict anorexia in hyperthyroidism and hyperphagia in hypothyroidism.

SOULEIRAC'S THEORY OF CARBOHYDRATE APPETITE REGULATED BY INTESTINAL ABSORPTION

Souleirac limited himself to the study of appetite for carbohydrate in rodents. However, his numerous publications (1944; 1945; 1946a, b; 1947a, b, c), later collected in book form (1947d), deserve a somewhat detailed analysis. His work has the original merit of being directed towards the quantitative account of a qualitative appetite, and thus provides facts which may eventually be used to integrate taste and calorie intake. Souleirac was struck by the observation that phloridzin, which, according to Carlson, increases gastric contractions, inhibited appetite for carbohydrate. Thyroidectomised and adrenalectomised animals, both of which present hypoglycaemic tendencies, also show diminished appetite for carbohydrate. The observation led to a search for possible correlations between carbohydrate appetite and physiological characteristics. Using a self-selection method, Souleirac systematically examined the quantitative and qualitative variations of uptake of different types of sugar after removal of the anterior pituitary, thyroid, and adrenal glands, alloxanisation of the pancreas and administration of the corresponding hormones, anterior and posterior pituitary extracts, thyroxine, "cortine" and deoxycorticosterone and insulin. He concurrently studied the modifications of taste threshold for carbohydrates and, using the technique of Cori (1926), the effect of the endocrine disturbances just listed on the intestinal absorption of carbohydrates. Similar studies were made after administration of adrenaline, ergotamine, pilocarpine, acetylcholine and atropine, after spinal section in the cerebral region and hypothalamic lesions, or after administration of glucose, riboflavin and phosphate. The effects of cold and physical exercise also were examined. Estimations of blood glucose and of serum amylase were made after these procedures. Souleirac found that there was no correlation between either absolute blood sugar level or the level of serum amylase and carbohydrate consumption. On the other hand, he found that all hormones with an effect on carbohydrate metabolism modified the taste threshold for glucose, though the interpretation of the modifications was difficult. By contrast, the correlation between the taste for carbohydrates and the intestinal absorption of carbohydrates was clear-cut. Any condition which increased intestinal absorption increased consumption and, conversely, if carbohydrate absorption was decreased, carbohydrate intake was decreased. For instance,

injections of glucose depressed absorption of glucose and glucose intake; phloridzin and thyroidectomy decreased glucose absorption and intake; insulin and alloxan diabetes increased glucose absorption and intake. The only exception was provided by atropine, which slightly decreased the proportional absorption of glucose from the intestine but considerably increased the total. Souleirac explains the effect of atropine by the intense thirst it produces.

Although the facts invoked by Souleirac are clear enough as far as they go, it seems regrettable that no data are ever given on the calorie intake of the experimental animals, but only on the amount of carbohydrate solution ingested. The omission is all the more regrettable because the solid food available, cereals and greens, constituted a high-carbohydrate diet. One would like to know also what the fluid (water) consumption in the different experimental situations was. Examination of the available information raises the question, which is not discussed by Souleirac, of how the organism detects the fact that carbohydrate is being absorbed. Souleirac observed that spinal section at the level of the sixth to seventh cervical vertebrae did not eliminate the response of the carbohydrate intake to endocrine stimulation, but then it would not interrupt splanchnic sensory connections. The increased intake after atropine treatment could conceivably lend itself to an interpretation based on the effect of the drug on the vagus. The fact that vagotomy and sympathectomy, which would seem to eliminate afferent impulses from the intestine to the central nervous system, while eliminating hunger pangs, do not eliminate feelings of emptiness, weakness and desire for food (Grossman and Stein, 1948-49), makes it unlikely that the regulation of food intake is based exclusively, or even primarily, on awareness of intestinal absorption. A humoral or hormonal intermediary could, of course, operate independently of intermediary nervous pathways, but there is no indication of the existence of such a link with the higher centres.

Souleirac suggests that the effect of the hypothalamus on the regulation of food intake is mediated through intestinal absorption; excitation of the hypothalamus would bring about a diminution of carbohydrate absorption and consumption; the action of the hypothalamus would be antagonistic to that of the pituitary and the balance between these organs would determine carbohydrate intake. While, in Souleirac's experiments, consumption of sugar solution increased after hypothalamic lesions, it is difficult to appreciate the significance of his finding that it cannot be compared with the increases also in food and water consumption which follow the operation. The incidental finding that unilateral lesions lead to increased carbo-

hydrate consumption is of interest in the light of the fact that slow development of obesity follows the production of unilateral hypothalamic lesions in the rat.

Thus, the facts presented by Souleirac, although offering an undeniable challenge, do not appear to support the mechanism he wants to base on them. His observation that any modification of carbohydrate metabolism can affect appetite and even taste, is in agreement with the postulation of the glucostatic theory (see below). It appears doubtful, however, whether, strong though the appetite for carbohydrate (or protein or salt) may be, hunger and the regulation of food intake are simply summations of selective hungers and partial regulations. Such selective appetites do exist and can be extremely compelling; the "salt wars" are bloody illustrations of their strength. Yet, compelling though such appetites are, they do not appear to overrule the general regulation. Men and animals will, it is true, eat after satiety has apparently been obtained if the supplement offered is particularly appetising, or contains a nutrient of which they have been deprived. Yet, no mammal will increase its food consumption from, say, a low-protein diet simply to satisfy a need for protein or a specific amino-acid.

GENERAL DISPOSAL (CHEMOSTATIC¹) THEORY

Glucostatic Theory for the Short-term Regulation of Food Intake. The glucostatic theory, proposed by Mayer and co-workers (Mayer, 1953b; 1953c; see also Van Itallie *et al.*, 1954) postulates that the short-term mechanism for regulating food intake operates through glucoreceptors sensitive to blood glucose. The glucoreceptors may be situated in the hypothalamic centres shown to be implicated in the regulation of food intake. The work of Souleirac opens the possibility of the existence of peripheral (gastro-intestinal) glucoreceptors as well. The idea receives some support from the earlier demonstration of the rapidity with which ingested glucose stops hunger contractions (Quigley and Hallaran, 1932) and the fact that duodenal irrigation with glucose also stops hunger contractions. The existence of glucoreceptors in the central nervous system is, of course, implicit in the fact that vagotomy abolishes the normal response to hypoglycaemia (Grossman and Stein, 1948-49; Porter *et al.*, 1953). The work of Zunz and La Barre (1927) showed as early as 1927 that when the circulation of a dog's head was isolated from that of the rest of the body, with the nerve supply

from head to body intact, hyperglycaemia of the head resulted in hypoglycaemia of the body, a finding recently confirmed and interpreted by Duner (1953). The demonstration of special receptivity to glucose and phosphorus of the hypothalamic "feeding" area given by Forssberg and Larsson (1954), related by them to atypical shifts of adenosine triphosphate and creatine phosphate during fasting, may also be taken as a partial proof of the role of these areas as glucoreceptors.

A glucostatic scheme enables one to account experimentally for the hunger state and hunger behaviour. The hunger state has been defined as the physiological state which results from prolonged deprivation of food. As far as the tissues are concerned, it consists in the low respiratory quotient characteristic of carbohydrate deprivation. Such a state is not necessarily associated with low absolute levels of blood glucose, as was believed by older workers. It has been shown by Van Itallie *et al.* (1953) that arteriovenous glucose differences (Δ -glucose), if estimated with the proper physiological safeguards and analytical care, give an easily obtainable and generally reliable measure of glucose utilisation. More detailed data on the limitations of the use of Δ -glucose values as a measure of utilisation of carbohydrates have since been experimentally obtained, and the conclusions have been discussed, by Van Itallie (1953 and in press). Consideration of Δ -glucose emphasises the characteristic common to starvation, insulin hypoglycaemia, diabetes mellitus and hunger diabetes, *i.e.*, reduced availability of carbohydrates.

It may be unnecessary to emphasise that the presence of the hunger state is not the only physiological factor influencing feeding behaviour. A number of factors may lead to those states which Janowitz and Grossman (1949) have called "hunger states without the desire to eat or without the intake of food (anorexia or hyporexia)". Conversely, hyperorexia can occur. However, in order to be valid, the glucostatic definition of the hunger state demands that it be generally accompanied by the desire to eat and that in a state of satiety the desire should be absent. Experiments performed by Van Itallie *et al.* (1953) and previously reported in detail have shown this to be true in normal animals and men, either adequately fed or underfed, and in diabetic subjects. Van Itallie (personal communication) has extended these findings to persons treated with cortisone. It has also been shown by Mayer (*Ann. N.Y. Acad. Sci.*, in press) that absolute variations in the level of inorganic phosphate follow the same pattern as Δ -glucose values, a finding which is of particular interest in the light of the later results of Forssberg and Larsson (1954).

¹ The term "chemostatic" was suggested to the author by G. C. Kennedy (personal communication), whose important contributions, suggesting in particular the role of depot fats in homeostasis (1954, in press), have already been mentioned.

Stunkard and Wolff (1954 and in press) have since shown that there was good correlation in man of small Δ -glucose values with hunger gastric contractions as recorded by the balloon technique, as well as with feelings of subjective hunger. Conversely, large Δ -glucose values were associated with the absence of gastric contractions and hunger sensations. Slow intravenous infusion of glucose in hungry individuals eliminated the feeling of hunger and the gastric contractions, except in diabetic subjects, where the impairment of glucose utilisation was demonstrated by a rise in blood sugar without a simultaneous rise in Δ -glucose values. Finally, in a neat demonstration of the fact that psychological factors operate within a physiological framework, Stunkard and Wolff showed that hunger sensations and hunger gastric contractions could be induced by psychological stimuli such as talk, sight or smell of food, provided a small Δ -glucose value testified to the existence of a hunger state as defined in the glucostatic sense.

The glucostatic theory permits the regulation of food intake to be integrated with the regulation of metabolism. It is well known that carbohydrate metabolism plays a central part in the regulation of energy metabolism. The stores of carbohydrate are small; glucose is used preferentially by all tissues and exclusively by the central nervous system. While there is a hierarchy of nervous, hormonal and humoral mechanisms designed to maintain blood sugar and, in particular, to prevent hypoglycaemia, only the taking of food will in the last resort restore normal utilisation of glucose. Carbohydrate metabolism has been implicated in the regulation of protein and of fat metabolism. For instance, Engel (1949) has shown that the availability of carbohydrates determines the rate of gluconeogenesis. Geyer *et al.* (1953) have shown that availability of carbohydrates decreases fat utilisation, and that lack of carbohydrates causes an increase in fat oxidation.

The preferential oxidation of carbohydrates during exercise and in the cold, and the decreased glucose utilisation and gluconeogenesis met with in growth, can be made to fit in with the glucostatic theory. Modifications in food intake after changing from a high-fat to a high-carbohydrate diet, or vice versa, could represent the lag in enzymic or hormonal re-adjustment to the burning of a different metabolic mixture.

The effect of metabolic hormones and disorders of metabolism also could be readily explained. Insulin treatment first causes a fall in blood sugar due to increased peripheral utilisation of glucose. In a second phase, a compensatory rise takes place which is secondary to decreased utilisation in the periphery (Somogyi, 1951). Incidentally, amphetamine curbs the increase of

appetite induced by insulin, illustrating perhaps the difference between "metabolic" and "regulatory" agents; this difference will be discussed below.

The apparent paradoxes afforded by the hyperphagia of diabetes mellitus, and by the phenomenon of hunger diabetes and other types of hyperglycaemia associated with reduced utilisation, are resolved by consideration of Δ -glucose. The effect of hyperthyroidism has been likened to hunger diabetes because of the accelerated depletion of carbohydrate stores. The complex action of adrenaline which, while it causes decreased peripheral utilisation of glucose, increases central utilisation as well as stopping gastric contractions and modifying nervous system function, has been discussed at length elsewhere (Mayer, *Ann. N.Y. Acad. Sci.*, in press). It is worth noting also that, while it is tempting to ascribe the effect of cortisone-like substances on intake and weight to decreased glucose utilisation (Van Itallie, personal communication), the few facts now available do not preclude a mechanism based on direct interference with the function of glucoreceptors. Heinbecker and Pfeifferberger (1950) have shown that in dogs prolonged treatment with cortisone or corticotropin leads to degeneration of the paraventricular nuclei of the hypothalamus and obesity. Research now in progress on obese mice with pituitary tumours secreting adrenocorticotrophic hormone may shed some light on these mechanisms.

The glucostatic theory, while it interprets certain aspects of the short-term mechanism for regulating food intake, gives by itself no clue to long-term regulation of bodyweight. The stability of weight maintained by normal animals under uniform environmental conditions (Gasnier and Mayer, 1939), by hypothalamic rats (Kennedy, 1950; 1952-53), by mice with different types of obesity (Mayer, 1955a) and by normal persons under fairly uniform living conditions, the periodic return of obese adults to the same weight (Bowser *et al.*, 1953), and the return of obese children to the same height-weight growth channel (Bruch, personal communication; Stuart, in press) are not properly interpreted by any of the short-term regulations proposed. Consideration of these problems led to the suggestion of a lipostatic hypothesis.

Lipostatic Hypothesis for the Long-term Regulation of Food Intake. Recent experimental findings obtained in the Harvard laboratory suggest that different types of normal and obese animals spontaneously mobilise each day a quantity of fat proportional to, or at least increasing with, their total fat content. The proportionality coefficient appears to depend on the type of animal, the kind of obesity in obese animals, possibly the amount

of exercise forced on the animals, the nature of the diet and the environmental temperature. Other evidence (Mayer and Silides, to be published) also suggests that as animals become more obese, the maximum rate to which lipogenesis can be pushed, by injection of insulin and glucose, decreases. The increasing saturation of the fat depots explains the tendency to reduced glucose tolerance in diabetics (a tendency which can be reversed to some extent by weight reduction (Conn, 1944)) and, since the fat appears to be readily available, may explain the transition in several types of obesity, in particular in the "regulatory" type (*vide infra*), from the "active" phase of obesity characterised by marked hyperphagia to a static phase characterised by a nearly normal appetite. The increasing saturation of the depots with fat is accompanied also by a decreased response to the stimulus of food (Anliker and Mayer, to be published) as measured by the bar-pressing method of Skinner (1951; 1953). The "lipostatic" mechanism would account for the long-term characteristic of weight regulation and, because glucose would be spared by the increasingly available fat and the resistance to greater peripheral conversion of glucose to fat, the mechanism may be readily made to fit in with the glucostatic scheme. Its experimental basis is, however, still fragmentary.

A Note on the Effect of High-protein Diets. The effect of high-protein diets on food intake deserves special mention. They decrease food intake in normal animals, and in different forms of experimental obesity (Mayer, 1953c; Marshall and Mayer, 1954; Mayer, French *et al.*, in press). They have high satiety value in many obese human subjects (Fryer *et al.*, 1955). It is noticeable, however, that while diets very high in protein (60 per cent.) tend to reduce the food intake of both normal animals and goldthioglucose or hypothalamic obese animals, variation of the protein level within the moderate range has little or no effect on food intake in experimental animals. In man, Bryant and co-workers (1952) have claimed that hunger in human subjects reappeared earlier after a low-protein meal, but Dole and co-workers (1954) obtained spontaneous reduction of intake on low-protein diets. The drastic decrease of appetite caused by giving an unbalanced amino-acid mixture would argue for the idea that the accumulated products of protein catabolism may have a limiting, in this case, toxic, effect on appetite. The mechanism of satiety at low levels of intake, if it exists, is not clear. Bryant and co-workers (1952) claim to have established steadier glucose utilisation after high-protein meals, but Fryer *et al.*, (1955) found that their obese patients felt generally more satisfied on a high-protein diet without showing steadier peripheral utilisation of

glucose. The "invisible" fat which usually accompanies protein in human meals, by delaying gastric emptying and postponing the re-appearance of the gastric component of the hunger sensation complex, makes the interpretation of subjective statements more difficult.

AN ATTEMPT AT INTEGRATION

Food intake thus operates within limits set by the biometric characteristics of the species and the individual. At a given moment feeding behaviour is conditioned by a number of environmental, physiological and psychological forces which can be classed as metabolic and regulatory. The metabolic factors depend on the general metabolism of the individual and appear to depend on the rate at which the body can dispose of certain products and consequences of eating, heat according to one theory, glucose according to another, perhaps also waste products of protein metabolism. Long-term factors also are concerned, in particular, the state of the fat depots, perhaps through a lipostatic effect (Kennedy, 1952-53; Mayer, *Ann. N.Y. Acad. Sci.*, in press) mediated through the short-term metabolic factors. The regulatory factors are conditions which act directly on the central regulatory mechanism, psychological factors or certain neurotropic drugs. This type of analysis leads one to expect that disturbances in the regulation of food intake may be in turn of two types, metabolic and regulatory. Such a distinction would apply to anorexia and emaciation as well as to hyperphagia and obesity. Both classes of phenomena will be reviewed, though examples will be chosen mostly from the field of obesity.

ABNORMALITIES OF BODYWEIGHT

An attempt has been made to list in Table 1 the different types of obesity and in Table 2 the opposite types of abnormality. It may be useful to remark at this point that the terms overweight and obesity are not equivalent. Overweight can result from causes other than generalised obesity. If by overweight is meant an increase of bodyweight relative to height above the average for the species, then the following causes can be distinguished:

INCREASED LEAN BODY MASS (AS IS SEEN IN HYPERTROPHY OF MUSCLE INDUCED BY WORK, ACROMEGALY, ADRENOGENITAL SYNDROME)

If standard tables of height-weight relationship are used, many highly muscular individuals fall into the overweight group without being obese (Brožek and Keys, 1950). Moreover, the work of

Keys (1955, in press) and co-workers shows that athletic overweight individuals are almost invariably underfat compared with sedentary normal-weight subjects of the same height and age.

INCREASED INTERSTITIAL FLUID VOLUME (SUCH AS IS MET WITH IN CHRONIC OEDEMA AND MYXOEDEMA)

A form of spongy obesity, the Gilbert Dreyfus or paradoxical obesity, has been described by Leray (1951), in which the overweight is due largely to excessive fluid retention.

INCREASED BODY FAT¹

The deposits of fat may be localised, as in lipomatosis, lipodystrophy, lipomata, in the hereditary sex-linked steatopygia of Bushman and Hottentot women, or in Dercum's disease (*adiposis dolorosa* or painful nodular obesity), or it can be generalised, as in obesity proper or in general systemic lipomatosis. Accumulation of lipids other than triglycerides are seen in the Nieman Pick and Tay Sachs diseases (phospholipins), in Gaucher's disease (cerebrosides) and in the Schüller Christian syndrome (cholesterol and its esters). Obesity proper alone is covered in Table 1.

TABLE 1

TYPES OF OBESITY

<i>In mice</i>	
Genetic :	In yellow mice ; heterozygous, dominant character (Danforth, 1927 ; Kasten, 1952).
	Associated with hyperglycaemia ; homozygous, recessive character (Mayer, 1954).
Of hypothalamic origin :	Spontaneous (Vidal and de Robertis, 1943) or surgically induced (Mayer, French <i>et al.</i> , in press).
Of endocrine origin :	Caused by injection of pituitary tumours secreting adrenocorticotrophic hormone (Furth <i>et al.</i> , 1954).
Otherwise induced :	By treatment with gold thioglucose (Waxler and Brecher, 1950 ; Marshall and Mayer, 1954).
	By high-fat diet, C ₂ H and A strains (Fenton and Chase, 1951 ; Fenton and Dowling, 1953).
<i>In rats</i>	
Genetic :	Associated with diabetes (Sayers <i>et al.</i> , 1944).
Of hypothalamic origin :	Induced by bilateral (Hetherington and Ranson, 1940, 1942 ; Brobeck, 1946 ; Mayer, 1953c) or unilateral lesions (Mayer and Barnett, 1955).
Of other central nervous system origin :	From frontal lobe damage (Covian <i>et al.</i> , 1953).
Of endocrine origin :	From hypertrophy of adrenal cortical tissue (Bomskov and Schneider, 1939).
	From prolonged treatment with protamine zinc insulin (Mackay <i>et al.</i> , 1940) or insulin with forced feeding (Ingle and Mzamis, 1947).
	After thyroidectomy with hypothalamic lesions (Hetherington, 1943) or with forced feeding (Scow, 1951).
	From castration, in females (Holt <i>et al.</i> , 1936).
Otherwise induced :	By immobilisation (Ingle, 1949).
<i>In dogs</i>	
Genetic :	In the Shetland sheepdog, recessive character (Mayer, 1953a).
Of hypothalamic origin :	Spontaneous (Martin, 1953), surgically induced (Heinbecker <i>et al.</i> , 1944), or due to paraventricular degeneration caused by corticotropin or cortisone in excess (Heinbecker and Pfeifferberger, 1950).
Otherwise induced :	By immobilisation (Mayer, 1953a).
<i>In monkeys</i>	
Of hypothalamic origin :	Surgically induced (Brooks <i>et al.</i> , 1942).
Of other central nervous system origin :	Surgically induced by lesions of the thalamus (Ruch <i>et al.</i> , 1941).
<i>In farm animals</i>	
Genetic :	In strains selectively bred for fat, in particular, pigs bred for lard.
Of endocrine origin :	Induced by castration (Fish, 1925 ; Sellheim, 1913) and by oestrogens in the fowl (Bird, 1946) ; by castration and implants of oestrogens in male cattle.
Otherwise induced :	By immobilisation in pigs, cattle and geese ; by forced feeding in geese for production of foie gras (Wolfe <i>et al.</i> , 1952).

¹ Methods of estimating body fat have been excellently reviewed by Brožek and Keys (1950) and Keys and Brožek (1953).

TABLE 1—(contd.)

TYPES OF OBESITY

In man	
Genetic :	<p>A multiplicity of genes have been studied by Newman, von Vershuer, Bauer, Gurney, Rony, Angel and others, reviewed by Mayer (1953c).</p> <p>In congenital adipose macrosomia (Bauer, 1945).</p> <p>In monstrous infantile obesity (Jaso and Arbelo Curbelo, 1945).</p> <p>Associated with Laurence Moon Biedl syndrome (Bauer, 1945).</p> <p>Associated with <i>hyperostosis frontalis interna</i> (Bauer, 1945).</p> <p>Associated with von Gierke's disease.</p> <p>In familial hypoglycaemia (congenital lack of alpha cells) (McQuarrie <i>et al.</i>, 1950).</p>
Of hypothalamic origin :	<p>In <i>dystrophia adiposogenitalis</i>, with discrete or diffuse hypothalamic injury (Brain, 1947); occasionally with panhypopituitarism and narcolepsy (Mussio Fournier and Proto, 1947); Kleine Levin syndrome (Ronald, 1946).</p>
Of other central nervous system origin :	<p>After frontal lobotomy (Cobb, 1944; Rinkel <i>et al.</i>, 1947).</p> <p>In association with cortical lesions, in particular, bilateral frontal lesions (Kirschbaum, 1951).</p>
Of endocrine origin :	<p>With insulin-producing adenoma of the islets of Langerhans (Whipple, 1944), with diffuse hyperplasia of the islets, and in association with diabetes.</p> <p>With chromophobe adenoma of the pituitary without hypothalamic injury (Friedgood, 1950).</p> <p>In Cushing's syndrome (hyperglycocorticoidism).</p> <p>From treatment with cortisone or adrenocorticotrophic hormone.</p> <p>In the Bongiovanni Eisenmenger syndrome (Bongiovanni and Eisenmenger, 1951).</p> <p>In disorders of the reproductive system: gynandrim and gynism (Simpson, 1951), aspermatogenic gynaecomastia without aleydigism (Klinefelter <i>et al.</i>, 1942); male hypogonadism (sometimes with bulimia), postpubertal castration (Conn, 1944), menopause, ovarian disorder (Leray, 1951), paradoxical Gilbert Dreyfus disorder (Leray, 1951).</p> <p>In pseudohypoparathyroidism (Seabright Bantam syndrome) (Wolfson, 1954).</p>
Otherwise induced :	<p>In association with gout.</p> <p>By immobilisation in adults (Greene, 1939; Mayer, 1955<i>ab</i>, and children (Fry, 1953; Johnson <i>et al.</i>, in press).</p> <p>By psychic disturbance (Mayer, 1953c).</p> <p>By social and cultural pressure (Mayer, 1953c).</p>

The distinction between obesity and overweight is dramatically illustrated by experiments with mice with the obese-hyperglycaemic syndrome (Alonso and Maren, 1954). If such animals are restricted in their food intake over a long period, weight can be maintained within the normal range; under conditions of drastic energy restriction, their weight can be decreased to a level one-third below non-obese values. The fat content of normal-weight or underweight obese animals is still, however, much higher than normal, proportionally and even in absolute amount.

Excessive thinness usually results from losses of all three types of body constituents. The rare disease called histiodiuresis (Lawrence, 1946) and some cases of essential thinness may, however, be due to specific absence of fat. Recognition of the multiple etiology of excessive thinness has preceded that of the multiple etiology of obesity. Different types of cause for excessive thinness are summarised in Table 2.

TABLE 2

CAUSES OF EXCESSIVE THINNESS

Lack of Food or of Components of Food

Shortage of calories, with or without excessive physical work; shortage of protein, *e.g.*, in kwashiorkor; shortage of amino-acids (experimental); vitamin deficiencies, *e.g.* beriberi and pellagra.

Failure of Utilisation of Food

Gastro-intestinal disorders such as sprue and coeliac disease, pancreatic and liver disease which interfere with absorption.

Diabetes mellitus, thyrotoxicosis, progeria (Talbot *et al.*, 1945) in spite of high intake.

Pernicious anaemia and certain other forms of anaemia.

Failure of Appetite

From infections, poisoning, drugs (amphetamine, gossypol); hypothalamic anorexia, experimental (Anand and Brobeck, 1951*a*), *cachexia strumipriva* (Rony, 1940); panhypopituitarism, particularly Simmonds' disease; Addison's disease and pituitary Addison's disease, histiodiuresis (Lawrence, 1946); essential human thinness (Rony, 1940) and *anorexia nervosa*.

(To be continued)

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1. TECHNIQUE

CHEMICAL

APPARATUS

3162

SCHWARZ, K. Über eine Verbesserung der Soxhlet-Extraktionsapparat. [Improvement of the Soxhlet extraction apparatus.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1954, **99**, 464-467.

A tap is introduced into the siphoning tube.

H. G. Bray.

3163

NEILANDS, J. B. and CANNON, M. D. Automatic recording pH instrumentation. *Anal. Chem.*, 1955, **27**, 29-33. [Dept. Biochem., Univ. California, Berkeley.]

An apparatus is described which is suitable for titration at constant pH and measurement of ionisation constants. The procedure described is suitable for the study of the action of such enzymes as acetylerase and lactic dehydrogenase and of any reaction in which acids are used up or produced.

H. G. Bray.

3164

KAHAN, J. A simple device for the rapid evaporation of chromatographic samples. *J. Lab. Clin. Med.*, 1954, **44**, 661-662. [Dept. Pharmacol., Karolinska Inst., Stockholm.]

A pipe system supplying compressed air and a test-tube rack, both attached to a stand placed in a water-bath, permit vigorous circulation of solvents during evaporation. Ten samples each of 50 ml. ethanol can be completely evaporated in 7 to 8 min.—A. Hepburn.

3165

OOSTERHUIS, H. K., PRINS, G. and VERLEUR, H. A new apparatus for the automatic coloration and extraction of the filter paper strips in electrophoresis on filter paper. *Rec. Trav. chim. Pays-Bas*, 1954, **73**, 963-968. [Lab. Chem. Physiol., Free Univ., Amsterdam.]

An automatic electrically controlled supply of acetic acid and water to a beaker connected to a siphon permits the extraction of excess dye from a large number of filter paper strips.—A. Hepburn.

3166

HOLDSWORTH, E. S. An apparatus for continuous electrophoresis on paper. *Biochem. J.*, 1955, **59**, 340-345. [Nat. Inst. Res. Dairying, Univ. Reading.]

3167

EADES, C. H. (JR.), MCKAY, B. P., ROMANS, W. E. and RUFFIN, G. P. Automatic titrating and

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recording apparatus for microbiological assays. *Anal. Chem.*, 1955, **27**, 123-127. [Dept. Biochem., Univ. Tennessee, Memphis.]

ANALYTICAL METHODS

General

3168

MELES, S. R. and QUACKENBUSH, F. W. Reliability of chemical analyses for fertilizers and feeds. *J. Assoc. Off. Agric. Chem.*, 1955, **38**, 108-130. [Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

3169

GRI, K. V. Circular paper chromatography. 9. Preparative circular paper chromatography for large-scale separation and isolation of substances. *J. Indian Inst. Sci. [A]*, 1955, **37**, 1-13. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

A fuller account is given of a method previously reported (Abst. 34, Vol. 25). H. G. Bray.

3170

GRI, K. V. and PARIHAR, D. B. Flowing chromatography on a circular paper pack. *Nature*, 1955, **175**, 304-305. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

The method described in Abst. 34, Vol. 25 has been adapted by a continuous elution process for use with an automatic fraction collector.

A. Hepburn.

3171

BALIGA, B. R., KRISHNAMURTHY, K., RAJAGOPALAN, R. and GRI, K. V. A simple method for desalting biological fluids for chromatography. *J. Indian Inst. Sci. [A]*, 1955, **37**, 18-22. [Dept. Biochem., Indian Inst. Sci., Bangalore 3.]

Ninety-five per cent. ethanol containing 0.5 per cent. (v/v) HCl is used. The results obtained are compared with those obtained by an electrolytic procedure.—H. G. Bray.

3172

SULSER, H. Quantitative Papierchromatographie mit dem photoelektrischen Leukometer. 7. Mitteilung über Anwendung der Papierchromatographie auf lebensmittelchemische Probleme. [Quantitative paper chromatography with the photoelectric leucometer. 7. Use of paper chromatography in problems of food chemistry.] *Mitt. Geb. Lebensmittel.*

Hyg., 1954, **45**, 518-527. [Lab. Eidg. Gesundheitsamt., Berne.] French and English summaries.

An optical method for the estimation of materials on paper chromatograms is described.

H. G. Bray.

3173

ACKERMAN, B. J. and CASSIDY, H. G. **Gradient and rate aspects in paper chromatography.** *Anal. Chem.*, 1954, **26**, 1874-1876. [Sterling Chem. Lab., Yale Univ., New Haven, Conn.]

3174

YAMAGUCHI, M. and HOWARD, F. D. **New technique for two-dimensional descending paper chromatography.** *Anal. Chem.*, 1955, **27**, 332-333. [Dept. Veg. Crops, Univ. California, Davis.]

See also Abst. 3163.

Carbohydrate Constituents

3175

KOWKABANY, G. N. **Paper chromatography of carbohydrates and related compounds.** *Advances in Carbohydrate Chem.*, 1954, **9**, 303-353. [Catholic Univ. America, Washington, D.C.]

3176

STRANGE, R. E., DARK, F. A. and NESS, A. G. **Interference by amino acids in the estimation of sugars by reductometric methods.** *Biochem. J.*, 1955, **59**, 172-175. [Dept. Microbiol. Res., Porton, Wiltshire.]

Interference by cystine, tyrosine and tryptophan in copper reduction methods is less than that in ferricyanide methods. A procedure is described in which cation exchange resins are used to remove amino-acids before the estimation of reducing sugars.—H. G. Bray.

3177

IWAINSKY, H. **Über den Einfluss von Aminosäuren auf die Bestimmung reduzierender Kohlenhydrate. [Effect of amino-acids on the estimation of reducing carbohydrates.]** *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **100**, 173-179. [Inst. Lebensmittelchem., Humboldt Univ., Berlin.]

Amino-acids interfere with methods in which copper reagents are used, but the Hagedorn Jensen and anthrone methods are little affected, the latter being the more reliable.—H. G. Bray.

3178

TURTON, C. N. and PACSU, E. **The effect of anion exchange resins on reducing sugars.** *J. Amer. Chem. Soc.*, 1955, **77**, 1059-1061. [Frick Chem. Lab., Princeton Univ., N.J.]

The passage of D-glucose or D-fructose through an Amberlite IRA-400 (OH-form) column resulted in small amounts of D-mannose. Conversely, D-mannose gave rise to D-glucose and D-fructose. Glucose, fructose and mannose produced in addition to D-fructose a ketose, apparently D-psicose (ribohexulose). Similar amounts of glucose, fructose and mannose were adsorbed on the column with equilibrium after 30 min. to 1 hr. The conversion of the resin to the carbonate form enabled the adsorbed sugars to be removed, but losses progressively increased after long periods of time and non-volatile acids were detected.—A. Hepburn.

3179

REYNOLDS, T. M. **Adsorption of glucose on a weakly basic anion-exchange resin.** *Nature*, 1955, **175**, 46-47. [Div. Food Preservation and Transport, C.S.I.R.O., Homebush, N.S.W.]

3180

DEVOR, A. W. **Cereal carbohydrate determination. Sulfonated 1-naphthol and anthrone reactions applied to sulfuric acid extract of cereals.** *J. Agric. Food Chem.*, 1954, **2**, 1290-1292. [Dept. Physiol. Chem., Ohio State Univ., Columbus, Ohio.]

Total carbohydrate in a 1.25 per cent. H_2SO_4 extract of cereals was simply and rapidly estimated by spectrophotometer after reaction with sulfonated 1-naphthol. Carbohydrate containing up to 14 per cent. pentose, calculated as xylose, could be measured with a glucose standard. By the study of the absorbance of glucose-xylose mixtures, graphs were obtained from which the percentage of pentose in cereal monosaccharides extracted could be calculated. Values ranged from zero in wheat and corn starches to 13.0 for oats. The different carbohydrate content found with the anthrone method, which measures hexose only, was used to confirm the pentose content.

A. Hepburn.

3181

BERNAERTS, J. **Dosage colorimétrique de faibles quantités de sucre interverti en présence de grands excès de saccharose. [Colorimetric estimation of small amounts of invert sugar in the presence of excess sucrose.]** *La Sucrerie Belge*, 1954, Nos. 7/8, pp. 7. [Lab. Central Minist. Affaires Econ., Brussels.]

The method of Caputto *et al.* (*Enzymologia*, 1948, **12**, 350) for the colorimetric estimation of monosaccharides in the presence of reducing disaccharide was successfully applied to the estimation of small amounts of invert sugar in the presence of excess sucrose. The sensitivity was much less in presence of phosphate ions.—A. Hepburn.

N.A. and R., July 1955

3182

WISE, C. S., DIMLER, R. J., DAVIS, H. A. and RIST, C. E. Determination of easily hydrolyzable fructose units in dextran preparations. *Anal. Chem.*, 1955, 27, 33-36. [N. Utilization Res. Branch, U.S. Dept. Agric., Peoria, Ill.]

Resorcinol and anthrone methods are described in which chromogenesis from glucose is much less than that from fructose. A qualitative chromatographic test for the detection of free or easily liberated fructose is described.—H. G. Bray.

3183

BULLASOVÁ, H. and HORÁKOVÁ, E. Kvantitativní stanovení glukosy v biologickém materiálu komplexometrickou metodou. [Quantitative estimation of glucose in biological material by a complexometric method.] *Chem. Listy*, 1954, 48, 1698-1700. [Biochem. Lab., Thomayer's Hosp., Prague.]

This is a new method for estimating glucose, based on the reduction of alkaline CuSO_4 and estimation of CuO dissolved in HNO_3 by microtitration with a complexone, with murexide as indicator.—M. Prokšová (Czechoslovakia).

3184

PRUNER, G. Micrometodo per la determinazione del glucosio in cm^3 0, 02-0, 10 di sangue con solfato di cerio n/2000. [Micro-method for the estimation of glucose in 0.02 to 0.10 ml. blood with 0.0005 N cerium sulphate.] *Rend. Ist. Super. Sanità, Rome*, 1954, 17, 123-128. French, English and German summaries.

In this method the sugar is oxidised with ferricyanide in heat at pH 10 and the resulting ferrocyanide is titrated with cerium sulphate, with o-phenanthroline ferrous sulphate complex as indicator. The recovery of 20 to 50 μg . glucose from 0.02 to 0.05 ml. blood was correct to ± 4 per cent.—D. Duncan.

3185

ROE, J. H. The determination of sugar in blood and spinal fluid with anthrone reagent. *J. Biol. Chem.*, 1955, 212, 335-343. [Dept. Biochem., Sch. Med., George Washington Univ., Washington, D.C.]

Precision was improved by previous mixing of anthrone and H_2SO_4 . When thiourea was added the reagent retained its chromogenic capacity for 2 weeks. The deproteinised filtrate from blood or diluted spinal fluid was mixed with the anthrone reagent, heated in a boiling-water bath for 15 min., and cooled, and glucose was estimated colorimetrically. In blood a considerable amount of carbohydrate, probably hexose diphosphate, was precipitated by a mixture of ZnSO_4 and $\text{Ba}(\text{OH})_2$, but not by tungstic or trichloroacetic acid. The

results compared favourably with those of the arsenomolybdate method of Nelson (Abst. 849, Vol. 14).—A. Hepburn.

3186

PREECE, I. A. and HOBKIRK, R. Paper electrophoresis of polysaccharides. *Chem. and Indust.*, 1955, No. 10, 257-258. [Heriot-Watt Coll., Edinburgh.]

3187

ESCHMANN, H. and POTTERAT, M. Filtration der Rohfaser auf Filterpapier, eine Vereinfachung der Methode nach L. Bellucci. [Filtration of crude fibre on filter paper; simplification of the method of L. Bellucci.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, 45, 499-501. [Lab. Eidg. Gesundheitsamt., Berne.] French and English summaries.

Filter paper is used instead of a Gooch crucible for the separation of fibre remaining after treatment of material with a mixture of acetic and nitric acids.—H. G. Bray.

Nitrogenous Constituents

3188

ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS AND AMERICAN OIL CHEMISTS' SOCIETY JOINT COMMITTEE. Summary of the collaborative work on total nitrogen. *J. Amer. Oil Chem. Soc.*, 1955, 32, 35-36.

The results of collaboration between 27 laboratories in the estimation of total N in 10 different materials showed that as catalyst Hg was superior to Cu, which was therefore no longer recommended. Boric acid was inferior to standard acids for the absorption of ammonia. The time required for a burner to bring a sample of water to the boil varied widely between and within laboratories with both gas and electricity. From this the optimum digestion time, total times ranging from 55 min. to more than 3 hr., is considered still in doubt, although the best results were obtained with digestion times of 100 to 120 min.—A. Hepburn.

3189

MARZADRO, M. Determinazione selettiva di varie forme di azoto col micrometodo di Kjeldahl. 3. [Selective estimation of different forms of nitrogen by the micro-Kjeldahl method. 3.] *Rend. Ist. Super. Sanità, Rome*, 1954, 17, 282-289. French, English and German summaries.

3190

LUBOCHINSKY, B. and ZALTA, J. P. Microdosage colorimétrique de l'azote ammoniacal. [Colorimetric micro-estimation of ammoniacal

nitrogen.] *Bull. Soc. Chim. biol.*, 1954, **36**, 1363-1366. [Serv. Biochim., Inst. Biol. Physico-Chim., Paris.]

A modification of the phenol-hypochlorite method, in which colour production is accelerated by adding sodium nitroprusside.—H. G. Bray.

3191

ALBANESE, A. A., ORTO, L. and ROSSY, J. The microestimation of albumin-globulin ratios of plasma proteins. *Arch. Biochem. Biophys.*, 1955, **54**, 304-311. [Nutrit. Res. Lab., St. Luke's Hosp., New York.]

The separation of the protein components in 0.07-ml. samples of plasma by paper strip electrophoresis enabled the albumin: globulin ratio to be estimated by densitometer readings of the coloured spots. Actual amounts could be calculated from the total protein estimated by the micro-Kjeldahl procedure. Results were highly reproducible and agreed well with those of the usual chemical method.—A. Hepburn.

3192

COOPER, G. R. and MANDEL, E. E. (with OWINGS, R. H. and FETNER, J.) Paper electrophoresis with automatic scanning and recording. *J. Lab. Clin. Med.*, 1954, **44**, 636-643. [Commun. Dis. Centre, Pub. Health Serv., U.S. Dept. Health.]

The electrophoretically separated protein components of serum on filter paper strips were scanned automatically by combining a densitometer with an electrocardiograph to give typical electrophoresis curves. Values obtained from 12 normal sera differed slightly but significantly from those from the boundary method, albumin being 3.8 per cent. lower and γ -globulin 5.2 per cent. higher in the total protein. Electropherograms from 15 to 20 chromatograms could be recorded in one hour. Results were highly reproducible and could be used for recognition of abnormalities in the serum proteins due to disease.—A. Hepburn.

3193

BRATTSTEN, I. Continuous fractionation of serum by zone electrophoresis. *Acta chem. scand.*, 1954, **8**, 1947-1948. [Inst. Biochem., Univ. Upsala.]

Continuous fractionation of serum proteins was achieved by an arrangement by which veronal buffer was transported through a supporting medium in a direction perpendicular to the electric field. Distribution curves with 4 main peaks, α -, β - and γ -globulins and albumin, were formed. Fractionation of from 20 to 30 ml. serum provided sufficient material for analysis of these components.

A. Hepburn.

3194

PECHAR, J. and HAVLOVÁ, M. Elektroforeza bílkovin na papíře. [Electrophoresis of proteins on paper.] *Sborn. pathofysiol. trav.*, 1954, **8**, 165-171. [Human Nutrit. Res. Inst., Prague.] English and Russian summaries.

3195

ACKERMANN, P. G., TORO, G. and KOUNTZ, W. B. Zone electrophoresis in the study of serum lipoproteins. 1. Methods and preliminary results. *J. Lab. Clin. Med.*, 1954, **44**, 517-530. [St. Louis Chron. Hosp., Sch. Med., Washington Univ., St. Louis, Mo.]

After electrophoresis of serum in starch soaked with buffer the starch block was divided into thirty-six $\frac{1}{8}$ -in. sections and analysed for protein, P and cholesterol. Curves were obtained by plotting the amounts of cholesterol and phospholipin ($C \times 25$) against the number of the starch segment. Comparison with a similar curve for protein showed that in the normal human subject cholesterol and phospholipin had each 2 main similar fractions which migrated at about the same rate as albumin and β_2 -globulin and were identified as α - and β -lipoproteins. Curves from patients with different diseases are shown.—A. Hepburn.

3196

GOTTFRIED, S. P., POPE, R. H., FRIEDMAN, N. H. and DiMAURO, S. A simple method for the quantitative determination of alpha and beta lipoproteins in serum by paper electrophoresis. *J. Lab. Clin. Med.*, 1954, **44**, 651-654. [Dept. Biochem., Bridgeport Hosp., Bridgeport, Conn.]

Electrophoresis of serum followed by staining with Sudan III showed the separation into α - and β -lipoproteins. Curves were drawn by plotting optical density against the distance migrated. A serum protein curve used for fixing the position of the lipoprotein fractions indicated that the peak of the α -fraction lay between the α_1 -globulin and the albumin and the β -fraction lay between the γ - and β -globulins. An arbitrary quantitative estimation was obtained by measuring the area under the curve and values are at present being compiled.—A. Hepburn.

3197

SCANU, A. and SCHIANO, S. Su di una nuova metodica di estrazione continua a freddo con etere dei lipidi del siero. Applicazione allo studio dei complessi lipoproteici. [On a new method of continuous cold extraction with ether of serum lipids. Application to the study of lipoprotein complexes.] 1. Sieri umani normali. [1. Normal human sera.] 2. Sieri umani patologici. [2. Pathological human

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sera.] *Riv. Ist. sieroterap. ital.*, 1954, **29**, 276-302; 457-471. [Ist. Patol. Spec. Med., Univ. Naples.] English summary.

3198

SMITH, E. L. and TULLER, E. F. The paper chromatographic detection of the free sulfur-containing amino acids and small peptides in whole blood and serum. *Arch. Biochem. Biophys.*, 1955, **54**, 114-120. [Baker Clin. Res. Lab., New England Deaconess Hosp., Boston, Mass.]

The blood or serum is deproteinised by means of acetic acid and oxalic acid in the presence, when blood is used, of N-ethyl maleimide, which protects sulphhydryl groups. The protein-free supernatant is desalted by means of a resin column and the product is examined by paper chromatography. The solvents used for 2-dimensional chromatography are *n*-butanol, 40 per cent.; acetic acid, 10 per cent.; water, in the presence of 33 per cent. diethylamine, followed by *tert*-butanol, 10 per cent.; water, in the presence of 1 per cent. diethylamine. The detecting reagents are ninhydrin and, for sulphur compounds, a mixture of sodium azide and iodine.

Cysteine was found in whole blood, and new sulphur compounds in both blood and serum.

H. G. Bray.

3199

YEMM, E. W. and COCKING, E. C. The determination of amino-acids with ninhydrin. *Analyst*, 1955, **80**, 209-213. [Dept. Botany, Univ. Bristol.]

A procedure suitable for routine use is described which leads to a stoichiometric reaction between ninhydrin and most amino-acids. The reaction takes place in citrate buffer (pH 5) with a mixture of potassium cyanide, methyl Cellosolve and ninhydrin as reagent.—H. G. Bray.

3200

MOORE, S. and STEIN, W. H. A modified ninhydrin reagent for the photometric determination of amino acids and related compounds. *J. Biol. Chem.*, 1954, **211**, 907-913. [Labs. Rockefeller Inst. Med. Res., New York 21.]

The modified reagent contains 2 per cent. ninhydrin and 0.3 per cent. hydrindantin (reduced ninhydrin) in 3:1 methyl Cellosolve and 4*N* sodium acetate buffer. This stronger buffer with sodium acetate instead of sodium citrate eliminates preliminary adjustment of the pH of the effluent fractions. The direct addition of hydrindantin obviates the use of SnCl₂ as a reducing agent.

A. Hepburn.

3201

MOORE, S. and STEIN, W. H. Procedures for the chromatographic determination of amino acids

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on four per cent. cross-linked sulfonated polystyrene resins. *J. Biol. Chem.*, 1954, **211**, 893-906. [Labs. Rockefeller Inst. Med. Res., New York 21.]

This is an improvement on the authors' original method (Abst. 4469, Vol. 21). A longer column, 150 cm., a resin with 4 instead of 8 per cent. cross-linkage and elution at pH 3.1 to 5 by sodium acetate-citrate buffers of gradually increasing pH and ionic strength enabled a mixture of 18 common amino-acids to be recovered in quantity within 3 per cent. of theory, except methionine, which had a constant loss of 10 per cent. Tryptophan and glutamine also were unstable. Basic amino-acids were eluted at pH 5 and no second column was required. Amino-acids and related compounds of plasma and tissue extracts can be estimated by this method; it can also be used to separate peptides.—A. Hepburn.

3202

HIRS, C. H. W., MOORE, S. and STEIN, W. H. The chromatography of amino acids on ion exchange resins. Use of volatile acids for elution. *J. Amer. Chem. Soc.*, 1954, **76**, 6063-6065. [Rockefeller Inst. Med. Res., New York.]

Aspartic acid, glutamic acid and tyrosine were isolated from an acid hydrolysate of bovine serum albumin by passage through a 30-cm. column of the strongly basic resin, Dowex 1- \times 8 in its acetate form, with 0.5*N* acetic acid as eluant. The remaining amino-acids were separated on a 150-cm. column of Dowex 50- \times 4 by elution with HCl gradually increasing from 1 to 4*N*. The recoveries from the latter column were quantitative, 70 per cent. for methionine. The recoveries of glutamic and aspartic acids were 85 and 70 per cent., respectively.—A. Hepburn.

3203

CAMPBELL, P. N., JACOBS, S., WORK, T. S. and KRESSMAN, T. R. E. Separation of amino-acids on columns of sulphonated polystyrene resins. *Chem. and Indust.*, 1955, No. 5, 117-118. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

Zeo-Karb ion-exchange resins were found satisfactory for the separation and estimation of amino-acids, with sodium citrate buffer as the eluant. The water regain value of the resin is important.

A. Hepburn.

3204

HAMDY, M. K., HARPER, W. J. and WEISER, H. H. A modified procedure for the separation of acidic amino compounds using a sulfonated polystyrene resin. *J. Dairy Sci.*, 1955, **38**, 147-154. [Dept. Dairy Technol., Inst. Nutrit. Food Technol., Ohio State Univ., Columbus.]

3205
GRANT, R. A. A recording dielectrometric method for column chromatography of the neutral amino acids. *Biochem. J.*, 1955, **59**, xiii. [Dept. Biochem., London Hosp. Med. Coll., E.1.]

3206
GEROK, W. Die quantitative papierchromatographische Bestimmung der Aminosäuren. [Estimation of amino-acids by paper chromatography.] *Hoppe-Seyler's Ztschr.*, 1955, **299**, 112-128. [Med. Klin., Univ. Zürich.] English summary.

3207
KOFRÁNYI, E. Über quantitative Papierchromatographie von Aminosäuren in Proteinhydrolysaten. [Quantitative paper chromatography of amino-acids in protein hydrolysates.] *Hoppe-Seyler's Ztschr.*, 1955, **299**, 129-138. [Abt. Ernährungsphysiol., Max-Planck-Inst. Arbeitsphysiol., Dortmund.] English summary.

The compounds on the developed chromatogram are located by spraying with 1:2-naphthoquinone-4-sulphonic acid, heating to 60° C. and examining under ultraviolet light.—H. G. Bray.

3208
HÁNNI, H. Über den Nitratsnachweis in Milch. [Detection of nitrate in milk.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, **45**, 502-508. [Eidg. Milchwirtsch. Versuchsanst., Liebefeld, Berne]. French and English summaries.

A diphenylamine test is not sufficiently sensitive to detect nitrate in normal milk, in that contaminated with dung or in that from animals with udder diseases or fed on nitrate-rich material. It does, however, permit the detection of 5 per cent. added tap water.—H. G. Bray.

3209
ŠÁRPY, N. and KIRCHNER, Š. Kvantitativne stanovenie dusitanov v údenarských výrobkoch kolorimetrickou metódou. [Quantitative estimation of nitrites in sausages by the colorimetric method.] *Průmysl potravin*, 1954, **5**, 84-85. [Food Indust. Res. Inst., Bratislava.]

The colorimetric method for estimation of nitrites in sausages by means of rivanol (2-ethoxy-6:9-diamino-acridine lactate) is described.

M. Prokšová (Czechoslovakia).

3210
HJORTH-HANSEN, S. Anvendelse av mikrodifusjon og vakuumdestillasjon ved bestemmelse av flyktig N og urinstoff N i fisk. [Estimation of volatile N and urea N in fish by

microdiffusion and distillation in vacuo.] *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1951, **2**, No. 2, pp. 11. English summary.
Trimethylamine N, total volatile N and urea N were rapidly estimated in fresh, stored, salted, smoked and frozen fish by distillation. Conway's microdiffusion method was suitable for mass analyses. The methods gave similar results.

A. Hepburn.

3211
TREADWELL, W. D. and WAHL, A. Zur Kenntniss der jodometrischen Bestimmung von Harnsäure. [The iodimetric estimation of uric acid.] *Helv. chim. Acta*, 1954, **37**, 1948-1954. [Lab. Anorgan. Chem., Tech. Hochsch., Zürich.]

Lipoid Constituents

3212
LASSOTA, L., KIELANOWSKI, J. and TABISZEWSKA, I. Porównanie dwóch metod oznaczania procentu tłuszczu w mleku krowim. [Comparison of two methods of estimating the fat content of cow's milk.] *Rocz. Nauk rol.* [B], 1954, **69**, 79-89. Russian and English summaries.

The "Burat" method of Sadokova (*Dokl. Akad. Nauk. S.S.S.R.*, 1947, **6**, 17) gave significantly higher results than Gerber's method, but for purposes of comparison either could be used. (From summary).—A. Hepburn.

3213
KIERMEIER, F. and PIRNER, G. Untersuchungen über die Gerber-Fettbestimmung. I. Einfluss von Temperatur und Säurekonzentration bei der Fettbestimmung im Rahm. [Gerber estimation of fat. 1. Effect of temperature and concentration of acid on fat estimation in cream.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **100**, 135-143. [Chem. Inst., Süddeutsch. Versuchsanst. Milchwirtsch., Weihenstephan.]

3214
ENSMINGER, L. G. Rapid method for water-insoluble acids (WIA) in butter. *J. Assoc. Off. Agric. Chem.*, 1955, **38**, 183-184. [Food and Drug Admin., Dept. Health, Cincinnati, Ohio.]

After the butter sample was shaken with water, water-insoluble acids were estimated by titration of an ether solution of the butter with sodium ethylate to a phenolphthalein end-point. The method agreed well with the A.O.A.C. method (1950). It was not suitable for cream, because of interference by protein.—A. Hepburn.

3215
ANTONIANI, C. and CERUTTI, G. Sul riconoscimento dell'acido isovalerianico in presenza di

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acido butirrico e acido capronico. [Detection of isovaleric acid in the presence of butyric and caproic acids.] *Ann. Sper. agrar.*, 1954, **8**, 801-807. [Ist. Indust. Agrar., Univ. Milan.] English summary.

The presence of 5 per cent. of dolphin fat in butter could be detected by identification of isovaleric acid by paper chromatography.

A. Hepburn.

3216

CERUTTI, G. Sulla reazione di Tortelli-Jaffe nell'analisi del burro. [The Tortelli Jaffe reaction in butter analysis.] *Ann. Sper. agrar.*, 1954, **8**, 747-750. [Ist. Indust. Agrar., Univ. Milan.] English summary.

A useful guide to the genuineness of butter was the colour produced in the Tortelli Jaffe reaction (*Chem. Ztg.*, 1915, **39**, 24).—A. Hepburn.

3217

OSIŃSKA, Z. Porównanie trzech metod oznaczania zawartości tłuszczu w mięsie. [Comparison of three methods of estimating the fat content of meat.] *Rocz. Nauk. rol. [B]*, 1954, **69**, 71-77. Russian and English summaries.

The methods of Grossfeld, taken as standard, and Gerber, slightly modified, were equally accurate; results by Soxhlet's method were generally higher and the standard error was 4 times greater than in the other 2. The relatively high accuracy of Gerber's method and its usefulness for mass serial determinations was confirmed. (From summary.)—A. Hepburn.

3218

SHIPLE, W. F. Identification of fats by urea fractionation. *J. Assoc. Off. Agric. Chem.*, 1955, **38**, 156-165. [Dept. Dairy Indust., Cornell Univ., Ithaca, N.Y.]

Fatty acids prepared from pure and adulterated butterfats, oleomargarines, coconut oil, herring oil, whale oil, seal oil, cottonseed oil and soya bean oil were fractionated by complex formation with urea in methanolic solution. The refractive indices of the fractions were measured at 50° C.

By strictly adhering to the details of the procedure given, the refractive indices can be used as a guide to the identification of a particular fat and also as a means of quickly detecting grossly adulterated samples of butterfat.—G. A. Garton.

3219

CROMBIE, W. M. L., COMBER, R. and BOATMAN, S. G. The estimation of unsaturated fatty acids by reversed-phase partition chromatography. *Biochem. J.*, 1955, **59**, 309-316. [Dept. Botany, Univ. Southampton.]

The reversed-phase chromatographic technique of Howard and Martin (*Abst. 1353*, Vol. 20) was

applied to mixtures of saturated and saturated fatty acids. Although many unsaturated fatty acids were separable from one another, they were not usually separable from saturated acids. In order to estimate the amount of each unsaturated and unsaturated fatty acid in a mixture it was chromatographed before and after oxidation with alkaline KMnO_4 . The KMnO_4 degraded the unsaturated acids to products which were eluted more rapidly than myristic acid, so that the unsaturated acids could be estimated by difference.

The method was tested on several standard fatty acid mixtures and on the fatty acids from water melon, palm kernel, linseed and oiticica oils, with results which agreed well with analyses by ester-fractionation and spectrophotometric methods.

G. A. Garton.

3220

KOBRLE, V. and ZAHRADNÍK, R. Rozdělovací chromatografie vyšších mastných kyselin na papíře. 2. Dělení nenasyčených mastných kyselin. [Paper partition chromatography of higher fatty acids. 2. Separation of unsaturated fatty acids.] *Chem. Listy*, 1954, **48**, 1703-1705. [Work Hyg. and Dis. Inst., Prague.]

3221

BARNETT, A. J. G. and SMITH, D. K. The movement of higher fatty acids under electrophoresis on filter-paper strips. *J. Sci. Food Agric.*, 1955, **6**, 53-57. [Div. Agric. Biochem., Dept. Biol. Chem., Univ. Aberdeen.]

An apparatus for electrophoresis is described in which the separation of saturated fatty acids (C_{10} - C_{18}) was effected. Acids lower than C_{10} moved at the same rate on the paper and were thus not separable; C_{18} acids were not separated owing to their adsorption on paper. A partial resolution of the fatty acids contained in a sample of oleic acid (B.P.) is reported.—G. A. Garton.

3222

SPITERI, J. Chromatographie de partage des acides gras. [Partition chromatography of fatty acids.] *Bull. Soc. Chim. biol.*, 1954, **36**, 1355-1362. [Lab. Recherches Indust., Tunisia.]

Paraffin oil was used as the stationary phase and glacial acetic acid as the mobile phase. The procedure is applicable to acids from C_{10} to C_{24} . The spots are revealed by treatment with AgNO_3 , followed by $(\text{NH}_4)_2\text{SO}_4$.—H. G. Gray.

3223

NAILOR, R., BAUER, F. C. (Jr.) and HIRSCH, E. F. Modifications in the hydroxamic acid method for the estimation of the esterified fatty acids in small amounts of serum. *Arch. Biochem.*

- Biophys.*, 1955, **54**, 201-205. [Henry Baird Favill Lab., St. Luke's Hosp., Chicago, Ill.]
- A modification of the method of Bauer and Hirsch (Title 73, Vol. 19).—H. G. Bray.
- 3224
BROWN, W. D. Determination of lipid phosphorus in ultramicro quantities of serum. *Austral. J. Exp. Biol. Med. Sci.*, 1954, **32**, 677-688. [Med. Kem. Inst., Lund, Sweden.]
- Lipid P in 10 μ l. serum isolated by solution in alcohol-dioxane or as the precipitate insoluble in trichloroacetic acid was oxidised to inorganic phosphate by perchloric acid. Phosphate was estimated colorimetrically after reaction with a mixture of hydrazine sulphate and sodium molybdate. Results from these methods did not differ significantly from those of a macro control method. A. Hepburn.
- 3225
DELSAL, J. L. Fractionnement des lipides du sérum sanguin par les solvants organiques. [Fractionation of blood serum lipids by organic solvents.] *Bull. Soc. Chim. biol.*, 1954, **36**, 1329-1334. [Inst. État Razi, Hessaek, Iran.]
- Serum lipids were separated into 2 fractions, steroids plus glycerides and phosphoaminolipids, by the difference in solubility in a mixture of methylal, methanol, light petroleum and water. A. Hepburn.
- 3226
COMFORT, A. Estimation of plasma cholesterol fractions by elution from paper. *Biochem. J.*, 1955, **59**, x. [Dept. Zool., University Coll., London, W.C.1.]
- Other Organic Constituents
- 3227
KVAMME, E. and HELLMAN, L. Isolation of pyruvic and alpha-ketoglutaric acids from blood and tissues in the presence of carbon-14 acetate. *Anal. Chem.*, 1954, **26**, 1995-1997. [Div. Phys. Biophys., Sloan-Kettering Inst. Cancer Res., New York 21.]
- 3228
NORDMANN, R., GAUCHERY, O., DU RUISSEAU, J. P., THOMAS, Y. and NORDMANN, J. Chromatographie sur papier des acides organiques non volatils des liquides biologiques. 1. L'urine. Technique chromatographique. [Paper chromatography of non-volatile organic acids in biological fluids. 1. Urine. Chromatographic technique.] *Bull. Soc. Chim. biol.*, 1954, **36**, 1461-1471. [Lab. Biochim., Salpêtrière, Paris.]
- Five ml. urine was passed through a column of the anion exchange resin Dowex 2, to remove interfering substances. The organic acids containing some mineral acids as impurities were eluted with formic acid, concentrated and separated by 2-dimensional paper chromatography with successive alkaline and acid developing solvents. A. Hepburn.
- 3229
BRAASCH, J. W., FLOCK, E. V. and ALBERT, A. A quantitative method for the separation of the iodinated amino acids of thyroid tissue. *Endocrinology*, 1954, **55**, 768-776. [Sect. Biochem., Mayo Clin., Rochester, Minn.]
- A procedure is described for the separation of thyroxine, triiodothyronine, iodide and mono- and di-iodotyrosine on a kieselguhr column eluted with alkaline chloroform: butanol and alkaline butanol: propanol.—H. G. Bray.
- 3230
WENGER, P. E., MONNIER, D. and RÜEDI, W. F. Étude critique du dosage de l'alcool dans le sang. [Critical study of the estimation of alcohol in blood.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, **45**, 528-552. [Lab. Chim. Minérale, Univ. Geneva.] German and English summaries.
- The methods of Nicloux, Rochat (Title 2544, Vol. 16) and Schifferli for the estimation of alcohol in blood and of Harger for its estimation in expired air have been found not entirely satisfactory. Precision limits of accuracy are given. A. Hepburn.
- 3231
GERLACH, E. and WEBER, E. Papierchromatographische Trennungsmethode für die säurelöslichen Phosphoverbindungen aus Nierengewebe. [Method for separating acid-soluble phosphorus compounds from kidney tissue by paper chromatography.] *Arch. exp. Pathol. Pharmacol.*, 1955, **224**, 496-522. [Pharmakol. Inst., Univ. Heidelberg.]
- A trichloroacetic acid extract of the tissue is fractionated by barium-ethanol precipitation. Four solvent mixtures and numerous detecting reagents are used. About 20 compounds were detected, many of which were estimated in terms of their P content. Orthophosphate, adenylic acid, diphosphopyridine nucleotide, creatine phosphate and adenosinedi- and -triphosphates were present in greatest amount; inosine monophosphate, cytidine monophosphate and several other nucleotides and phosphorylated hexoses and trioses were present in smaller quantities.—H. G. Bray.
- 3232
CHENG, E. W. and BURROUGHS, W. Determination of small amounts of diethylstilbestrol in feeds. *J. Assoc. Off. Agric. Chem.*, 1955, **38**, 146-150. [Iowa Agric. Exp. Stat., Ames.]

Samples of feed were extracted with benzene, concentrated, and applied to a Celite chromatographic column wetted with NaOH. Coloured pigments were eluted with Skellysolve B and diethylstilboestrol by HCl in ethanol. Diethylstilboestrol was estimated by the colorimetric reaction with a 3 per cent. solution of SbCl_3 in ethylene dichloride and by the absorbance after ultraviolet irradiation. As little as 5 mg. diethylstilboestrol per lb. feed could be estimated.—A. Hepburn.

Inorganic Constituents

3233

GEHRKE, C. W., RUNYON, C. V. and PICKETT, E. E. A quantitative spectrographic method for the determination of tin, copper, iron, and lead in milk and milk products. The effect of storage on the concentration of these metals in evaporated milk. *J. Dairy Sci.*, 1954, **37**, 1401-1408. [Dept. Agric. Chem., Missouri Agric. Exp. Stat., Columbia.]

3234

VANSCHOUBROEK, F. and OYAERT, W. Study of a flame photometric method for the determination of minerals in cow's milk. *Zootechnia*, 1954, **3**, 326-343. [Lab. Animal Husb., State Univ., Ghent.] French and Spanish summaries.

The optimum ashing temperature, interference by other minerals and the effect of nitric acid in the ash were studied.—H. G. Bray.

3235

LAKSHMINARAYANAN, K. Microchromatography. 2. Detection of trace elements in biological media. *Proc. Indian Acad. Sci. [B]*, 1954, **40**, 167-172. [Botany Lab., Univ. Madras.]

For the technique see Abst. 84, Vol. 25.

Cations corresponding to Cu, Co, Ni, Fe, Mn, Al, B, Mo and Zn were studied. The solvents used were *n*-butanol : acetic acid : water (4 : 1 : 5), aqueous collidine and aqueous lutidine. The spray reagents were a mixture of rubeanic acid and ammonia, 8-hydroxyquinoline, acridine hydrochloride, sodium diethyldithiocarbamate and ferrous.—H. G. Bray.

3236

KAHLE, G. and REIF, E. Eine umströmte stationäre Hg-Elektrode für die polarographische Mikroanalyse und ihre Bedeutung für den Nachweis der Spurenelemente des Blutes. [An immersed stationary Hg electrode for polarographic micro-analysis and its importance for the detection of trace elements in blood.] *Biochem. Ztschr.*, 1955, **326**, 305-310. [Rudolf Virchow Krankenhaus, Berlin.]

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3237

CHRISTIANSON, G., JENNESS, R. and COULTER, S. T. Determination of ionized calcium and magnesium in milk. *Anal. Chem.*, 1954, **26**, 1923-1927. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

Milk is equilibrated with the cation exchange resin Amberlite IR-100 and the bound cations are eluted with HCl and estimated in the eluate by titration with ethylenediamine tetra-acetate. The amounts bound by the resin are expressed as concentrations by reference to the amounts bound when the resin is equilibrated with standard solutions of the ions studied.—H. G. Bray.

3238

CHEN, P. S. (Jr.) and TORIBARA, T. Y. Some errors in the determination of calcium in aged blood serum eliminated by flame photometry. *Anal. Chem.*, 1954, **26**, 1967-1968. [Sch. Med. Dent., Univ. Rochester, N.Y.]

The chief errors in the Ca oxalate method arise from the unspecific nature of the oxidising agent used, incomplete precipitation and co-precipitation of oxalates other than that of Ca.—H. G. Bray.

3239

BAUER, G. C. H. A rapid method for the simultaneous determination of calcium and sodium in bone. *Acta physiol. scand.*, 1954, **31**, 351-358. [Orthopaedic Clin., Malmö, Sweden.]

Samples of fat-free bone powder were shaken with trichloroacetic acid for 4 hr. The resulting solutions were diluted with water and analysed by flame photometry. Synthetic bone salts with the same emission of Ca light as the unknowns were used as standards for the estimation of Na.

A. Hepburn.

3240

ERICSSON, Y. Simplified methods for determination of calcium and magnesium in the saliva. *J. Dent. Res.*, 1955, **34**, 104-112. [Nat. Inst. Dent. Res., Bethesda, Md.]

An ethylenediamine tetra-acetate titration procedure is described for the estimation of Ca and Mg together, and a Titan yellow method for Mg alone.

H. G. Bray.

3241

MCGEE-RUSSELL, S. M. A new reagent for the histochemical and chemical detection of calcium. *Nature*, 1955, **175**, 301-302. [Dept. Zool., Univ. Museum, Oxford.]

The dye used is the anthraquinone derivative "Kernecht-rot", or nuclear fast red, for which the name calcium red is suggested.—H. G. Bray.

3242

CHRISTIAN, K. R. and COUP, M. R. Measurement of feed intake by grazing cattle and sheep. 6. The determination of chromic oxide in faeces.

N.Z. J. Sci. Technol. [A], 1954, **36**, 328-330.
[Ruakura Animal Res. Stat., Dept. Agric.,
Hamilton.]

Chromic oxide in faeces ash was oxidised to dichromate by digestion with an aqueous mixture of phosphoric acid, manganese, sulphate and potassium bromate for 7 to 15 min. Any chromic oxide remaining dissolved in the solution and was oxidised by more bromate. The entire procedure took about 45 min. and 50 samples could be analysed simultaneously. Dichromate was estimated by reduction with arsenite and back titration with permanganate or by titration with ferrous ammonium sulphate. The reproducibility to within 2.5 per cent. was high and there was satisfactory agreement with the previous method (Abst. 2679, Vol. 23).—A. Hepburn.

3243

SALTZMAN, B. E. Microdetermination of cobalt in biological materials. *Anal. Chem.*, 1955, **27**, 284-287. [Div. Special Health Serv., U.S. Dept. Health, Cincinnati, Ohio.]

The material is ashed and the Co present is converted to its complex with 1-nitroso-2-naphthol, which is extracted with chloroform. The extract is purified with HCl and is ashed. Co in the residue is estimated by a nitroso R salt method.

H. G. Bray.

3244

JÉRÔME, H. and SCHMITT, H. Microméthode spectrophotométrique de dosage du cuivre total dans les tissus et liquides biologiques. [Spectrophotometric micro-method for estimating total copper in tissues and biological fluids.] *Bull. Soc. Chim. biol.*, 1954, **36**, 1343-1354. [Lab. Thérap., Fac. Méd., Paris.]

Two procedures are described, the first for use after treatment of the sample with HCl and trichloroacetic acid to liberate Cu and to precipitate protein and the second after wet ashing. Cu is estimated as its complex with 2:2'-diquinoline.

H. G. Bray.

3245

JANČIĆ, M. Une contribution à la méthodique du dosage du cuivre dans les liquides biologiques. [Estimation of copper in biological fluids.] *Acta med. jugoslav.*, 1954, **8**, 253-256. [Central Hemijiska Lab., Klin. Bolnice, Med. Fak., Sarajevo.] Serbian summary.

For clinical diagnosis an accurate method of estimating Cu in blood and urine is essential. Diethyldithiocarbamate is the reagent which it has been usual to employ but, since it gives the same colour with Fe as with Cu, Fe must be got rid of, which is a tiresome process. The reaction of Weehuizen (*Pharm. Weekbl.*, 1905, **42**, 271) is recommended in preference, and the technique is described in detail.—E. M. Hume.

3246

FABRE, R., TRUHAUT, R. and ROUQUETTE, A. Sur le microdosage du fluor dans les végétaux. [Micro-estimation of fluorine in plants.] *C.R. Acad. Sci.*, 1955, **240**, 226-229.

Incineration of a 5- to 10-g. sample in the presence of magnesium oxide and acetate, followed by treatment with sulphuric or perchloric acid with silica, allowed HF to be distilled off into 0.1 N NaOH. The distillate was acidified with HCl, brought to pH 3.5 with sodium monochloroacetate and titrated against thorium nitrate with sodium alizarin sulphate as indicator. The method was simple and sensitive to a few μg .—A. Hepburn.

3247

DUBRAVČIĆ, M. Determination of iodine in common salt by the catalytic reduction of ceric ions. *Analyst*, 1955, **80**, 146-153. [Lifeguard Milk Products, Ltd., Melbourne, C.I., Victoria.]

A development of a method previously described (Rogina and Dubravčić, *Analyst*, 1953, **78**, 594). Less than 0.01 μg . I per 10 ml. reaction mixture can be estimated in the presence of NaCl.—H. G. Bray.

3248

SCHADE, A. L., OYAMA, J., REINHART, R. W. and MILLER, J. R. Bound iron and unsaturated iron-binding capacity of serum; rapid and reliable quantitative determination. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 443-448. [Lab. Infect. Dis., Nat. Microbiol. Inst., Nat. Inst. Health, Bethesda, Md.]

Bound Fe is quickly estimated in small quantities of serum in the presence of serum proteins by adjusting with phosphate buffer to a pH at which Fe is dissociated and reacts with terpyridine to form a coloured complex which is measured by spectrophotometer. Ascorbic acid is used to reduce the Fe. The unsaturated Fe-binding capacity of serum is found by adding Fe and measuring the excess free to combine with terpyridine.—A. Hepburn.

3249

DICKENMAN, R. C., CRAFTS, B. and ZAK, B. The analysis of blood iron. *Arch. Biochem. Biophys.*, 1954, **53**, 381-386. [Dept. Pathol., Coll. Med., Wayne Univ., Detroit, Mich.]

3250

PARRY, E. P. and McCLELLAND, A. L. Permanent colour standards for determination of phosphate by molybdenum blue method. *Anal. Chem.*, 1955, **27**, 140-141. [Dept. Chem., Univ. Connecticut, Storrs.]

The standards consist of mixtures of solutions of copper sulphate and bromophenol blue.

H. G. Bray.

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3251

FLYNN, R. M., JONES, M. E. and LIPMANN, F. A colorimetric determination of inorganic pyrophosphate. *J. Biol. Chem.*, 1954, **211**, 791-796. [Biochem. Res. Lab., Massachusetts Gen. Hosp., Boston.]

The reagent containing molybdate and 1:2:4-aminonaphtholsulphonic acid used by Fiske and Subbarow (*J. Biol. Chem.*, 1925, **66**, 375) for the estimation of orthophosphate was adapted by the addition of cysteine to estimate 0.05 to 0.5 μ mol. pyrophosphate. In the presence of orthophosphate the reading obtained after 7 min. is subtracted from the final reading at 90 min.

A. Hepburn.

3252

THREEFOOT, S. A., BURCH, G. E. and RAY, C. T. The biologic decay rates and excretion of radio-cesium, Cs^{134} , with evaluation as a tracer of potassium in dogs. *J. Lab. Clin. Med.*, 1955, **45**, 313-322. [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

3253

HULET, W. H. Procedure for the determination of sodium, potassium and chloride in biologic material. The sodium, potassium and chloride content of the "200 mg. sodium diet". *Amer. J. Med. Sci.*, 1955, **229**, 81-84; 85-88. [Dept. Int. Med., George F. Geisinger Mem. Hosp., Danville, Pa.]

Na and K were estimated by flame photometer and chloride by a mercuric nitrate method.

Results are given for the analysis of 15 diets for these elements: all contained more Na than was expected.—H. G. Bray.

3254

ROBINSON, C. V., ARONS, W. L. and SOLOMON, A. K. An improved method for simultaneous determination of exchangeable body sodium and potassium. *J. Clin. Invest.*, 1955, **34**, 134-140. [Biophys. Lab., Harvard Med. Sch., Boston, Mass.]

A differential counting technique is described by means of which ^{24}Na and ^{42}K can be estimated in solution without preliminary separation.

H. G. Bray.

3255

FORBES, G. B. and D'AMBRUSO, M. Determination of sodium in bone with the aid of cation exchange chromatography. *J. Biol. Chem.*, 1955, **212**, 655-661. [Dept. Paediat., Sch. Med. Dent., Univ. Rochester, N.Y.]

When an acid solution of bone ash was applied to a Dowex 50 ion-exchange column, elution with 0.7 N HCl resulted in the quantitative separation of Na with no interfering ions in the 100 to 300

ml. zone of the effluent. Analysis by flame photometry was then possible. The elution took 7 hr., was accurate and was suitable for 0.3 to 2 g. samples of bone (wet weight).—A. Hepburn.

Enzyme Activity

3256

HOMANN, W. Eine papierchromatographische Methode zur Messung der Cholinesterase-aktivität. [A method for estimating cholinesterase activity by paper chromatography.] *Arch. exp. Pathol. Pharmacol.*, 1955, **224**, 176-178. [Pathol. Inst., Univ. Erlangen.]

3257

WILLIAMS, A. W. A simple method for the estimation of pepsin in gastric juice. *J. Clin. Pathol.*, 1955, **8**, 85. [Dept. Pathol., Univ. Aberdeen.]

The method is based on the conversion by pepsin of edestin, which gives an opalescence with a saturated solution of NaCl, to edeston, which does not.—H. G. Bray.

3258

PLACER, ZD. Trávicí enzymy. 4. Chymásové stanovení proteolytické aktivity žaludeční šťávy. [Digestive enzymes. 4. Rennet activity as a base for the estimation of the proteolytic activity of gastric juice.] *Sborn. pathofysiol. trav.*, 1954, **8**, 160-164. [Human Nutrit. Res. Inst., Prague.] English and Russian summaries.

A method of estimating pepsin in gastric juice by the coagulation of milk to which methylene blue is added is described.

A. Jančařík (Czechoslovakia).

3259

SCHORMÜLLER, J. and LAHMANN, E. Beiträge zur Biochemie der Käsereifung. 10. Untersuchungen zur Methodik der Phosphatasenbestimmung in reifendem Sauermilchkäse. [Biochemistry of cheese ripening. 10. Estimation of phosphatase in ripening sour milk cheese.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **100**, 114-135. [Inst. Lebensmittelchem., Tech. Univ. Berlin, Charlottenburg.]

A detailed critical investigation of available methods.—H. G. Bray.

Miscellaneous

3260

SLOMAN, K. G., BORKER, E. and REUSSNER, M. D. Determination of moisture in chocolate. *J. Agric. Food Chem.*, 1954, **2**, 1239. [Central Labs., General Foods Corp., Hoboken, N.J.]

3261

FETZER, W. R. and KIRST, L. C. The determination of moisture in gluten and sweetened feeds.

J. Assoc. Off. Agric. Chem., 1955, **38**, 130-140. [Clinton Foods, Inc., Clinton, Iowa.]

Moisture was estimated in maize oilmeal, gluten meal, soya meal, gluten feed and sweetened feeds by different methods. Estimation by benzene distillation was considered the most accurate for the heat-sensitive gluten feed and other sweetened feeds. The A.O.A.C. methods (1950) were not considered sufficiently accurate for heat-sensitive feeds.—A. Hepburn.

3262

PIETERMAAT, F. P. and MAES, E. Le dosage ultra-rapide de l'humidité dans les farines et le gluten essoré, dans un champ électrique à haute fréquence. [Rapid estimation of moisture in flour and dried gluten, in a high-frequency electric field.] *Bull. Écon. Meun. belge*, 1954, **16**, 89-95.

3263

TERRIER, J. Le dosage indirect de l'eau dans les produits sucrés. [Indirect estimation of water in sugar products.] *Mitt. Geb. Lebensmittel. Hyg.*, 1954, **45**, 496-498. [Lab. Cantonal, Geneva.] German and English summaries.

Water can be estimated to within an accuracy of 0.2 per cent. by heating the sample with silica gel (Acrosil) in a vacuum oven for 1 hr. at 80°C. and applying a blank correction.—A. Hepburn.

3264

SIDWELL, C. G., SALWIN, H. and MITCHELL, J. H. (Jr.) Measurement of oxidation in dried milk products with thiobarbituric acid. *J. Amer. Oil Chem. Soc.*, 1955, **32**, 13-16. [Quartermaster Food and Container Inst. Armed Forces, Chicago, Ill.]

Acidified samples of dried whole milk were steam-distilled and treated with 2-thiobarbituric acid. The degree of oxidation was estimated by spectrophotometric examination of the resulting red product.—A. Hepburn.

3265

MILLER, W. J. A modification of the *p*-anisidine method for the determination of free and total gossypol. *J. Amer. Oil Chem. Soc.*, 1955, **32**, 29-33. [Buckeye Cotton Oil Co., Atlanta, Ga.]

Dianilinogossypol in cottonseed meals may be measured as free gossypol when *p*-anisidine is used to form a coloured complex. A new method is suggested in which this difficulty is overcome. After extraction with 70 per cent. aqueous acetone, redistilled aniline is used to form a coloured complex, free gossypol being measured as dianilinogossypol. When the colour is developed at 100°C. for 15 min. the calibration curve conforms to Beer's law.—D. H. Shrimpton.

3266

SCHARRER, K., JUNG, J. and PILGENRÖTHER, A. Über die Methodik der Senfölbestimmung in Futtermitteln und Futterpflanzen. [Method for estimating mustard oil in feeds and fodders.] *Arch. Tierernährung*, 1954, No. 5, Beihefte, 77-94. [Agric. Chem. Inst., Justus Liebig Hochsch., Univ. Giessen.]

3267

NEVENS, W. B., HARSHBARGER, K. E., TOUCHBERRY, R. W. and DUNGAN, G. H. A method for estimating the money value of corn silage. *Illinois Agric. Exp. Stat. Bull.* No. 576, May 1954, pp. 16. [Urbana, Ill.]

See Abst. 1679, Vol. 25.

MICROBIOLOGICAL

3268

HILL, H. Zur Methodik der mikrobiologischen Aminosäurebestimmung. [Technique of microbiological estimation of amino-acids.] *Arch. Tierernährung*, 1954, No. 5, Beihefte, 135-145. [Physiol. Inst., Tierärztl. Hochsch., Hanover.]

The bacteria used for estimation of threonine, valine, histidine and isoleucine were *Streptococcus faecalis* (lactis) R, for arginine, methionine, lysine, leucine and phenylalanine *Leuconostoc mesenteroides* (P 60), and for tryptophan *Lactobacillus arabinosus* 17-5 (ATCC 8014). The methods and basal media are fully described. The growth of the bacteria depends on the concentration of the limiting amino-acid when other requirements are met, and the degree of growth is measured by the pro-

duction of lactic acid and the shift in pH. The method can be used, for example, for amino-acids in hydrolysates of organic material or for free amino-acids in serum.—D. Duncan.

3269

HORN, M. J., BLUM, A. E., GERSDORFF, C. E. F. and WARREN, H. W. Sources of error in microbiological determinations of amino acids on acid hydrolysates. 2. Apparent loss of amino acids on storage. *Cereal Chem.*, 1955, **32**, 64-70. [Human Nutrit. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Washington 25, D.C.]

Unfiltered acid hydrolysates of raw and cooked barley lost arginine, histidine, methionine, isoleucine, lysine and valine after storage for up to

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2 months at pH 6.8 under toluene at room temperature. Leucine, phenylalanine and threonine were unaffected. No loss on storage occurred after filtration at pH 4.0. Only arginine, histidine and especially methionine in the unfiltered hydrolysates fell below the values obtained with filtration. Losses were apparently not due to bacterial

decomposition. The initial higher values in the unfiltered hydrolysates of valine, lysine, arginine and isoleucine were attributed to the activity of humin (see Abst. 945, Vol. 24).

Casein and whole barley hydrolysed in acid separately and together gave similar total amounts of the 9 amino-acids.—A. Hepburn.

CLINICAL AND EXPERIMENTAL

3270

KARLBERG, P. and LIND, J. Studies of the total amount of hemoglobin and the blood volume in children. 1. Determination of total hemoglobin and blood volume in normal children. *Acta paediat.*, 1955, **44**, 17-34. [Paediat. Clin., Karolinska Sjukhuset, Stockholm.] French, German and Spanish summaries.

A respiration method due to Sjöstrand (Abst. 1788, Vol. 19), in which expired air is analysed before and after the addition of a known small quantity of carbon monoxide, was used. Procedures are described which are applicable to infants and to children over 3 to 4 years of age.

H. G. Bray.

3271

CRANE, M. G. and ADAMS, R. Sources of error in the determination of plasma volume using I^{131} labeled human serum albumin (RIHSA) and liquid gamma counting. *Amer. J. Med.*, 1954, **17**, 118-119. *Proc.* [Dept. Int. Med., Coll. Med. Evangelists, Los Angeles, Calif.]

3272

NOMOF, N., HOPPER, J. (Jr.), WENNESLAND, R., SCOTT, K. G. and BROWN, E. Blood (red cell) volume measured by carbon monoxide and radiochromium methods. *Amer. J. Med.*, 1954, **17**, 123. *Proc.* [Dept. Med., Univ. California Sch. Med., San Francisco.]

3273

LEHMANN, H. and KAY, H. L. A possible source of error in the estimation of haemoglobin by photoelectric methods. *Biochem. J.*, 1955, **59**, iv. [Dept. Pathol., St. Bartholomew's Hosp., London, E.C.1.]

3274

LJUNGGREN, H. Measurement of total body water with deuterium oxide and antipyrine. *Acta physiol. scand.*, 1955, **33**, 68-82. [Dept. Int. Med., Serafimerlasarettet, Stockholm.]

Deuterium oxide and antipyrine were infused intravenously, one after the other, into 2 healthy men. Total body water was estimated by both methods 7 and 8 times during 2 months. The coefficients of variation of the deuterium and anti-

pyrine spaces were 1.8, 2.0 and 5.6, 4.5 per cent., respectively. The greater variability of the antipyrine space was probably due to the larger error of 4 per cent. in the zero time concentration in the plasma; the equilibrium concentration of deuterium was about 1 per cent. The analytical error in the measurement of D_2O concentration by the gradient tube method was ± 0.0017 g. per cent.

A. Hepburn.

3275

MALDONADO H., E., DONOSO INFANTE, A. and FAIVOVICH, A. Determinación de la acidez gástrica sin intubación, por medio de resinas de intercambio catiónico. [Estimation of gastric acidity without intubation, by means of cation-exchange resins.] *Rev. méd. Chile*, 1954, **82**, 562-567 (with discussion 567-568). [Cat. Méd., Univ. Chile.]

3276

WOODMAN, D. and YEOMAN, W. B. A simplified method of investigating steatorrhoea. *J. Clin. Pathol.*, 1955, **8**, 79-80. [Dept. Pathol., Frenchay Hosp., Bristol.]

The total fat excreted by patients on the usual hospital diet is measured over 3 or 4 days by methods which are described. In 11 normal subjects the mean daily fat excretion was 3.91 ± 2.45 g. as fatty acid; in 11 with steatorrhoea, 10.29 ± 4.49 g.—D. Harvey.

3277

PEETERS, H. and CALLENS, L. Une technique simple du test d'excretion d' I^{131} . (Test fonctionnel de la glande thyroïde.) [A simple technique for the I^{131} excretion test. (Functional test of the thyroid gland.)] *Rev. belg. Pathol. Méd. exp.*, 1954, **23**, 343-350. [Lab. Hôp. St. Jean, Bruges.]

A simple method of estimating the urinary excretion of a single dose of radio-active iodine is described. Between 15 and 20 $\mu C.$ of carrier-free I^{131} diluted in 50 ml. of distilled water were administered through a plastic straw while the recipient was fasting. The glass was rinsed with the same volume of water and this also was swallowed. Urine samples were collected in litre bottles 5 times in the next 48 hr., with 6 hr. between the

first 2 collections and 12 hr. between the other 3. The volumes were made up to the litre mark and the radio-activity was measured with a scintillating counter. Comparison was made with a bottle containing a dose of ^{131}I equal to the amount ingested, diluted to the same volume and kept for the same length of time. Several possible causes of error, such as the presence of salt or glucose in the urine, were examined and found to be of slight significance. It is claimed that this technique is simple and accurate.—B. W. Simpson.

3278

SINGLETON, W. S. and BENERITO, R. R. **Surface phenomena of fats for parenteral nutrition.** *J. Amer. Oil Chem. Soc.*, 1955, **32**, 23-25. [S. Reg. Res. Lab., New Orleans, La.]

The surface tensions and interfacial tensions (against water) of crude and purified groundnut, cottonseed, rice bran and olive oils, of purified coconut and sesame oils and of crude pecan oil were measured.

On the basis of surface phenomena it is concluded that the crude oils could be more easily emulsified than the refined oils, though the physiological effects in parenteral nutrition of the non-glyceride material in the crude oils are not known.

G. A. Garton.

3279

AHRENS, E. H. (Jr.), DOLE, V. P. and BLANKENHORN, D. H. **The use of orally-fed liquid formulas in metabolic studies.** *Amer. J. Clin. Nutr.*, 1954, **2**, 336-342. [Hosp., Rockefeller Inst. Med. Res.] Spanish summary.

Details are given of the preparation and composition of 3 basic mixtures which, in the authors' experience, have proved to be the most useful for administration by stomach tube. The first provided 1.25 Cal. per g. and contained 22 g. maize, cottonseed or coconut oil, 37.5 g. Lesofac and 41.5 g. dextrose with water to make 400 g.; the second also provided 1.25 Cal. per g. and consisted of 25 g. frozen egg yolk, 18 g. unsalted butter, 30 g. Lesofac and 41.5 g. dextrose with water to make 400 g.; the third provided 1.5 Cal. per g. and consisted of 12.5 g. maize oil, 175 g. evaporated milk and 34.5 g. dextrose with water to make 333.3 g.

Thirty patients were given these diets for as long as 16 weeks without ill effect. Twelve dogs took them well for 2 to 10 weeks and maintained or gained weight. Advantages of the diets are constant composition, economy and ease of preparation; also, a few mixtures meet the needs of several different metabolic studies.—G. F. Garton.

3280

PEARSON, E., BALIKOV, B. and REISS, E. **An analysis of errors contributed by the diet in**

metabolic studies. *Metabolism*, 1955, **4**, 29-38. [Surg. Res. Unit, Brooke Army Med. Centre, Fort Sam Houston, Tex.]

In a long metabolic experiment on burned patients storage space was limited, so that one batch of food was sufficient for only 6 to 8 weeks. When all of one or more foods from a batch had been served the rest was not used and the 3 menus served were prepared from a new batch of foods. Three to 5 samples of each menu were prepared for analysis from 9 batches of food. Samples were analysed for N, Ca, P, Mg, K, Na and Cl.

Significant differences between batches were found in all constituents except K. In a particular batch of food a large variation due to non-analytical errors was noted. Consistent changes of composition during storage were not found. The mean analytical composition of each menu differed considerably from the composition calculated from standard tables of food composition.

F. C. Aitken.

3281

BABCOCK, M. J. **Methods for measuring fingernail growth rates in nutritional studies.** *J. Nutrition*, 1955, **55**, 323-336. [Dept. Agric. Biochem., New Jersey Agric. Exp. Stat., Rutgers Univ., New Brunswick.]

Details are given of a method for measuring nail growth rates over short periods of time. It is suggested that such measurements would be useful in assessing nutritional status. The method, which could detect differences in fingernail growth rates of about 5 per cent., depends on measuring the distance a scratch mark on the thumbnail advances relative to the lunula during one week. Enlarged photographs are used to record the positions of the mark and increase accuracy.

G. F. Garton.

3282

HODSON, J. J. **Identification of hypocalcified and demineralized areas in sections of human enamel.** *Nature*, 1955, **175**, 261-262. [Dept. Oral Pathol., Univ. Sheffield.]

3283

BLASIUS, W. **Ein elektrodynamisches Ergometer zur quantitativen Messung der Tretarbeit im Liegen bei verschiedener Belastung und Frequenz.** [An electrodynamic ergometer for measuring pedalling work in the lying position against different loads and at different rates.] *Pflügers Arch.*, 1954-55, **260**, 137-140. [Physiol. Inst., Med. Akad., Justus Liebig Hochsch., Giessen.]

3284

KOUWENHOVEN, W. B., STARZL, T. E. and BAKER, B. **A low cost treadmill for experimental**

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animals. *J. Appl. Physiol.*, 1954, **7**, 347-348. [Dept. Eng., Johns Hopkins Univ., Baltimore, Md.]

Details are provided of a treadmill which is suitable for dogs or other small animals weighing from 5 to 25 kg. and which operates at speeds from 0.8 to 7.0 m.p.h. Its total cost, including \$200 for labour charges, was \$631.—D. Harvey.

3285

HOLTkamp, D. E., Ochs, S., Pfeiffer, C. C. and Heming, A. E. Determination of the oxygen consumption of groups of rats. *Endocrinology*, 1955, **56**, 93-104. [Res. and Development Div., Smith, Kline and French Labs., Philadelphia, Pa.]

A detailed description of the apparatus is given. H. G. Bray.

3286

Long, J. A. and Lyons, W. R. A small perfusion apparatus for the study of surviving, isolated organs. *J. Lab. Clin. Med.*, 1954, **44**, 614-626. [Inst. Exp. Biol., Univ. California, Berkeley.]

In this apparatus plastic replaces glass in almost all parts which are strong, separable and easily replaceable. It is possible to perfuse with blood. Only small organs have been used; they can be kept under constant microscopic observation and in position for photography.—A. Hepburn.

3287

COLUMBUS, A. Stickstoff-Grundumsatz und Methodik der Bestimmung der biologischen Eiweisswertigkeit nach dem N-Bilanz-Verfahren bei wachsenden Ratten. [Endogenous nitrogen metabolism and methods for estimating the biological value of protein by the N balance technique on growing rats.] *Arch. Tierernähr.*, 1954, No. 4, Beihefte, 51-82. [Inst. Tierernähr., Humboldt Univ., Berlin.]

Nitrogen balances under carefully controlled conditions were studied with genetically homogeneous groups of rats from 5 or 6 weeks of age until growth was almost completed.

N-free diet was used to study endogenous urinary N, which can be expressed as a function of bodyweight, as can the endogenous faecal N. Equations are given which show how the biological value of different proteins was related to the protein intake and the endogenous N turnover. Skimmed milk, meatmeal, yeast and bean proteins, and also 2 kinds of sweet lupin protein, were compared.

D. Duncan.

3288

COLUMBUS, A. Der Stickstoff-Grundumsatz bei wachsenden Kaninchen, und eine Bilanz-Methodik zur Bestimmung der biologischen

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Eiweisswertigkeit. [Endogenous nitrogen metabolism in growing rabbits and a balance method for estimating the biological value of protein.] *Arch. Tierernähr.*, 1954, No. 5, Beihefte, 146-165. [Inst. Tierernähr., Humboldt Univ., Berlin.]

The method resembled that for rats (preceding Abst.). Three breeds of rabbit were used. The pre-period on N-free diet was 7 days, with estimation of endogenous N excretion on the last 2. The relations between urinary and faecal N losses and bodyweight are plotted and expressed in formulae. The use of the method to compare the biological values of several soya bean and lupin proteins is described.—D. Duncan.

3289

NEHRING, K. (with HAESLER, E.) Untersuchungen über die biologische Wertigkeit von Eiweissfuttermitteln. 1. Die Bestimmung der biologischen Wertigkeit und der Ergänzungswirkung von Eiweissfuttermitteln durch Versuche an wachsenden Ratten. [Biological value of protein feeds. 1. Estimation of the biological and growth values of protein feeds by studies on growing rats.] *Arch. Tierernähr.*, 1954, No. 5, Beihefte, 110-126. [Oskar Kellner Inst. Tierernähr., Rostock.]

The technique was that described by Columbus (Abst. 3287). The intake for rats of 80 to 170 g. was constant at 10 g. dry substance per rat daily. The estimation of N metabolism in the pre-period of 4 days on the N-free basal diet is described and formulae are given. The optimum protein intake was estimated to be 1.5 mg. N daily or 9.38 per cent. total protein. Controls in each study received this quantity of skimmed milk protein.

The technique was used to study the value of adding methionine to food yeast protein. The mean biological value of yeast protein was 66.7, and with added methionine 78.97. The mean weight changes in 5 days on these proteins were -1.3 and +5.0 g. In a second experiment the mean biological values of yeast alone or with methionine or penicillin were 44.85, 69.8 and 50.15 and the weight changes -3.55, +2.9 and -2.0 g. The values of yeast and sesame meal together and separately were compared also.—D. Duncan.

3290

SCHÜRCH, A. Bestimmung, Berechnung und Signifikanz von Verdauungskoeffizienten. [Estimation, calculation and significance of coefficients of digestibility.] *Schriftenreihe Fütterungslehre Fachverband Futtermittelindust.*, Hamburg, 1954, No. 14, pp. 4. [Inst. Haustierernähr., Eidg. Tech. Hochschule, Zürich.]

A short review of modern methods.—I. Leitch.

3291

- TAYLER, J. C. **Technique of weighing the grazing animal.** *Proc. Brit. Soc. Animal Prod.*, 1954, 3-16. [Grassland Res. Inst., Hurley, Berks.]

3292

- FARRAR, J. T., SMALL, M. D. and INGELFINGER, F. J. **In vivo method for studying intestinal motility in the rabbit.** *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 16-19. [Evaus Mem., Massachusetts Mem. Hosp., Boston.]

A method of introducing polythene tubing into the rabbit's intestine and peritoneal cavity so that they remain in a fixed position for several months is described. The method allows repeated study of intestinal motility in the same animal and of the responses to the introduction of fluids or drugs into the intestine.—A. T. Phillipson.

3293

- BONE, J. F. **A technic for aspiration liver biopsy in dairy cattle.** *North Amer. Vet.*, 1954, 35, 747-752. [Dept. Vet. Med., Oregon State Coll., Corvallis.]

A stainless steel trocar and cannula with attached syringe are used. The technique is described in detail. Biopsies have been performed successfully on 64 cattle, ranging in age from 3 days to 12 years, with no ill effect. The average weight of tissue obtained is 1 g.—W. A. Greig.

3294

- TORELL, D. T. **An esophageal fistula for animal nutrition studies.** *J. Animal Sci.*, 1954, 13, 878-884. [Univ. California.]

A method of making an oesophageal fistula in sheep is described. The principal difficulty is in keeping the fistula closed when not in use; attempts to do this are described. The technique was used successfully in one animal to collect pasture eaten while the animal grazed.

A. T. Phillipson.

3295

- BOUCKAERT, J. H. and OYAERT, W. **A method of collecting fluid leaving the omasum of sheep.** *Nature*, 1954, 174, 1195. [Vet. Coll., Ghent.]

A funnel-shaped cannula which can be placed inside the abomasum of sheep and which is fitted with a side arm which protrudes through the abomasal and abdominal wall is described. The wide mouth of the cannula is fixed underneath the omaso-abomasal orifice. When in use the lower end of the funnel is closed with a balloon so that fluid passing from the omasum flows to the exterior through the side arm. Fluid obtained in this way contains more chloride than rumen fluid,

and pepsin may be present in traces. The pH is usually higher than that of the rumen and the dry matter content varies from 5 to 10 per cent. Reticulum and rumen movements remain normal.

A. T. Phillipson.

3296

- CHANG, W. Y., COUCH, J. R., LYMAN, C. M., HUNTER, W. L., ENTWISTLE, V. P., GREEN, W. C., WATTS, A. B., POPE, C. W., CABELL, C. A. and EARLE, I. P. **The nutritional value of prepress-solvent cottonseed meals.** *J. Amer. Oil Chem. Soc.*, 1955, 32, 103-109. [Texas Agric. Exp. Stat., College Station.]

The nutritional value of pre-press cottonseed meals was studied in 4 different laboratories by different animal methods. In chick feeding trials, one group gave the meals at 50 per cent. of the ration from day old to 4 weeks. A second group included the meals so as to provide 20 per cent. crude protein and these rations were given from 14 to 22 days. A third group tested the supplementary value of the meals by giving them to chicks which had been reared for 10 days on a ration of yellow maize meal fortified with vitamins and minerals. The cottonseed meals were then included in rations which were given for 2 weeks, so that they contributed 6 per cent. of the crude protein, maize meal providing another 6 per cent. A fourth group of workers used a rat repletion method.

In all studies a better prediction of protein quality was given by the amount of N soluble in 0.02 N NaOH than by that soluble in NaCl. The amount of total gossypol in these particular meals was also a good guide to protein quality. The first group of workers found that the best meals gave better growth results than soya bean meal.

D. H. Shrimpton.

3297

- SMART, W. W. G. (Jr.), MATRONE, G. and SMART, V. W. **Use of copper derivatives of chlorophylls in ratio method for estimating digestibility of forages.** *J. Agric. Food Chem.*, 1954, 2, 1331-1332. [Animal Nutrit. Sect., Dept. Animal Indust., N. Carolina.]

In digestibility trials with rabbits fed on diets containing switch cane (*Arundinaria* sp.), only 55 per cent. of the chromagen ingested was recovered in the faeces. A slight modification of the analytical procedure, by treating samples with 0.1 M cupric chloride in 1 N HCl before extraction with 85 per cent. acetone, permitted 100 per cent. recovery of the copper-chlorophyll pigments. The copper complex was stable to acid and alkali and to light and was almost free from carotenoids. The solutions of copper chlorophyll pigments were read at 406 mμ.—D. M. Walker.

3298

VÁRDI, P. and BEDÓ, M. Die Anwendung der Indexmethode zur Bestimmung der "wirklichen Verdaulichkeit". [Application of the index method for estimating "true digestibility".] *Acta physiol. hung.*, 1954, **6**, *Suppl.*, 85-86. [Inst. Ernährungswissensch., Budapest.]

3299

LEE, D. H. K., McDOWELL, R. E., SCHEIN, M. W. and FOHRMAN, M. H. A method for the analysis and comparative presentation of temperature and humidity regimes. *J. Animal Sci.*, 1955, **14**, 192-199. [Dairy Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric.]

The importance of humidity as a part of climate is discussed. A method by which the significance of temperature and humidity can be visualised, using a psychrometric chart, is described and illustrated.—T. D. Bell.

3300

BAKER, G. A. Factor analysis of relative growth. *Growth*, 1954, **18**, 137-143. [Univ. California, Davis.]

The application of factor analysis methods to growth data is illustrated. When a large number of measurements are made and there are possibly only a few groups of effects at work, namely, environmental, genetic, physiological, the adoption of factor methods reduces the computational work considerably.

The application is illustrated in detail, using 20

measurements on each of 75 peaches. The statistical results are interpreted in terms of facts known about the growth of peaches. A further abbreviated example is given of the application of the method to growth data for almonds.

A. W. Boyne.

3301

WOELKE, M. Die Anwendung der Grosszahl-Forschung und Häufigkeitsanalyse in einem Geflügelversuch. [Use of large samples and frequency analysis in a poultry experiment.] *Arch. Geflügelk.*, 1954, **18**, 264-271. [Inst. Tierzucht, Justus Liebig Hochschule, Giessen.] English and French summaries.

The weight of hen's eggs is investigated with 3627 eggs, produced by 19 hens, the data being treated as if they were independent. First an analysis of all the eggs is made, then of the yield of 18 hens, and also of the other hen. The results obtained by numerical methods (mean and standard deviation) are compared with those obtained by the use of probability paper. In addition, a numerical measure of skewness is obtained, but in the graphical method it is indicated only by a systematic deviation from linearity of the cumulative percentage curve.

The relative merits of conventional methods of analysis and of the use of probability paper with large samples are discussed; the conclusion is that although the method to be employed is a matter for personal choice, the former are generally preferable.—A. W. Boyne.

See also Absts. 3683, 3959, 3967, 4203, 4224.

COOKING, STERILISATION AND PRESERVATION OF FOOD

3302

PYNE, G. T. and MCHENRY, K. A. The heat coagulation of milk. *J. Dairy Res.*, 1955, **22**, 60-68. [Dept. Dairy Chem., Univ. Coll., Cork.]

From experiments on separated milk from individual cows, bulked separated milk and reconstituted spray-dried skimmed milk, it was concluded that the tendency of milk to coagulate on heating depends mainly on Ca ion concentration and colloidal phosphate content, with increased acidity and partial denaturation of caseinate by heating as subsidiary conditions.—W. M. Deans.

3303

BURTON, H. Colour changes in heated and unheated milk. 2. The whitening of milk on heating.

BURTON, H. and ROWLAND, S. J. 3. The effect of variation in milk composition on the whitening

and browning of separated milk on heating. *J. Dairy Res.*, 1955, **22**, 74-81; 82-90. [Nat. Inst. Res. Dairying, Univ. Reading.]

For part 1, see Title 216, Vol. 25.

3304

MARTIN, W. H., CLAYDON, T. J. and BARTLEY, E. E. Aureomycin content, bacterial development, starter activity, and cheese quality of milk from cows fed an aureomycin supplement. *J. Dairy Sci.*, 1955, **38**, 47-52. [Dept. Dairy Husb., Kansas Agric. Exp. Stat., Manhattan.]

No detectable amount of aureomycin was found in the milk of cows which had received aureomycin at the rate of 32 mg. per 100 lb. liveweight daily as Lederle's Aurofac 2A (see Abst. 5217, Vol. 23) and there was no significant effect on bacterial development in the milk, amount of acid developed in milk inoculated with starter, or quality of Cheddar cheese made therefrom.—W. M. Deans.

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3305

FORSS, D. A., PONT, E. G. and STARK, W. The volatile compounds associated with oxidized flavour in skim milk. *J. Dairy Res.*, 1955, 22, 91-102. [Dairy Res. Sect., C.S.I.R.O., Melbourne.]

3306

PIJANOWSKI, E. Czynniki trwałości proszku mlecznego w świetle najnowszych badań. [Conditions influencing the keeping quality of milk powder in the light of recent investigations.] *Rocz. Nauk rol.* [B], 1954, 68, 337-368. [Zakl. Technol. Mlecz. SGGW, Warsaw.]

3307

KHALDINA, M. F., ODINTSOVA, A. N. and MAMAIEVA, P. Z. Vliyaniye razlichnykh faktorov na protzess sozrevaniya kumysa. [The effect of different conditions on the ripening of kumiss.] *Konevodstvo*, 1954, 24, No. 8, 22-29.

Acidity and temperature are the most important conditions. The fermenting agent should be fresh. Yeast of the *Torula* type and lactic acid bacteria (*Bact. bulgaricum* type) are used. The optimum temperature for yeast fermentation is about 30° C. and for *Bact. bulgaricum* 40° C. It is important to maintain the correct temperature throughout the process. Acidity during the autumn and winter period should be up to 50° Turner during the fermentation process.

H. Scherbatoff.

3308

KREMER, YU. N. Vliyaniye sernistogo gaza na sokhranyaniye triptofana pri kislotnom gidrolize belkov. [The effect of sulphur dioxide on the conservation of tryptophan in the acid hydrolysis of proteins.] *Dokl. Akad. Nauk S.S.S.R.*, 1954, 98, 627-628.

The proteins used were freshly washed fibroin and casein, which were brought into solution by digestion with pepsin. Twenty ml. of the solution was placed in 100 ml. Kjeldahl flasks and saturated cold with sulphur dioxide for 10 min. Sufficient concentrated sulphuric acid was poured into each flask to bring the content up to 2, 4, 6, 8 or 10 per cent. The flasks were corked with cotton-wool and autoclaved for 3 hr. at 1 atm. and 120° C. The hydrolysates were then transferred to measured 200-ml. flasks. Total N was estimated in the hydrolysates by the micro-Kjeldahl method, amino-N by the method of Pope and Stevens and tryptophan by the method of Hopkins and Winkler. As control the hydrolysis was performed under the same conditions without saturation with SO₂.

By this method almost all the tryptophan is conserved but it is possible that other amino-acids are destroyed. Hydrolysates with 2 and 4 per

cent. acid are almost colourless; with the usual method of acid hydrolysis the products are usually dark brown.—H. Scherbatoff.

3309

CLARK, H. E., WILMETH, M. C., HARRISON, D. L. and VAIL, G. E. The effect of braising and pressure saucepan cookery on the cooking losses, palatability, and nutritive value of the proteins of round steaks. *Food Res.*, 1955, 20, 35-41. [Dept. Foods Nutrit., Kansas State Coll., Manhattan.]

Cooking losses, press fluid and shear value were ascertained for paired top and bottom round steaks from 3 U.S. commercial grade carcasses, braised to an internal temperature of 176° F. (80° C.) in a gas oven or cooked in a pressure cooker at 10 or 15 lb. pressure to 176° F. or at 15 lb. pressure to 234° F. (112-2° C.).

The results were analysed statistically and showed that the temperature to which the meat was cooked, and not the cooking method, was crucial; meat cooked to 176° F. lost less weight and was better for aroma, flavour and juiciness than meat cooked to 234° F., but was less tender.

Samples of the cooked and raw meat, ground, dried and extracted with ether, were incorporated for 4 weeks in the diet, fed to appetite, of groups of 8 to 10 weanling male Sprague Dawley rats to provide 1.6 or 2 per cent. N, the rest of the diet being Crisco 20, Ruffex 2, salt mixture 5, vitamin mixture 5 and dextrin to 100. Food intake, weight gain, urinary and faecal N and liver and carcass N were estimated.

There was no evidence of impairment of the nutritive value of the meat proteins by any of the methods of cooking. It was concluded also that although rats on the 2 per cent. N diet retained more N, under the conditions of the experiment the diet with 1.6 per cent. N was as useful for the comparison of nutritive values of beef cooked in different ways.—W. M. Deans.

3310

NIINIVAARA, F. P., DUROCHMAN, E. and VARTIOVAARA, U. An improved processing of dry sausage by means of bacterial pure cultures. *Acta agral. fenn.*, 1955, 83, 230-237. [Res. Lab. Meat Producers, Hämeenlinna, Finland.] Finnish summary.

When a harmless nitrate-reducing micro-organism resembling *Micrococcus aurantiacus* (Schroeter) Cohn, isolated from processed meats, was added to dry (raw smoked) sausage at the rate of 50×10^6 cells per kg. mix, the colour developed more rapidly, so that the manufacturing time could be cut down from 14 to 9 days, and spoilage by putrefactive bacteria did not occur.

W. M. Deans.

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3311

AURE, L. Traners resistens mot harskning. [Resistance of fish oil to development of rancidity.] *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1951, 2, No. 3, pp. 36. English summary.

3312

AURE, L., BAKKEN, K. and JEBSEN, J. W. Undersøkelse av sildemel framstilt etter forskjellige tørkemetoder. [Herring meals produced by different drying processes.] *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1952, 2, No. 8, pp. 16. English summary.

Four processes were compared: flame drying (2 methods), hot-air, steam and vacuum drying with meal and press cake. The meals were re-examined after 3 and 12 months. Herring oil usually contains 50 to 100 I.U. vitamin A per g. Flame-dried meal had none and meal dried by hot air lost in store what was left. Steam drying preserved vitamin A and there was little oxidation in storage. After vacuum drying vitamin A could not be estimated by the Carr Price method. Rancidity was inversely related to vitamin A content. There was no change in free fatty acids during drying or subsequent storage, and choline was not affected. Roughly half the ammonia N was lost during drying. Digestibility of the protein *in vitro* was not related to the method of drying.

I. Leitch.

3313

Aktuelle fryseritekniske spørsmål. [Practical problems in the technique of freezing.] *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1954, 2, No. 15, pp. 149. English summary.

This is a report of a symposium in Bergen in November 1952. It includes papers on the general problems of preservation of fish by freezing, and on quick-freezing, packing, utilisation of waste, by-products, production of fish oil, and cold storage from the commercial and engineering points of view.—I. Leitch.

3314

SOLA, E. Metoder for foredling av fiskeavfall. [Processing fish waste.] *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1954, 3, No. 1, pp. 48. English summary.

In this lecture the production of fishmeal in Norway is described. The raw materials in 1951 were approximately 7000 tons of white fish and 4000 tons of fat fish waste. The "old" method, with preliminary boiling and pressing, and so with loss of at least 20 per cent. of dry matter, is now little used. The Schlöterhose method with vacuum drying followed by drying in steam-heated drums is excellent but costly. The Vega method, which avoids the need for boiling or vacuum drying by mixing half-dry with fresh material in the first stage,

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produces a whole meal (see Abst. 3364, Vol. 25) of excellent quality if the oven drying is correctly managed. A modification of this method, in which a press to remove fat is introduced between the first and second stages, is used for fat fish waste. Several other methods are described, with costs in fuel and power.—I. Leitch.

3315

GILBERG, Y. Undersøkelser over modning av sild konserveret med salt og eddik. [Ripening of herring preserved with salt and vinegar.] *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1953, 2, No. 10, pp. 15.

3316

GILBERG, Y. Undersøkelser over holdbarhet av lettsaltet sild behandlet med eddik. [Keeping quality of lightly salted herring treated with vinegar.] *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1953, 2, No. 11, pp. 23. English summary.

3317

KOROBKINA, G. S. and BESSONOV, S. M. Prigotovlenie sukhikh detskikh pitatel'nykh smesei. [Preparation of dry food mixtures for children.] *Vop. Pitani.*, 1955, 14, 13-17.

A study of the differences in composition between whole grain and the processed form of different cereal foods, and the effect of variations in certain details of preparation on these differences, with an account of the applications of the work on a commercial scale.—D. W. Taylor.

3318

WAGER, H. G. The browning reaction in dehydrated carrot and potato: its initiation and the separation and partial characterization of an intermediate from dehydrated carrot. *J. Sci. Food Agric.*, 1955, 6, 57-64. [Low Temp. Res. Stat., Univ. Cambridge.]

The substances responsible for the browning reaction in dehydrated carrot were soluble in water and ethanol. The basic, acidic and neutral fractions obtained from ethanol extracts of carrots or potatoes by ion-exchange chromatography were heated separately and in all combinations. Considerable browning occurred only when both basic and neutral fractions were present. A colourless intermediate of the reaction which occurred slightly in the basic fraction heated alone was isolated and appeared to be an isoglycosylamine.—A. Hepburn.

3319

KUPPERMAN, R. P. and KARON, M. L. Effect of time and temperature of storage on the free and total gossypol content of cottonseed meals

and of mixed diets. *J. Amer. Oil Chem. Soc.*, 1955, **32**, 54-57. [S. Reg. Res. Lab., New Orleans, La.]

A study was made of the effects of duration and temperature of storage on the free and total gossypol contents of cottonseed meals, some with added gossypol, and of diets to which gossypol had been added. There was no change in free or total gossypol content during storage in commercially prepared meals, but in all others there was a decrease of free gossypol. In the diets there was also a decrease of total gossypol. These changes were more marked when the temperature was raised to 37.5° C. or to 60° C. for 90 days. It is not known whether the gossypol is destroyed or not.—D. H. Shrimpton.

3320

PONS, W. A. (JR.), THURBER, F. H. and HOFFFAUT, C. L. Prepress-solvent extraction of cottonseed, processing conditions and characteristics of products. *J. Amer. Oil Chem. Soc.*, 1955, **32**, 98-103. [S. Reg. Res. Lab., New Orleans, La.]

Free gossypol and N soluble in 0.5 M NaCl were estimated in samples of meal and oil drawn at different stages of processing in 11 mills where the cottonseed undergoes a screw-pressing process before solvent extraction. The free gossypol content of the meals was reduced during cooking, when some gossypol appeared to be bound to some constituents of the meal; and during pre-pressing and solvent extraction, when more gossypol was removed in the oils which separated. The greatest reduction in N soluble in 0.5 M NaCl also occurred during cooking, changes in subsequent stages of the process being slight.

D. H. Shrimpton.

3321

SPRENGER, J. J. I. and DIJKSTRA, N. D. The effect of drying temperatures on the quality of the product in dehydrating grass. *European Grassland Conference, Paris*, June 1954, pp. 11.

High-temperature grass driers (air temperature at inlet above 200° C.) had been found to cause losses of 15 per cent. of the digestible crude protein content of fresh grass, low-temperature driers lost 5.3 per cent. The high-temperature product is not now inferior, standards of management having improved. Oil-firing allows greater control than coke, particularly over outlet temperature, which should be as low as possible.—J. L. Corbett.

3322

COWAN, R. L., BRATZLER, J. W. and SWIFT, R. W. Grass silage preservation with sodium bisulfite. *Pennsylvania Agric. Exp. Stat. Prog. Rep.* No. 99, April 1953, pp. 10. [State Coll., Pa.]

Cocksfoot and alfalfa-bromegrass mixture were ensiled with powdered sodium bisulfite at the rate of 8 lb. per ton of green matter. A simple automatic method of adding the bisulfite, adapted from a fertiliser spreader, is described. Provided un wilted crops are used good silage can be made easily and safely. The experimental silages reported compared well with similar crops ensiled with molasses or without preservatives in appearance, odour, composition and digestibility. In simple palatability trials 2-year-old heifers ate 3 times as much alfalfa silage made with sodium bisulfite as they did of alfalfa silage made with SO₂ or without preservative.—T. D. Bell.

3323

DIJKSTRA, N. D. Proefnemingen over ensilieren van gras met Kofa-zout en albumex. [Experiments in ensiling grass with Kofa salt and Albumex.] *Versl. Landbouwk. Onderzoek.*, 1954, No. 60.5, pp. 26. English summary.

Kofa salt is a mixture of 20 parts calcium formate and 3 parts sodium nitrite; Albumex is a mixture of 1 part each of aluminium formate and sodium nitrate with 3 parts NaCl. Two experiments were made with each. Neither produced any improvement in quality of silage and the slight reduction of losses by Kofa salt was too small to be of significance.—I. Leitch.

3324

POLJÄRVI, I. A.I.V., Calcifor- ja Kofa-menetelmän vertailu-kokeita. [Comparative experiments with the A.I.V., Calcifor and Kofa methods of making silage.] *Acta agral. fenn.*, 1955, **83**, 173-184. [Maatalousk. Kotieläinhoito-osasto, Tikkurila.] German summary.

Clover and timothy were ensiled by the A.I.V., Calcifor and Kofa methods or without addition. Conservation of nutrients, quality and digestibility were best with the A.I.V. method; next came the Calcifor and Kofa methods, the results of which were much the same and superior to those without addition.

Autumn rape was ensiled by the A.I.V. and Kofa methods and again the A.I.V. method proved superior. (From summary).—W. M. Deans.

3325

ISAJEV, F., FRANZ, J. and NOVÁK, J. Výsledky pokusů se silážováním vojtěšky a vojtěško-travní směsky bez přidavku konzervačních přísad. [Experimental results of making silage of lucerne and lucerne-grass mixtures without preservatives.] *Šborn. čsl. Akad. Zvěř.*, 1954, **27**, 501-516. Russian and English summaries.

Alfalfa silage was made from wilted crops without the addition of molasses. Laboratory

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tests were first made to establish the limits of wilting for good silage. It was found that the dry matter of the crop should not exceed 50 to 55 per cent.

Compared with hay, silage made with wilted crops always had greater losses of nutrients, because of the losses at the edges even in good silos. Moulds grew more quickly than lactic acid bacteria, because in the semi-dry crop poor compaction meant that there was too much air. The addition of a small quantity of molasses prevented this.

To avoid complete loss when haymaking is impossible, the dried crop can be ensiled, but it is better to add a little molasses, or to ensile the young green alfalfa with 25 per cent. straw. (From summary.)—T. D. Bell.

3326

BARTOŠ, S. Hodnocení siláží s vysokým obsahem sušiny. [Classification of silages with a high content of dry matter.] *Sborn. ěsl. Akad. Zěměd.*, 1954, 27, 525-530. Russian and English summaries.

When the Skorpik method is used, silage of high dry matter content may be wrongly classified because of its high pH value. It was found that the ammonia content is a better measure of the quality of such silage. (From summary.)

T. D. Bell.

3327

ŠALOVÁ, J. Ověření nejvhodnějších dávek mazu ze škrobnatých krmiv k silážování zelené píce. [The most suitable addition of steamed starch-containing feeds to silages of green fodder.] *Sborn. ěsl. Akad. Zěměd.*, 1954, 27, 563-574. Russian and English summaries.

Laboratory and field experiments were made. They showed that when silage was made from crops rich in protein, 2 per cent. molasses could be replaced by 1.75 per cent. steamed bruised maize, 2 per cent. steamed ground barley, 7.5 per cent. steamed potatoes or 1.25 per cent. dry potato flakes. Smaller amounts gave inferior silage, but greater amounts had no advantage. Unsteamed grains were of no use. The method of steaming was to leave the grains for 2 to 3 hr. in twice their volume of water at 50° to 70° C. (122° to 158° F.). This method of ensiling was not successful with alfalfa of high dry matter content. (From summary.)—T. D. Bell.

3328

Nový, O. Klasifikační tabulka silážních pícnin podle obsahu cukru a cukerného minima. [A table classifying silage crops by their sugar content and the minimum content of sugar

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required.] *Sborn. ěsl. Akad. Zěměd.*, 1954, 27, 575-584. Russian and English summaries.

Nine hundred and sixty-eight samples of different feeds were analysed and the results are tabulated, showing the sugar content and the amount of sugar it is necessary to add for silage making. By the use of these tables it is hoped to avoid waste of molasses and, on the other hand, the risk of spoiling the silage. The tables were tested on 28 occasions and found reliable. (From summary.)—T. D. Bell.

3329

KREULA, M. On the content of butyric acid and butyric acid bacteria in silage. *Acta agral. fenn.*, 1955, 83, 238-243. [Lab. Valio, Helsinki.]

Good silages free from butyric acid were prepared by the A.I.V. method from sugar beet tops, turnips with tops, and clover and timothy. A positive correlation was found between pH, butyric acid and the number of butyric acid bacteria. Butyric acid fermentation depended closely on pH and above pH 4 was not inhibited. The quality of silage was adversely affected by a high fibre content even when pH was satisfactory.

A. Hepburn.

3330

DAL MONTE CASONI, P. Sulla conservazione delle polpe fresche di barbabietola. [The preservation of fresh sugar-beet pulp.] *Ann. Sper. agrar.*, 1954, 8, 569-608. [Staz. Sper. Bieticoltura, Rorigo.] English summary.

3331

BLACK, W. A. P. The preservation of seaweed by ensiling and bactericides. *J. Sci. Food Agric.*, 1955, 6, 14-23. [Inst. Seaweed Res., Inveresk, Midlothian.]

Laboratory and pilot scale experiments were made. When sea water with 20 per cent. NaCl added was used the seaweed was preserved, but there were major changes in composition and loss of nutrients. The addition of bactericides to sea water in sufficient quantity for preservation killed the seaweed also. Good preservation was obtained by treating the seaweed with sulphur dioxide and excluding air.

Seaweed ensiled without any addition gave a good lactic acid fermentation. The conservation of the nutrients depended on the original composition of the seaweed and therefore on the season at which it was harvested. Digestibility trials were proposed but could not be made because sheep of the breed available would not eat the silage.

T. D. Bell.

See also Absts. 3340, 3370-72, 3376, 3424, 3425, 3505, 3625-28, 4058, 4520.

CULTURE OF MICRO-ORGANISMS FOR FOOD

3332

MURRAY, S., WOODBINE, M. and WALKER, T. K.
Microbiological synthesis of fat. The formation of fat from sucrose. *J. Exp. Botany*, 1953, 4, 251-256. [Div. Indust. Biochem., Fac. Technol., Univ. Manchester.]

In all 43 strains of moulds, representative of 10 species, were cultured for 14 days at 25° C. on 4 media containing inorganic salts and sucrose. The weights of mycelia and their fat content were estimated.

The highest yields of mycelium were produced by *Penicillium javanicum*, van Beyma, *P. soppi*, Zaleski and *Aspergillus nidulans*, Eidam. The highest fat contents (based on mycelial weight) were produced by *P. soppi*, 34.8 per cent., *Fusarium lini*, 28.4 per cent., and *A. nidulans*, 25.8 per cent. Other moulds giving results showing promise for further study included *Penicillium spinulosum*, *P. aurantiobrunneum*, *P. oxalicum*, *Fusarium graminearum*, *F. oxysporum*, *Aspergillus flavus* and *A. clavatus*.—G. A. Garton.

2. CHEMICAL COMPOSITION OF FOODSTUFFS

(Except Vitamins, for which see Section 3).

ENERGY VALUE, PROXIMATE PRINCIPLES AND INORGANIC CONSTITUENTS

GENERAL

3333

Nederlandse voedingsmiddelentabel. [Tables of composition of Netherlands foods.] *Voeding*, 1955, 16, 132-146.

A collection of data published from time to time by several workers.

3334

DE MAN, T. J. and ZWIEP, N. Amino-zuurgehalten in een aantal voedermiddelen. [Amino-acid content of a number of foods.] *Voeding*, 1955, 16, 147-155. [N. V. Philips, Boxane.]

A list compiled from recent literature.

3335

BARRERO GONZÁLEZ, A. Valoración química energética de algunos piensos españoles. [Heat of combustion of some Spanish feeds.] *An. Inst. Invest. Vet., Madrid*, 1953, 5, 129-132. English and German summaries.

The composition in terms of moisture, ash, protein, fat, fibre, N-free extract and energy value obtained by bomb calorimetry is tabulated for 22 Spanish feedingstuffs, including cereals, bulky fodders, tomato and orange pulps, dried milk, meatmeal and olive oil.—D. Duncan.

3336

ODEJAB, D. Y. and MASANKAY-ARENAS, L. R. Chemical analysis of some commonly and some uncommonly used Philippine feeds and feeding stuffs. 2. *Philippine J. Animal Indust.*, 1951 (1953), 12, 29-32. [Bur. Animal Indust.]

For part 1 see *Philippine J. Animal Indust.*, 1949, 10, 371.

Data are given for ash, crude protein, ether extract, crude fibre, N-free extract and energy

value for some grasses, legumes and miscellaneous plants grown locally and for some plant and animal feedingstuffs.—J. S. Thomson.

See also Abst. 4032.

FOODSTUFFS OF ANIMAL ORIGIN

General

3337

FREDHOLM, H. Threonine in foods of animal origin. *Acta Agric. scand.*, 1954/55, 5, 11-22. [Res. Lab. Dept., Sveriges Slakteriförbund, Stockholm.]

Threonine was estimated chemically and microbiologically in different kinds of meat, milk, some products related to these, cheese and *Torula utilis* protein. Free threonine was found in ripe Gouda, Herrgård and Cheddar cheese. The amounts diminished during ripening. Autoclaving, roasting or boiling of beef, pork or *Torula utilis* protein diminished hydrolysable threonine; autoclaving in presence of soluble carbohydrates had the greatest effect. The losses were greater when measured microbiologically by *Streptococcus faecalis*, which is specific for L-threonine.

A. Hepburn.

Milk and Milk Products

3338

ZILLIKEN, F., BRAUN, G. A. and GYÖRGY, P. Gynaminic acid. A naturally occurring form of neuraminic acid in human milk. *Arch. Biochem. Biophys.*, 1955, 54, 564-566. [Dept. Biochem., Sch. Med., Univ. Pennsylvania, Philadelphia.]

The fractions from the non-dialysable portion of deproteinised human milk which were precipitable with 60 to 87 per cent. ethanol possessed the

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highest growth activity for *Lactobacillus bifidus* var. Penn (see Absts. 1617, 3509, Vol. 24). Hydrolysis with 0.05 N H₂SO₄ for 1 hr. at 80° C. did not destroy this activity. From the ethanol-precipitable material 3 fractions were isolated by ion-exchange chromatography. From one of these a new acid called gynaminic acid was crystallised. Treatment with methanol and HCl and N-deacetylation with Ba(OH)₂ converted it to methoxyneuraminic acid. Mild hydrolysis of the other 2 fractions released gynaminic acid and further hydroxylis fucose, glucose, galactose and glucosamine. The dialysable portion of the growth substance in milk showed a similar pattern on chromatography; one of the 2 acid fractions found was apparently gynaminic acid. Gynaminic acid was considered to be a naturally occurring form of neuraminic acid and a component of the growth substance.—A. Hepburn.

3339

PALOHEIMO, L., HERKOLA, E. and MÄKELÄ, A.
Studies on the composition of cow's milk.
Acta agral. fenn., 1955, **83**, 113-124. [Dept. Animal Husbandry, Univ. Helsinki.]

The first part of this paper is a study of the variations in the composition of the milk of 14 Ayrshire cows under constant conditions indoors during 19 five-day periods when their milk yields were almost constant. The data were collected in the years 1936 to 1938. They are tabulated for each cow.

For most of the cows the percentage deviation of protein from the mean was less than 5 and that of sugar less than 6. Ash was more variable, and fat most variable, the variation exceeding 10 per cent. for 2 cows. These findings are similar to those of Kühn *et al.* (*J. Landwirtsch.*, 1874, **22**). The protein content and energy value of the milks were in good agreement with those calculated from the formula of Poijärvi and Listo (*Valt. maatalouskoet. julk.*, 1930, **28**).

The second part gives a preliminary account of experiments in progress on the effect of feed deprivation. Results are presented for 8 cows which for 3 days were given a maintenance ration of timothy hay only; before and after, they were fed according to requirement.

Milk yield fell abruptly, especially in high-yielding cows. Protein and sugar contents were reduced but fat content rose considerably; changes in ash content were slight. Recovery from the effects of feed deprivation took several days.

W. M. Deans.

3340

SEEKLES, L. and SMEETS, W. T. G. M. L'instabilité du lait par suite d'une augmentation de la teneur en ions de calcium. [**Instability of**

milk following an increase in calcium ion content.] *Lait*, 1954, **34**, 610-627.

The authors' own investigations of the cause of the "Utrecht abnormality" are reviewed with special reference to the method devised for the estimation of Ca ions in milk (see Absts. 4240, Vol. 17; 1289, Vol. 23). The treatment of cows producing such milk while on a rich diet is to give 50 or, if necessary, 100 g. sodium citrate daily by mouth for a few days; 30 g. given by subcutaneous injection may also be effective. Stabilisation of milk in bulk can readily be brought about by adding a small amount of sodium citrate.

D. Harvey.

3341

TASKER, N. **The recorded butterfat content of bulk milk from a herd of White Fulani cattle.** *J. Dairy Res.*, 1955, **22**, 16-21. [Dept. Local Indust., N. Nigeria.]

Fat was estimated daily throughout 1950 by the Gerber method in bulked morning and evening milk from some 50 White Fulani cows at the Livestock Improvement Centre at Vom, which is about 4000 ft. above sea level and has a mean rainfall of about 55 in., three-quarters of it in summer. From December to April grazing is supplemented with grain, hay and silage. There were 91 cows in the herd; the mean milk yield per cow per annum was 1437 lb., and the mean 305-day yield 1407 lb., but the mean lactation period was only 256 days.

Fat percentage averaged over the year was 6.39; for morning milk 6.29, evening 6.56. The considerable seasonal variations could not be related to changes in humidity. The fat percentage was highest and least variable when maximum day temperature was lowest and the difference between day and night temperatures was least; this almost coincides with the period when the maximum amount of grazing is available (June to October). In the author's view, this is decisive, and he suggests that either the nutritional value of the roughage available in the dry season has been overestimated or the amount of walking necessary to find grazing has been underestimated, and that much more supplementary feed during the dry season is required.—W. M. Deans.

3342

OLENOV, YU. M. O prichinakh razlichnoi zhirnosti posledovatel'no vydovaemykh portzii moloka. [**Causes of variation in the fat content of milk from successive strippings.**] *Dokl. Akad. Nauk S.S.S.R.*, 1954, **97**, 361-364. [Inst. Biol., Karelo-Finnish Filial Acad. Sci., U.S.S.R.]

A functional difference in the minutest lobes of the udder is postulated to account for differences in fat content of milk at different stages of milking. The fat content of the so-called residual milk, *i.e.*,

the milk after the last stripping, was greatest when the quantity of this milk was comparatively small.

H. Scherbatoff.

3343

BEGOVIĆ, S. and MAGLAJLIĆ, E. Der Acetylcholingehalt in der Kuhmilch. [**Acetylcholine content of cow's milk.**] *Arch. exp. Pathol. Pharmacol.*, 1955, **224**, 44-47. [Inst. Pathophysiol., Tierärztl. Fak., Sarajevo.]

Fresh cow's milk was found to contain 0.1 μ g. acetylcholine per ml., and dried whole milk 1 μ g. per g. Its possible effects on digestion in calves are discussed.—W. M. Deans.

3344

SPISNI, D. Ricerche sul contenuto di metionina e triptofano nelle proteine del latte di vacca e di pecora. [**Methionine and tryptophan content of the proteins in the milk of the cow and ewe.**] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 661-662. [Ist. Zootec. Gen., Univ. Pisa.]

In the milk of the cow and ewe, respectively, the percentage of methionine in the casein was 5.2 and 2.5, and of tryptophan 3.0 and 2.3; in the lactalbumin and globulin the percentage of methionine was 0.7 and 1.0, and of tryptophan 1.34 and 1.84.—E. M. Hume.

3345

ARCHIBALD, J. G. Aluminum in cow's milk. *J. Dairy Sci.*, 1955, **38**, 159-162. [Massachusetts Agric. Exp. Stat., Amherst.]

Al was estimated photometrically in milk from 3 pairs of cows, Ayrshire, Holstein and Jersey, matched for stage of lactation, in a cross-over experiment in which one of each pair had a supplement of Al $K(SO_4)_2 \cdot 12H_2O$, about 2 g. daily, equivalent to 114 mg. elemental Al. The milk contained on the average 0.46 mg. Al per litre, range 0.15 to 0.97, without the supplement and 0.81, range 0.39 to 1.42, with it, a difference significant at the 5 per cent. level.—W. M. Deans.

3346

SIRRY, I. and HASSAN, H. A. Composition of goat milk in Egypt. *Indian J. Dairy Sci.*, 1954, **7**, 188-193. [Fac. Agric., Univ. Cairo.]

The average percentage values for milk from 22 goats were fat 4.08, solids-not-fat 8.56, total N 0.533, casein N 0.429, albumin, globulin and proteose N 0.070, N.P.N. 0.035; sp. gr. was 1.0316 and casein number 80-52. Corresponding values for bulk milk from a flock of 6 to 14 goats were 3.97, 8.27, 0.517, 0.414, 0.070, 0.033; 1.0310 and 80.01. Sp. gr. and solids-not-fat were significantly lower than in cow's milk (100 individual samples), but the casein number was significantly higher.

A. Hepburn.

3347

ODINTZOVA, A. N. Fiziko-khimicheskie svoistva zhira koby'ego moloka. [**The physico-chemical composition of the fat of mare's milk.**] *Konevodstvo*, 1954, **24**, No. 10, 33-36. [Physico-Chem. Lab., Moscow Reg. Tuberculosis Sanatorium "Mizyri".]

The physical properties measured were the melting- and solidification-points and the refractive index. The melting-point of mare's milk fat varies between +21° and +23°, the solidification-point between -10° and -15.5° C., the refractive index between 1.4585 and 1.4606 at 40° C.

The chemical constants estimated were the amount of volatile fatty acids soluble in water, expressed by a number between 5.8 and 4.5; the saponification number, which was between 210 and 212; and the iodine number, which ranged from 80.34 to 108.

Compared with cow's milk fat the melting- and solidification-points of mare's milk fat were closer, those for cow's milk fat being from +26° to +34° and -18° to -23° C., respectively. [The refractive index for cow's milk fat was not given.] The refraction number at 40° C. was 48.5 to 51.5 for mare's milk and 42 to 45 for cow's milk fat.

The chemical properties of cow's milk fat were as follows: volatile fatty acids soluble in water 25 to 30, saponification number 222 to 232, amount of unsaturated fatty acids 25 to 40.

The fat of mare's milk was more liquid than that of cow's milk and contained more unsaturated acids. According to the amount of fatty acids soluble in water it was nearer human than cow's milk.—H. Scherbatoff.

3348

PERRIN, D. R. The chemical composition of the colostrum and milk of the sow. *J. Dairy Res.*, 1955, **22**, 103-107. [Ruakura Animal Res. Stat., N.Z. Dept. Agric.]

The initial colostrum from 4 sows had high protein and low lactose and fat contents. As in other species, protein and total solids decreased rapidly and lactose increased after parturition. The transition to milk occurred after 4 to 7 days. In contrast to other species, the ash content of the colostrum of 2 sows was lower than that of the milk, and total ash and its main constituents Ca and P increased as lactation was established.

A. Hepburn.

3349

ROSS, V. and MOORE, D. H. Some properties of the casein of mouse milk (RIII). *Biochim. biophys. Acta*, 1955, **16**, 293-294. [Dept. Biochem., Coll. Phys. Surg., Columbia Univ., New York.]

A protein considered to be casein was isolated from milk of mice of the R¹¹¹ mammary-tumour-carrying strain in the concentration of approximately 2.8 per cent.—A. Hepburn.

3350

LUCKEY, T. D., MENDE, T. J. and PLEASANTS, J. The physical and chemical characterization of rat's milk. *J. Nutrition*, 1954, **54**, 345-359. [Lobund Inst. Res. Life Sci., Univ. Notre Dame, Ind.]

More than 200 lactating rats, most of them of the Wistar strain, were milked by hand under anaesthesia, each animal being milked once only, and the physical and chemical properties of the milk and colostrum were studied. On a wet weight basis colostrum contained 22 per cent. fat; milk showed considerable variations in fat content, mean 9.3 per cent.; the fat contained no butyric or caproic acid. Both milk and colostrum had a protein content of 8.7 per cent.; the protein was similar in composition to that of other milks. The milk contained 1.4 per cent. ash; this was about 3 times the ash content of colostrum. The carbohydrate content of the milk was the least variable of all the principal constituents, mean 3.7 per cent. on a wet basis. No carotene or vitamin A was found; other vitamins were present in amounts similar to those in cow's milk.

G. F. Garton.

3351

GREGORY, M. E., KON, S. K., ROWLAND, S. J. and THOMPSON, S. Y. The composition of the milk of the blue whale. *J. Dairy Res.*, 1955, **22**, 108-112. [Nat. Inst. Res. Dairying, Univ. Reading.]

Milk from 3 whales was extremely rich in fat and rich also in protein and solids-not-fat. One of the samples apparently was abnormal, as it contained only about one-twelfth as much fat as the other 2. Lactose was low and total minerals, especially Ca and P, were high. Vitamin A was lower, vitamin B₁, nicotinic acid, pantothenic acid and vitamin B₆ higher, and biotin and riboflavin about the same as in cow's milk. A strict comparison with other species is not possible because the stage of lactation was unknown.—A. Hepburn.

3352

CERUTTI, G. Sulle costanti chimico-fisiche del burro danese. [Physico-chemical constants of Danish butter.] *Ann. Sper. agrar.*, 1953, **7**, 189-192. [Inst. Indust. Agrar., Milan.] English summary.

3353

CERUTTI, G. and FARFALETTI-CASALI, P. L. Sulle costanti del burro argentino. [Constants of Vol. 25, No. 3

Argentine butter.] *Ann. Sper. agrar.*, 1953, **7**, 979-982. [Staz. Sper. Freddo, Milan.] English summary.

3354

HANSEN, R. P., SHORLAND, F. B. and COOKE, N. J. The occurrence of *n*-undecanoic acid in butterfat. *Chem. and Indust.*, 1955, No. 4, 92. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

From the sample of butterfat used in a previous study (Abst. 4086, Vol. 24) *n*-undecanoic acid was isolated by methods which included fractional distillation and low-temperature crystallisation of the methyl esters of the fatty acids. The identity of the acid was confirmed by gas-liquid chromatography by the method of James and Martin (Abst. 77, Vol. 22).—G. A. Garton.

3355

SHORLAND, F. B., GERSON, T. and HANSEN, R. P. The branched-chain fatty acids of butterfat. 6. Further investigations on the C₁₅ saturated acids. *Biochem. J.*, 1955, **59**, 350-352. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]

By the use of methods which included fractional distillation of the methyl esters and low-temperature crystallisation, (+)-12-methyltetradecanoic acid, 13-methyltetradecanoic acid and *n*-pentadecanoic acid were isolated from about 50 kg. New Zealand butterfat in yields which were 0.43, 0.37 and 0.82 per cent., respectively, of the total fatty acids.—G. A. Garton.

3356

CERUTTI, G. Sulla determinazione dell'acido iso-oleico nei grassi alimentari. [Estimation of iso-oleic acid in edible fats.] *Ann. Sper. agrar.*, 1953, **7**, 739-742. [Staz. Sper. Freddo, Milan.] English summary.

Iso-oleic acid in 30 samples of butter ranged from 0.45 to 1.35 per cent. The amounts in hydrogenated whale fat, dolphin oil and fish oil varied with the conditions of hydrogenation.

A. Hepburn.

See also Abst. 4312.

Meat (All Kinds)

3357

WIERBICKI, E., CAHILL, V. R., KUNKLE, L. E., KLOSTERMAN, E. W. and DEATHERAGE, F. E. Meat quality. Effect of castration on biochemistry and quality of beef. *J. Agric. Food Chem.*, 1955, **3**, 244-249. [Ohio State Univ., Columbus.]

In 3 years' trials bullocks and bulls were compared. In the last trial bulls implanted once or twice at 3-month intervals in the ear with diethylstilboestrol were included. The same high standard of feeding and management applied to all

animals. Bulls fattened much more quickly and efficiently than bullocks, particularly those given 2 implantations. They had a higher percentage of edible meat, owing to less waste fat, but had lower carcass grades, and the meat was not so tender. In the treated bulls carcass grades and tenderness were very near those of bullocks. Bulls could be marketed younger than bullocks, since they reached a suitable weight sooner. Results indicated that age was the most important condition affecting tenderness, so that marketing at a standard weight would offset the tendency to toughness of bulls compared with bullocks of the same age.

In considering tenderness, biochemical studies of intramuscular fat, colour (cyanometmyoglobin) and connective tissue (hydroxyproline) showed that these were not directly related to tenderness. In all the young well-nourished carcasses studied there was little connective tissue. A consistent relation was found between tenderness and extractable N of muscle plasma. Marbling and colour give an indication of tenderness only in that they may be a guide to the age and sex of the animal.

T. D. Bell.

3358

MAREČEK, V. and NĚMEČEK, J. Složení masových štáv a výluhů. [The composition of meat gravies and extracts.] *Průmysl potravin*, 1954, 5, 58-61.

The passage of nitrogenous substances from beef into the water phase at normal temperatures, 70° C. and at boiling was studied. The meat gravy or extracts were found to contain up to 20 per cent. of the total N in the form of free amino-acids. The amino-acids passed into solution in the same sequence as in hydrolysis of protein by acid and not as in digestion by pancreatic enzymes.

M. Prokšová (Czechoslovakia).

3359

GUNSTONE, F. D. Animal fats. 5. The component acids of chimpanzee fat. 6. The component acids of tiger fat and of puma fat. *Biochem. J.*, 1955, 59, 454-455; 455-458. [Dept. Chem., Univ. Glasgow.]

For previous parts see Absts. 221, Vol. 24; 273, Vol. 25.

5. By the ester-fractionation technique, chimpanzee fat was shown to contain 45 per cent. of oleic acid and 30 per cent. of palmitic acid as major components, together with octadecadienoic 8, stearic 7 and hexadecenoic acid 5 per cent. as the most important minor components.

6. Depot fats were obtained from a tiger (*Felis tigris*) and puma (*Felis concolor*), both of which had died in captivity. Ester-fractionation analysis showed that the fats were similar in composition, containing from 38 to 40 per cent. of oleic acid,

24 to 27 per cent. of palmitic acid and from 10 to 11 per cent. of stearic acid as major components; the minor component acids included octadecadienoic 6 to 9, octadecatrienoic 4 to 7, hexadecenoic 5 to 6 and myristic acid 3 to 4 per cent., with 2 to 3 per cent. of acids higher than C₁₈.

These specimens of fat contained more unsaturated acids than other analysis of tiger and puma fats reported in the literature; the difference is considered probably to be due to diet.

G. A. Garton.

3360

PATHAK, S. P. and PANDE, G. D. The component acids and glycerides of Indian crocodile (*Gavialis gangeticus*) fat. *J. Sci. Food Agric.*, 1955, 6, 48-53. [Coll. Technol., Banaras Hindu Univ., Banaras 5.]

The fatty acid and glyceride composition of the depot fat of a crocodile caught in the Ganges was studied. The saturated acids comprised palmitic 25.8, stearic 8.7, myristic 4.2 and lauric 0.2 per cent. and the unsaturated acids comprised C₁₄ 2.0, C₁₆ 11.6, C₁₈ 35.5, C₂₀ 10.0 and C₂₂ 2.0 per cent. The neutral fat contained fully saturated glycerides 7.5, mono-unsaturated-disaturated glycerides 27.7 and di-unsaturated-monosaturated glycerides 64.8 per cent.—G. A. Garton.

See also Abst. 3356.

Fish

3361

JONES, N. R. The free amino-acids of fish. 1. Taurine in the skeletal muscle of codling (*Gadus callarias*). *J. Sci. Food Agric.*, 1955, 6, 3-9. [D.S.I.R., Torry Res. Stat., Aberdeen.]

Taurine was isolated from cod muscle in crystalline form by extraction with boiling water or hot ethanol followed by ion-exchange chromatography. It could be identified by 2-dimensional paper chromatography, and spot elution showed that the quantity was relatively constant within a batch of fresh codlings but varied considerably between batches. During storage in ice the gutted codling lost taurine continuously, most in the first 5 days. This was apparently due to seepage or "drip" on gutting and leaching by the ice-melt water. When muscle was macerated into ice-cold distilled water and marine spoilage micro-organisms were introduced no loss of taurine occurred.—A. Hepburn.

3362

SHEWAN, J. M. The nitrogenous extractives from fresh fish muscle. 3. Comparison of several flat fishes and members of the herring-mackerel group. *J. Sci. Food Agric.*, 1955, 6, 99-104. [D.S.I.R., Torry Res. Stat., Aberdeen.]

Aqueous alcohol extracts of muscle from 6 flat fishes, lemon sole, plaice, turbot, dab, megrim and brill, and 4 pelagic fishes, herring, mackerel, Twaite shad (*Clupea finta*) and Ray's bream (*Brama raii*) were analysed as described for gadoid and elasmobranch fish (Absts. 194, Vol. 23; 2870, Vol. 24). The result for the flat fishes was similar to that found for the gadoids, the main difference being the comparatively small amounts of anserine and trimethylamine oxide and the absence of methylhistidine. Pelagic fishes were quite different from this and from one another. The salient features as compared with the gadoids were the predominance of histidine and lysine, smaller amounts of trimethylamine oxide and an apparent absence of carnosine, anserine, β -alanine and methylhistidine. Bream resembled both groups in having moderate amounts of alanine, trimethylamine oxide, anserine, some β -alanine and methylhistidine, and large amounts of histidine. Mackerel allowed to spoil in ice for 8 days contained large amounts of histamine, probably from bacterial decarboxylation of free histidine. The possible relation of this effect to food poisoning is discussed.—A. Hepburn.

3363

MASTER, F. and MAGAR, N. G. Studies in the nutritive value of Bombay fish. 2. Amino-acid composition. *Indian J. Med. Res.*, 1954, 42, 509-513. [Dept. Biochem., Inst. Sci., Bombay.]

For Part 1 see Abst. 4391, Vol. 24.

Amino-acids were estimated microbiologically in the muscle from 6 different common edible fishes, lobster and prawn. Lysine was apparently absent from 3 of the fishes but was found in quite large amounts, ranging from 16.5 to 19.8 g. per 100 g. protein, in the other 5 species. Both tyrosine and histidine were low, on the average 1.3 and 1.6 g. The amino-acid composition compared favourably with that of casein, egg and ox muscle. A. Hepburn.

3364

BAKKEN, K. Undersøkelser av "helmet". [Analysis of "whole meal".] *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1952, 2, No. 6, pp. 7. English summary.

"Whole meal" is fishmeal produced without loss of water-soluble protein such as occurred with older methods. In an attempt to find a criterion to distinguish between whole meal and ordinary meal, water-soluble protein, riboflavin and breakdown products of protein, by formol titration corrected for NH_3 , were estimated in 5 samples of whole herring meal and 5 of ordinary herring meal. Tests are reported also on the effect of pH on the extraction of protein, and data are given for soluble

and total protein in a series of herring meals from 1946 to 1950.

In whole meal, amine N was about 300 mg. per 100 g., and in ordinary meal about 150 mg. Total soluble protein ranged from 17 to 24 g. per 100 g. protein in whole meal, and from 6 to 7 g. in ordinary meal. Whole meal had also twice as much riboflavin as ordinary meal, 10 to 12 as against 5 to 6 μg . per g. meal.—I. Leitch.

3365

PATHAK, S. P. and PANDE, G. D. Component fatty acids of Indian shark liver oil. *J. Amer. Oil Chem. Soc.*, 1955, 32, 7-9. [Dept. Indust. Chem., Banaras Hindu Univ., Banaras 5.]

The liver oil from a species of shark (*Carcharias melanopterus*) caught in the Arabian Sea was analysed by ester-fractionation. Saturated fatty acids comprised 33.7 per cent. of the total acids, made up of palmitic acid 18.5, stearic acid 9.0, myristic acid 4.4 and arachidic acid 1.8 per cent. The unsaturated acid content was C_{14} 2.8, C_{16} 12.8, C_{18} 19.9, C_{20} 19.0, C_{22} 7.3 and C_{24} 4.3 per cent. of the total acids. The abnormally high saturated fatty acid content is discussed in relation to the composition of other elasmobranch liver oils of Indian origin.—G. A. Garton.

See also Absts. 3356, 3379, 4054.

FOODSTUFFS OF VEGETABLE ORIGIN

General

3366

RICHARDSON, L. R., SPEIRS, M., PETERSON, W. J., FERNANDEZ, M. DEL C. C., REDER, R., KRACKENBERGER, H. F., MILLER, E. V., ARMY, T. J. and BEESON, K. C. Influence of environment on the chemical composition of plants. 1. A review of the literature. *Southern Co-op. Ser. Bull.* No. 36, January 1954, pp. 198. [Texas Agric. Exp. Stat.]

This extensive review covers ascorbic acid, carotene, riboflavin, vitamin B_1 , crude fibre, ether extract, Ca, Mg, Na, K, Fe and micro-nutrients in plants as affected by environment.

J. S. Thomson.

3367

MALYUGA, D. P. and MAKAROVA, A. I. O soderzhanii kobal'ta v pochvakh i rasteniyakh Tuvy. [The cobalt content of soils and plants from Tuva.] *Dokl. Akad. Nauk S.S.S.R.*, 1954, 98, 811-813. [V.I. Vernadsky Inst. Geochem., Acad. Sci., U.S.S.R.]

The average cobalt content, from analyses of hundreds of soil samples from different parts of the region, of mountain-chestnut, mountain-forest dark grey, mountain chernozem and other soils was 1.5×10^{-3} per cent. There was a definite relation between the amounts of Co in soils

animals. Bulls fattened much more quickly and efficiently than bullocks, particularly those given 2 implantations. They had a higher percentage of edible meat, owing to less waste fat, but had lower carcass grades, and the meat was not so tender. In the treated bulls carcass grades and tenderness were very near those of bullocks. Bulls could be marketed younger than bullocks, since they reached a suitable weight sooner. Results indicated that age was the most important condition affecting tenderness, so that marketing at a standard weight would offset the tendency to toughness of bulls compared with bullocks of the same age.

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Fish

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SHAWAN, J. M. **The nitrogenous extractives from fresh fish muscle. 3. Comparison of several flat fishes and members of the herring-mackerel group.** *J. Sci. Food Agric.*, 1955, 6, 99-104. [D.S.I.R., Torry Res. Stat., Aberdeen.]

Aqueous alcohol extracts of muscle from 6 flat fishes, lemon sole, plaice, turbot, dab, megrim and brill, and 4 pelagic fishes, herring, mackerel, Twaité shad (*Clupea finia*) and Ray's bream (*Brama raiti*) were analysed as described for gadoid and elasmobranch fish (Absts. 194, Vol. 23; 2870, Vol. 24). The result for the flat fishes was similar to that found for the gadoids, the main difference being the comparatively small amounts of anserine and trimethylamine oxide and the absence of methylhistidine. Pelagic fishes were quite different from this and from one another. The salient features as compared with the gadoids were the predominance of histidine and lysine, smaller amounts of trimethylamine oxide and an apparent absence of carnosine, anserine, β -alanine and methylhistidine. Bream resembled both groups in having moderate amounts of alanine, trimethylamine oxide, anserine, some β -alanine and methylhistidine, and large amounts of histidine. Mackerel allowed to spoil in ice for 8 days contained large amounts of histamine, probably from bacterial decarboxylation of free histidine. The possible relation of this effect to food poisoning is discussed.—A. Hepburn.

3363

MASTER, F. and MAGAR, N. G. Studies in the nutritive value of Bombay fish. 2. Amino-acid composition. *Indian J. Med. Res.*, 1954, 42, 509-513. [Dept. Biochem., Inst. Sci., Bombay.]

For Part 1 see Abst. 4391, Vol. 24.

Amino-acids were estimated microbiologically in the muscle from 6 different common edible fishes, lobster and prawn. Lysine was apparently absent from 3 of the fishes but was found in quite large amounts, ranging from 16.5 to 19.8 g. per 100 g. protein, in the other 5 species. Both tyrosine and histidine were low, on the average 1.3 and 1.6 g. The amino-acid composition compared favourably with that of casein, egg and ox muscle.

A. Hepburn.

3364

BAKKEN, K. Undersøkelser av "helmet". [Analysis of "whole meal".] *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1952, 2. No. 6, pp. 7. English summary.

"Whole meal" is fishmeal produced without loss of water-soluble protein such as occurred with older methods. In an attempt to find a criterion to distinguish between whole meal and ordinary meal, water-soluble protein, riboflavin and breakdown products of protein, by formol titration corrected for NH_3 , were estimated in 5 samples of whole herring meal and 5 of ordinary herring meal. Tests are reported also on the effect of pH on the extraction of protein, and data are given for soluble

and total protein in a series of herring meals from 1946 to 1950.

In whole meal, amine N was about 300 mg. per 100 g., and in ordinary meal about 150 mg. Total soluble protein ranged from 17 to 24 g. per 100 g. protein in whole meal, and from 6 to 7 g. in ordinary meal. Whole meal had also twice as much riboflavin as ordinary meal, 10 to 12 as against 5 to 6 μg . per g. meal.—I. Leitch.

3365

PATHAK, S. P. and PANDE, G. D. Component fatty acids of Indian shark liver oil. *J. Amer. Oil Chem. Soc.*, 1955, 32, 7-9. [Dept. Indust. Chem., Banaras Hindu Univ., Banaras 5.]

The liver oil from a species of shark (*Carcharias melanopterus*) caught in the Arabian Sea was analysed by ester-fractionation. Saturated fatty acids comprised 33.7 per cent. of the total acids, made up of palmitic acid 18.5, stearic acid 9.0, myristic acid 4.4 and arachidic acid 1.8 per cent. The unsaturated acid content was C_{14} 2.8, C_{16} 12.8, C_{18} 19.9, C_{20} 19.0, C_{22} 7.3 and C_{24} 4.3 per cent. of the total acids. The abnormally high saturated fatty acid content is discussed in relation to the composition of other elasmobranch liver oils of Indian origin.—G. A. Garton.

See also Absts. 3356, 3379, 4054.

FOODSTUFFS OF VEGETABLE ORIGIN

General

3366

RICHARDSON, L. R., SPEIRS, M., PETERSON, W. J., FERNANDEZ, M. DEL C. C., REDER, R., KRACKENBERGER, H. F., MILLER, E. V., ARMY, T. J. and BEESON, K. C. Influence of environment on the chemical composition of plants. 1. A review of the literature. *Southern Co-op. Ser. Bull.* No. 36, January 1954, pp. 198. [Texas Agric. Exp. Stat.]

This extensive review covers ascorbic acid, carotene, riboflavin, vitamin B_{12} , crude fibre, ether extract, Ca, Mg, Na, K, Fe and micro-nutrients in plants as affected by environment.

J. S. Thomson.

3367

MALYUGA, D. P. and MAKAROVA, A. I. O soderzhanii kobalt'a v pochvakh i rasteniyakh Tuvy. [The cobalt content of soils and plants from Tuva.] *Dokl. Akad. Nauk S.S.S.R.*, 1954, 98, 811-813. [V.I. Vernadsky Inst. Geochem., Acad. Sci., U.S.S.R.]

The average cobalt content, from analyses of hundreds of soil samples from different parts of the region, of mountain-chestnut, mountain-forest dark grey, mountain chernozem and other soils was 1.5×10^{-3} per cent. There was a definite relation between the amounts of Co in soils

and in plants. The considerable amounts of Co and other elements in soils and plants in this region enable biologists to make field observations on the effect of Co on animals and plants.—H. Scherbatoff.

See also Abst. 3328.

Cereals

3368

ANTONIANI, C., FENAROLI, L., FEDERICO, L., FERESINI, P. and MONZINI, A. Ricerche sulla composizione chimica e sul valore nutritivo di diversi tipi di mais coltivati in Italia. Nota preliminare. [The chemical composition and nutritive value of different types of maize grown in Italy. Preliminary note.] *Ann. Sper. agrar.*, 1953, 7, 1807-1822. [Staz. Sper. Maiscolt., Bergamo.] English summary.

A table of the results of the analysis of 100 samples of different varieties of maize grown in Italy is presented. Open-pollinated and hybrid flinty, soft and dent varieties are included. The literature is reviewed and analytical methods are described. The results are to be discussed in a later paper.—T. D. Bell.

3369

ACKER, L., DIEMAIR, W. and SAMHAMMER, E. Über das Lichenin des Hafers. 1. Eigenschaften, Darstellung und Zusammensetzung des schleimbildenden Polysaccharids. [The lichenin of oats. 1. Properties, preparation and composition of the mucopolysaccharides.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, 100, 180-188. [Inst. Lebensmittelchem., Univ. Frankfurt a.M.]

3370

DESIKACHAR, H. S. R. Determination of the degree of polishing in rice. 1. Some methods for comparison of the degree of milling. 2. Determination of thiamine and phosphorus for processing control. 3. The use of colored rice as an indicator of the degree of bran removal in rice milling. *Cereal Chem.*, 1955, 32, 71-77; 78-80; 80-82. [Div. Food Processing, Central Food Technol. Res. Inst., Mysore.]

1. Samples of 3 varieties of rice polished to 12 different degrees were used in the preliminary study of possible rapid, simple methods of assessing degree of polishing. Several such tests are described, some of use only for comparative purposes. Figures showing the loss of vitamin B₁ on milling are included.

2. A rapid (30-min.) method for estimating vitamin B₁ consists in shaking 5 g. rice flour with 50 ml. of 10 N H₂SO₄ for 10 min., adjusting to pH 4 with Na acetate, making up to 100 ml., filtering and estimating vitamin B₁ by the thiochrome method. Results for 6 differently milled

samples of one variety were about 10 per cent. lower than those by the complete extraction method of Kik and Williams (Abst. 4134, Vol. 16).

A rapid method for estimating P consists in digesting 0.5 g. rice flour with 2 ml. concentrated H₂SO₄ for 5 min., making up to 100 ml., filtering and using 5- to 10-ml. aliquots for estimation of P by the method of Fiske and Subbarow. Results were from 92 to 95 per cent. of these obtained by the complete digestion method of Gerritz (Abst. 44, Vol. 5).

Both methods are considered suitable for control of rice processing.

3. Vitamin B₁ was estimated by the method of Kik and Williams in 6 differently milled samples of a natural mixture of white rice and 7 to 8 per cent. of red rice and in the white and red rices separately; and when the bran pigments of the red rice were extracted with hot NaHCO₃ solution, its colour was found to serve as a measure of the degree of milling, very sensitive in the early stages of milling. Since both types of rice lost vitamin B₁ at the same rate, the use of red rice as an indicator is suggested. Rice polished to remove 85 per cent. of the bran contained about 2 µg. vitamin B₁ per g., sufficient to prevent beriberi on a rice diet.—W. M. Deans.

3371

PARIHAR, D. B. Saccharides of different varieties of Indian rice. *Nature*, 1955, 175, 42-43. [Defence Sci. Lab., Hillside Rd., New Delhi.]

Saccharides were estimated by circular paper chromatography in 4 samples of raw rice, one 3 years old, two 1 year old and one new, and in 3 varieties of parboiled rice, two 1 year old and one 3 years old. New raw rice contained only fructose, glucose and suerose. All other samples contained in addition galactose, maltose, raffinose and maltotriose. Isomaltose and maltotetraose were found only in the 3-year-old samples. Raffinose was more abundant in the parboiled rice. The changes in older samples, possibly due mostly to the action of α -amylase on starch, may improve digestibility and taste.—A. Hepburn.

See also Abst. 3269.

Roots

3372

SCHWIMMER, S., BEVENUE, A., WESTON, W. J. and POTTER, A. L. Survey of major and minor sugar and starch components of the white potato. *J. Agric. Food Chem.*, 1954, 2, 1284-1290. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 6, Calif.]

The alcohol-soluble sugars of potatoes were analysed quantitatively and by paper chromatography after storage at 40°, 50° or 70° F. The

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main sugars found were glucose, fructose and sucrose. Fresh potatoes contained very little sugar, most of it at 40° F. with a maximum after about 4 weeks. Lowering the storage temperature to 34° F. after 18 weeks increased the total sugar, especially reducing sugar, but raising the temperature to 70° F. produced considerable decreases. During low-temperature storage sucrose initially rose more rapidly than the reducing sugars, but the position was soon reversed. In 4 varieties of potato studied the glucose:fructose ratio approached unity at low temperatures and was consistently above 2 at higher temperatures. The variety White Rose, which had a superior capacity for accumulating total sugar, had corresponding ratios of about 0.5 and unity.

Paper chromatography showed the presence of heptulose in all samples, and some contained substances tentatively identified as melibiose, melezitose, raffinose and a non-moving fructosan. Storage time and temperature did not alter the amylose-amylopectin ratio or the phosphorus content of the starches isolated from the potatoes. A. Hepburn.

3373

SCHWIMMER, S., BEVENUE, A. and WESTON, W. J. **Phosphorus components of the white potato.** *J. Agric. Food Chem.*, 1955, **3**, 257-260. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 6, Calif.]

The acid-soluble phosphate of 2 varieties of potatoes was studied by fractionation of the barium salts of the phosphate esters and paper chromatography.

From one-half to two-thirds of the total phosphorus was acid-soluble. During storage for up to 21 weeks the Ba-soluble fractions increased at first, but decreased later. Chromatographic spots were tentatively ascribed to orthophosphate, glycerol phosphate, phosphoglyceric acid, fructose diphosphates, nucleotide and phytate. There was evidence of 5 other unknown phosphates. It is suggested that orthophosphate, and not the hexose phosphates, may play a part in the non-enzymic browning of processed potatoes. In these 2 varieties the ratio of P content of starch to total P in tuber was the same, and it is suggested that the starch serves as a metabolic storage reservoir for P.—W. M. Deans.

Leafy Vegetables

3374

PARRÁKOVÁ (Ed.). **Stanovenie jódu v jodozovanej zelenine. [Iodine estimation in the iodised vegetable.]** *Biológia*, 1954, **9**, 347-358. [Inst. Plant Physiol., Slovak Univ., Bratislava.] German and Russian summaries.

The I content of iodised salad and spinach was estimated. Small quantities of I in aqueous

solution as KI stimulated germination and growth of plants. The I content of plants could be increased only by gradually increasing the I content of the soil, not by larger doses of I. The possibility of iodised plants serving as a prophylactic for children in regions with endemic goitre is considered.—A. Jančářík (Czechoslovakia).

Legumes

3375

PESOLA, V. A. **Protein content of field pea seeds as a varietal character.** *Acta agr. fenn.*, 1955, **83**, 125-132. [Dept. Plant Breeding, Agric. Res. Centre, Jokioinen, Finland.]

Crude protein as a percentage of dry matter is given for some 30 varieties or strains of field pea grown under standard conditions in 6 seasons at the Agricultural Research Centre, Jokioinen. The Svalöf variety of Torsdags II had a mean protein content of 20.42 per cent., but a number of varieties being developed at the Centre or from elsewhere surpassed this, one having almost 23 per cent. Apart from low values in one dry summer, it was concluded that differences in protein content of peas are mainly genetic. Protein content could not be related to size, weight or colour of pea.

W. M. Deans.

3376

YAMAGUCHI, M., MACGILLIVRAY, J. H., HOWARD, F. D., SIMONE, M. and STERLING, C. **Nutrient composition of fresh and frozen lima beans in relation to variety and maturity.** *Food Res.*, 1954, **19**, 617-626. [Dept. Veg. Crops., Univ. California, Davis.]

The 2 main types of bean studied, baby Lima and Fordhook, were divided into 3 grades of maturity. They were analysed fresh and after blanching and freezing. The locality where they were grown made no apparent difference. Baby Lima beans had a higher mineral content and a higher nutrient value but a lower organoleptic score (on the cooked frozen samples) than the Fordhook beans. In both types of bean total solids, alcohol-insoluble solids, starch, protein and minerals increased with maturity, ascorbic acid and carotene decreased and vitamin B₁, riboflavin and nicotinic acid changed only slightly. Ascorbic acid, carotene and the B vitamins decreased after blanching and freezing.—A. Hepburn.

See also Abst. 4251.

Fruits

3377

ASH, A. S. F. and REYNOLDS, T. M. **Water soluble constituents of fruit. 1. Some observations on the occurrence of free galacturonic acid in fruit.** *Austral. J. Biol. Sci.*, 1954, **7**, 435-443. [Div. Food Preservation and Transport, C.S.I.R.O., Homebush, N.S.W.]

Other Types

3378

- PORTER, W. L., HOBAN, N. and WILLITS, C. O.
Contribution to the carbohydrate chemistry of
maple sap and sirup. *Food Res.*, 1954, 19, 597-
602. [E. Reg. Res. Lab., Philadelphia 18, Pa.]

Sterile maple sap contained sucrose in large excess over all other carbohydrates. Monosaccharides amounted to less than 0.0001 per cent. The reducing power of the sterile sap increased on passage through a charcoal column, but pure sucrose was not hydrolysed. Five oligosaccharides were obtained on paper chromatograms. One apparently homogeneous fraction contained 2 trisaccharides, one closely resembling raffinose and the other a glucosyl sucrose.—A. Hepburn.

3379

- MOURA CAMPOS, F. A., DE SIQUEIRA, R. and PECHNIK, E. Contribuição ao estudo do valor nutritivo de alguns óleos e de algumas castanhas nacionais. [Contribution to the study of the nutritive value of some indigenous oils and "chestnuts"]. *Biblioteca Brasil. de Nutrição* 9, *Serv. Aliment. da Previdência Social*, 1953, pp. 160.

In this monograph on the nutritive value of Brazilian oils a description is given of 60 plants or trees from which oil is obtained. The data, collected from many sources, include in most cases the yield of oil, many of the physical constants, and in some cases information on the vitamin content. For 21 of the plants supplementary information is given based on personal experimental work of the authors, dealing with such subjects as energy value, vitamin A content of the oil, its chemical composition and digestibility, content of saturated and non-saturated fatty acids, retention of carotene by the oil under different conditions of light and temperature, and biological experiments. This is followed by a comparative study of the principal oils, classified according to the oil content of the whole fruit, mesocarp, seeds and bran. Estimations are given of oleic, linoleic and ricinoleic acids in 7 of the plants.

In some regions of Brazil oils of animal origin are used in cooking. Seven fish oils are described, with data on vitamin content, energy value and physical constants, based in some cases on work by the authors. A brief chapter summing up the energy value of the oils includes results of the authors for 9 oils, in which the energy value ranges from 886.8 to 939.2 Cal. per 100 g.

The second part of the monograph deals with the nutritive value of native nuts. These are in general rich in lipids and proteins, the latter being of good quality, with a high biological value and good digestibility. Comparative tables of data from different sources show that the proteins

of the cashew nut and soya bean approximate most closely to proteins of animal origin. A detailed study is given of 6 nuts which are of great nutritional importance in Brazil: groundnut, Brazil and cashew nuts, the "Sapucaia" nut (*Lecythis usitata*), and the nuts of the Brazilian rubber tree "Seringueira" and of *Aracaria angustifolia*. The studies include data on chemical composition from different sources, including personal results, with a description in some cases of biological experiments illustrating the value of the oils as a source of protein or vitamins. The methods used by the authors are given in an appendix.

M. B. Richards.

3380

- MOURA CAMPOS, F. A., PECHNIK, E. and DE SIQUEIRA, R. Valor nutritivo de algumas oleaginosas brasileiras. [Nutritive value of some Brazilian oilseeds.] *Univ. Brasil Inst. Nutrição Trab. e Pesq.*, 1952, 5, 109-139. English summary.

3381

- NARAYANA RAO, M. and KRISHNA MURTHY, K. Gossypol content of Indian cottonseed and cottonseed oil. *Bull. Central Food Technol. Res. Inst. Mysore*, 1954, 3, 311. [Div. Biochem. Nutrit.]

The free gossypol content of the whole seed, kernel, oil and refined oil of 9 varieties of Indian cottonseed was estimated and the value for whole seed was found to range between 0.70 and 0.92 per cent. compared with 1.9 to 3.0 per cent. for Egyptian and Sea Island varieties of cottonseed. When oil obtained by hydraulic pressing was refined it contained no gossypol.—D. H. Shrimpton.

3382

- PĚKNICE, R. J. Výživná hodnota kvasnic. [The nutritive value of yeast.] *Průmysl potravin*, 1954, 5, 74-79.

Data are given for energy, protein, fat, carbohydrates, Ca, Fe, vitamin A, vitamin B₁, riboflavin, nicotinic acid and ascorbic acid in yeast (*Torula utilis* and *Saccharomyces cerevisiae*).

A. Jančařík (Czechoslovakia).

See also Absts. 4248, 4250.

Pasture, Hay and Silage

3383

- HOLMES, W. and MACLUSKY, D. S. The intensive production of herbage for crop-drying. 5. The effect of continued massive applications of nitrogen with and without phosphate and potash on the yield of grassland herbage. *J. Agric. Sci.*, 1954, 45, 129-140. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Herbage yields and composition obtained during the fourth, fifth and sixth years of a small scale

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plot experiment are reported (for report on the first 3 years see Absts. 274, 3252, Vol. 19; 3271, Vol. 21). Fertiliser treatments applied each year were 0, 260, 520 or 416 lb. N, with no P or K, 336 to 538 lb. K_2O , 120 to 180 lb. P_2O_5 or both these quantities of P and K at all levels of N, applied in 4 or 5 dressings, one after each herbage cutting. With potash present there was a high, maintained, response to N, the average dry matter and crude protein yields over the whole 6 years at all 4 levels of N application being 7940 and 1410 lb. per acre, respectively. Corresponding yields in the absence of K were 4970 and 960 lb. per acre, respectively. The effect of P was negligible. The botanical composition depended on N and K; the presence of both maintained a vigorous ryegrass-timothy sward. K alone gave a clovery sward, but in its absence, with or without N, there was an invasion of the poorer grasses, which depressed early-season production.—J. L. Corbett.

3384

PELTON, W. L. and WEBBER, L. R. The effects of irrigation and chemical fertilization on the yield and protein content of a pasture mixture. *Canad. J. Agric. Sci.*, 1955, **35**, 1-10. [Dept. Soils, Ontario Agric. Coll., Guelph.]

Small-scale plots of grass with clover were irrigated to maintain 4 different soil-moisture contents. With increasing applications of water, production of dry matter and crude protein was raised significantly and the proportion of clover in the herbage increased. Heavy application of fertilisers also significantly increased total dry matter and crude protein production and the protein content of the grass at each level of watering, but proportionately decreased clover yields.—J. L. Corbett.

3385

CUNNINGHAM, I. J. and HOGAN, K. G. Oestrogens in New Zealand pasture plants. *N.Z. Vet. J.*, 1954, **2**, 128-134. [Wallaceville Animal Res. Stat., Dept. Agric., Wellington.]

Oestrogens in pasture plants in all seasons from representative areas of New Zealand were estimated by the mouse uterus method. There was a high content of oestrogen in subterranean clover at all seasons and from all districts, and there was a slight trace in some samples of white clover. When pure species of grasses and clover were examined, appreciable amounts of oestrogen were found in subterranean and red clover at all seasons. In early spring there were small amounts in short-rotation and perennial ryegrasses.

An instance of lactation occurring in wethers is reported. The cause seemed to be the presence of subterranean and red clovers in the pastures which they had grazed.—T. D. Bell.

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3386

RICHARDSON, A. and HULME, A. C. Shikimic acid in grass. *Nature*, 1955, **175**, 43-44. [Edward Davies Chem. Labs., Univ. Coll. Wales, Aberystwyth.]

An unknown acid previously detected in grass (Abst. 4295, Vol. 24), has now been isolated from extracts of ryegrass (*Lolium perenne*) and identified as shikimic acid.—A. Hepburn.

3387

CAMPANILE, S. Su la composizione chimica del *Trifolium thalii* Vill. [Chemical composition of *Trifolium thalii*, Vill.] *Ann. Sper. agrar.*, 1954, **8**, 741-745. [Staz. Chim.-Agrar. Sper., Rome.] English summary.

Trifolium thalii, Vill. grows in dry mountain pastures, forming a valuable fodder with little fibre. Chemical analysis gave the following percentage composition: moisture 16.6, crude protein 22.75, ether extract 2.4, crude fibre 11.3, ash 7.25 and N-free extract 39.7.—T. D. Bell.

3388

DOUGALL, H. W. The composition of green oats for forage and ensilage. *East African Agric. J.*, 1954, **20**, 118-119. [Dept. Agric., Kenya.]

Green oats after initial grazing by cattle and again 7 weeks later after several days' grazing contained on the average crude protein 32.17, true protein 25.85, carbohydrate (by difference) 32.90, and crude fibre 19.26 per cent. The percentage digestibility of the crude protein was 86.15, the protein equivalent 24 and the starch equivalent 70. As the crop matured protein, oil and minerals decreased, carbohydrate and crude fibre increased and the protein became less digestible. At the full flowering stage the composition was crude protein 8.13, true protein 4.71, carbohydrate 56.01, crude fibre 28.05 per cent. and the percentage of digestibility of the crude protein was 46.74. Although its composition was poorer the maturer crop was considered more economical for silage making because of the greater yield. A companion crop, the legume Serradella, at the time of harvesting was rich in highly digestible protein, was not fibrous and could produce better mixed silage.—A. Hepburn.

MISCELLANEOUS

3389

CURYEO, J. Charakterystyka miodów pszczelich ze wschodnich województw Polski pod względem zawartości wody i sacharoz. [Water and sucrose content of honey from the eastern districts of Poland.] *Roczn. Nauk rol.* [B], 1954, **68**, 325-335. [Inst. Sadownictwa.] Russian and English summaries.

3. VITAMINS

GENERAL

3390

GYÖRGY, P. **Vitamins—past and present.** *Pediatrics*, 1955, **15**, 119-123. [Dept. Paediat., Sch. Med., Univ. Pennsylvania, Philadelphia.]

The author briefly reviews his own past researches.—E. M. Hume.

3391

JANSEN, B. C. P. **Vitamines on anti-vitamins. [Vitamins and antivitamins.]** *Voeding*, 1954, **15**, 520-526.

This short review is intended to form part of a textbook of modern nutrition (see Abst. 3588, Vol. 24).—I. Leitch.

3392

WOERNLEY, D. L. **The magnetochemistry of vitamins.** *Arch. Biochem. Biophys.*, 1955, **54**, 378-383. [Dept. Biophys., Roswell Park Mem. Inst., Buffalo, N.Y.]

The magnetic susceptibility of a number of vitamins was measured by the Gouy method as previously described (*J. Biol. Chem.*, 1954, **207**, 717). The experimental results for ascorbic acid, biotin, Ca pantothenate, folic acid, 2-methylnaphthoquinone, nicotinic acid and α -tocopherol were in close agreement with theoretical values. Values for magnetic susceptibility are useful in the characterisation of complex compounds and as a criterion of purity.—A. M. Copping.

3393

STEINER, P. E., RASMUSSEN, T. B. and FISHER, L. E. **Neuropathy, cardiopathy, hemosiderosis, and testicular atrophy in Gorilla gorilla.** *Arch. Pathol.*, 1955, **59**, 5-25. [Dept. Pathol., Univ. Chicago, Ill.]

The full post-mortem picture is described of a 22-year-old male gorilla which died after an illness lasting 7 months. There was diffuse chronic degenerative change in the spinal cord and dorsal root ganglia with secondary degeneration of ascending tracts and of peripheral nerves, combined with atrophy of muscles of the extremities and a chronic ulcer on the left foot. Other findings were changes in the heart suggestive of beriberi, slight arteriosclerosis in the brain and spinal cord, haemosiderosis and atrophy in the liver and spleen, severe tubular atrophy and fibrosis of the testes, and obesity, besides recent changes indicative of death from acute congestive heart failure.

In a discussion of the findings and of the conditions reported in other captive gorillas, it is sug-

gested that despite all efforts to provide the known nutritional requirements, there was some dietary defect. The restricted distribution of the gorilla in nature suggests the possibility that its requirements are more exacting than those of the chimpanzee. The lesions are compatible with deficiency of several vitamins of the B complex and of vitamin E.

There was no sign that the animal was senile.
D. Duncan.

3394

WAHL, O. and BACK, E. **Einfluss der im Pollen enthaltenen Vitamine auf Lebensdauer, Ausbildung der Pharynxdrüsen und Brutfähigkeit der Honigbiene (*Apis mellifica*).** [Effect of the vitamins in pollen on life span, formation of pharynx glands and hatching capacity in the honeybee (*Apis mellifica*).] *Naturwissenschaften*, 1955, **42**, 103-104. [Lehr- u. Versuchsanst. Bienenzucht, Marburg a.d. Lahn.]

In bees kept at controlled temperatures in cages there was no difference in life span on purified basal diets with or without vitamins. The pharynx glands developed moderately well without addition of vitamins but attained full size only with vitamin supplements, of which pantothenic acid appeared to be specially active. Hatching and larval development were improved by inclusion of protein and vitamins in the diet.—A. M. Copping.

3395

DIAMANT, E. J., HALEVY, S. and GUGGENHEIM, K. **Studies on vitamin metabolism in emetine poisoning.** *J. Nutrition*, 1955, **55**, 241-253. [Lab. Nutrit., Dept. Biochem., Hebrew Univ.-Hadassah Med. Sch., Jerusalem, Israel.]

The effect of repeated small daily doses of 0.05 mg. emetine hydrochloride was studied in young rats for 4 weeks. Rats given emetine lost appetite and gained only 28 ± 2.4 g. during the experiment. Pair-fed rats without emetine gained 55 ± 2.0 g. and those with unrestricted food intake 70 g. No change was detected in metabolism of vitamin A, riboflavin, nicotinic acid, biotin, or pantothenic acid in the rats receiving emetine. Storage of vitamin B₆ and folic acid in the liver, excretion of folic and ascorbic acid in the urine, and the amount of citrovorum factor synthesised after injection of folic and ascorbic acid, were all less in the rats given emetine. Storage of ascorbic acid was lower in the liver and higher in the adrenal glands than for normal rats, but the synthesis of ascorbic acid in response to barbiturate was not impaired.—A. M. Copping.

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3396

RICKELS, K. Über die Wachstumsbeeinflussung von pathogenen Keimen durch Vitamine. [Influence of vitamins on the growth of pathogenic organisms.] *Münch. med. Wochenschr.*, 1954, **96**, 1510-1511. [Pathol. Bakteriolog. Inst., Stadt Krankenhaus, Kassel.]

The possibility that vitamin C or members of the vitamin B complex might inhibit growth of pathogenic bacteria was investigated with 203 strains of cocci, *Bacterium coli* and *Bacterium proteus*. Only panthenol as Bepanthen had any inhibiting effect, which was shown with pneumococci, streptococci and staphylococci in presence of high concentrations of the vitamin. The clinical use of Bepanthen given by mouth in infections is suggested.—A. M. Copping.

3397

BERGER, M. Wirkung von Vitaminen und Hormonen auf einige Protozoen. [Effect of vitamins and hormones on certain protozoa.] *Internat. Ztschr. Vitaminforsch.*, 1955, **25**, 434-442. [Frauenklin., Univ. Bern.] English and French summaries.

It was sought to ascertain whether ciliate and flagellate protozoa could be used for a pregnancy test. They were grown from pure culture in flasks containing 1 litre of water with 10 ml. filtered juice from briefly cooked, fresh carrots. After 4 re-inoculations in about 10 weeks they were suitable for test. Test cultures contained 10 ml. of the stock culture, 80 ml. water and 5 drops carrot juice with the test substance added. The numbers of protozoa in 8 drops of culture were counted daily for a week.

All the substances tested were inhibitory or lethal in excessive doses. With *Chilomonas* sp. and *Glaucoma scintillans*, urine from pregnant subjects produced much more growth than urine or serum from non-pregnant subjects. Slightly too much serum or urine caused an initial setback followed by intensive growth. With correct concentrations the accuracy of the test was from 71 to 74 per cent. in 50 tests with pregnant, and 50

with non-pregnant urine. *Paramoecium caudatum* could not be used.

Some stimulation was produced by preparations of serum gonadotropin and chorionic gonadotropin, especially the former. Bacterial growth in the cultures increased also. The greatest stimulation was given by thymophysin, insulin, Cortrophine or a mixture of B vitamins. Vitamin C, pituitary hormones, adrenaline, thyroxine and individual vitamins of the B group had little or no effect. Small doses of oestrogens were ineffective, larger doses lethal.—D. Duncan.

3398

WODSACK, W. and UECKERMAN, E. Die Vitamin-gehalte der wichtigsten Baumrinden und deren möglicher Einfluss auf das Schälen des Rotwildes. [Vitamin contents of the more important barks of trees and their possible bearing on bark stripping by red deer.] *Internat. Ztschr. Vitaminforsch.*, 1955, **25**, 379-384. [Chem. Anst., Hyg. Inst., Hamburg.] English and French summaries.

To test the idea that red deer may strip the bark of trees in order to make up for vitamin or other deficiencies of their diet, samples of the bark of common coniferous and deciduous trees taken in October (7 species) and April (9 species) were analysed for vitamin B₁ by the thiochrome method as described by Müller and Moor (Abst. 4631, Vol. 19), riboflavin by the lumiflavin method of Roth [no reference], nicotinic acid by a modification of the method of Ritsert (Abst. 2960, Vol. 9) and vitamin C by Kuhn's version of the dichlorophenolindophenol method (Abst. 3047, Vol. 11).

Some of the amounts found were noteworthy; for instance, the vitamin C value in mg. per 100 g. fresh substance was for oak bark in spring 32, for spruce 17.1 and for alder 15.6, which also had 10 mg. nicotinic acid per 100 g., but the values bore no relation to the observed preferences of the deer.

Experiments with salt licks fortified with vitamins or trace elements have so far given negative results.—W. M. Deans.

VITAMIN A

3399

SCOTT, N. Rapid assay for vitamin A. *Chemist-Analyst*, 1954, **43**, 97. [Vitarine Co., Inc., 636 Eleventh Ave., New York.]

A modification of the U.S.P. spectrophotometric method for estimating vitamin A is described. The simplified procedure has the advantage of being more rapid and of not requiring any special glassware or large quantities of ether. A sample containing about 100 U.S.P. units of vitamin A

was weighed directly into a Maizel Gerson saponification vessel; a second vessel was used for a blank estimation. To each vessel 0.35 ml. of 50 per cent. alcoholic KOH and 5 ml. of ethanol were added. The vessels were refluxed for 15 min.; the contents were extracted with 10 ml. ether. The ether extract was washed 3 times with water and then evaporated in a stream of nitrogen. Next, 10 ml. isopropanol were pipetted into each vessel and after being thoroughly shaken the new solutions

were transferred to cuvettes and their absorption was measured at 310, 325 and 334 $m\mu$ in a spectrophotometer. The Morton Stubbs correction was applied. Results obtained with U.S.P. Reference oil and with cod liver oil and percomorph liver oil by this rapid method gave good agreement with those obtained by the standard U.S.P. method.—I. M. Sharman.

3400

CORMIER, M. De l'époxyde de vitamin A à la vitamine A alcool. [From vitamin A epoxide to vitamin A alcohol.] *Bull. Soc. Chim. biol.*, 1954, 36, 1255-1264.

A solution of vitamin A alcohol was treated with MnO_2 in the dark by Morton's method. The progress of the oxidation was followed by recording the ultraviolet absorption spectrum with a Beckman spectrophotometer. Five min. after the addition of MnO_2 the maximum absorption changed from 325 $m\mu$ to maxima at 330 and 335 $m\mu$, indicating the presence of the hydrate of vitamin A aldehyde. After 60 min. the maximum absorption shifted to 368 $m\mu$ because of the presence of vitamin A aldehyde. A similar band was observed after 4 hr., but after 6 hr. maximum absorption was at 347 $m\mu$, possibly because of the presence of vitamin A acid. In another series of experiments when the production of vitamin A aldehyde was considered to be at its maximum 3 per cent. of absolute ethanol was added to the light petroleum mixture, according to Meunier's method, and records of the absorption spectra were continued. From 1 to 18 hr. after the addition maxima at 347 and 280 $m\mu$ occurred, probably indicating the presence of vitamin A acid and an isomer of vitamin A epoxide; 48 hr. after the addition maxima were found at 335 and 280 $m\mu$, showing the presence of the hydrate of the aldehyde and the isomer or "precursor" of the epoxide of vitamin A. After 4 more days maxima were found at 335 and 275 $m\mu$, indicating the presence of the hydrate of vitamin A aldehyde and the true epoxide of vitamin A.

In further tests the reverse reaction was studied, in which vitamin A epoxide was reduced to vitamin A alcohol in the presence of zinc oxide activated by heating to 1200°C. Absorption maxima at 280 and 365 to 368 $m\mu$ were then observed, indicating the presence of modified vitamin A epoxide and vitamin A aldehyde. Data for the optical densities are presented for all the results obtained and the significance of the substances absorbing at 335 $m\mu$ and 280 $m\mu$, respectively, is discussed.

I. M. Sharman.

3401

ČUŤA, F. and ČELIKOVSKÝ, J. Spektrofotometrické a kolorimetrické stanovení vitamínu A kyselinnou chloristou. [Spectrophotometric and co-

lorimetric estimation of vitamin A with perchloric acid.] *Chem. Listy*, 1954, 48, 1346-1350. [Fats and Oils Res. Inst., Ústí nad Labem, Czechoslovakia.]

A simple method for estimating vitamin A, not influenced by the presence of vitamin D, is described.—M. Prokšová (Czechoslovakia).

3402

GRANGAUD, R. and MASSONET, R. Activité antixérophthalmique des esters de l'astaxanthine. [Antixerophthalmic effect of the esters of astaxanthin.] *C.R. Soc. Biol.*, 1954, 145, 1392-1394.

In order to obtain pure astaxanthin esters a light petroleum extract of the hypodermis of the shrimp, *Aristeomorpha foliacea*, was shaken with ethanol to remove free astaxanthin and chromatographed on alumina to remove carotene and vitamin A. The astaxanthin esters were dissolved in vegetable oil so that it contained 250 μg . astaxanthin per g. Albino rats with signs of xerophthalmia and no longer gaining weight were given 80 mg. of the oil daily. Cure of xerophthalmia was obtained between the 12th and 15th day, but there was no increase in weight.

R. J. Ward.

3403

WARD, R. J. and MOORE, T. Absorption at 275 $m\mu$. in rat-liver fat. *Biochem. J.*, 1955, 59, xv-xvi. [Dunn Nutrit. Lab., Univ. Cambridge.]

3404

WALD, G. Visual pigments and vitamins A of the clawed toad, *Xenopus laevis*. *Nature*, 1955, 175, 390-391. [Biol. Labs., Harvard Univ., Cambridge, Mass.]

Dartnall (*J. Physiol.*, 1954, 125, 25) extracted from the retina of *Xenopus* a visual pigment having maximum spectral absorption at about 515 $m\mu$. He believed it to be a new pigment. The observation is confirmed. Rhodopsin and porphyropsin have maxima at 500 and 522 $m\mu$, respectively. The pigment from *Xenopus* could, therefore, be a mixture of the two. Such a mixture can be analysed by exposing it to light, when rhodopsin is bleached to vitamin A and porphyropsin to vitamin A₂. The two vitamins are readily identified by treatment with the $SbCl_5$ reagent; the products formed have spectral maxima at 620 and 690 $m\mu$, respectively. An extract from *Xenopus* eyes was so treated and the spectrum was recorded. It showed a peak near 690 $m\mu$ and a broad elevation in the region of 620 $m\mu$.

It is concluded that the principal retinal pigment from *Xenopus* is porphyropsin, accompanied by a small proportion of rhodopsin. The significance is discussed of the discovery for the first time of porphyropsin in an adult anuran.—V. H. Booth.

N.A. and R., July 1955

3405

KAHÁN, Á., TÖRÖK, É. and CSEPI, K. Über die endokrine Beziehungen des Vitamin A-Stoffwechsels und der Netzhautfunktionen. [*Endocrine relations of vitamin A metabolism and retinal function.*] *Acta med. hung.*, 1954, 6, Suppl. 1, 69-70. [Augenklin., Med. Univ., Budapest.]

3406

RUBIN, S. H. and DE RITTER, E. Vitamin A requirements of animal species. *Vitamins and Hormones*, 1954, 12, 101-135. [Nutrit. Labs., Hoffmann-La Roche, Inc., Nutley, N.J.]

3407

BLAZOT, J. and SERFATY, A. Intensité respiratoire du diaphragme isolé de rat; influence de l'avitaminose A. [Rate of respiration of the isolated rat diaphragm; effect of vitamin A deficiency.] *Arch. Sci. physiol.*, 1955, 9, 1-9. [Lab. Physiol. Gén., Fac. Sci., Toulouse.]

Weanling male albino rats were paired as equally as possible according to their weight. One animal from each pair was given a diet deficient in vitamin A. The remaining animals were given the same diet with weekly supplements of 5000 I.U. vitamin A. As each of the animals in the first group became deficient, as shown by a fall in its growth curve, portions of its diaphragm were isolated. The diaphragm from the corresponding control animal was also examined at the same time. Rates of oxygen consumption were measured by the Warburg method. The rats when examined weighed between 150 and 225 g. The isolated tissues from the deficient animals respired more actively than those from the control animals. The average weight of dry tissue examined from the deficient animals was 10.6 mg. and absorbed on the average 4.23 c. mm. oxygen per mg. per hr., corresponding values for the control animals being 11.6 mg. and 3.80 c. mm., respectively. The difference in the respiration rates varied with the weight of the isolated tissue, being 8 per cent. in favour of the deficient animals when the weight of tissue was 5 mg. and 11 per cent. when 20-mg. portions were examined.—I. M. Sharman.

3408

IRVING, J. T. and RICHARDS, M. B. Sensitivity of different tissues to vitamin A deficiency and to the prophylactic action of the vitamin. *S. African J. Med. Sci.*, 1954, 19, 108. *Proc. [Joint Dent. Res. Unit, C.S.I.R., Johannesburg.]*

3409

O'DONOGHUE, J. G. Blindness in beef cattle and its possible relationship to vitamin A deficiency.

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Canad. J. Comp. Med., 1955, 19, 61-64. [Vet. Serv. Branch, Alberta Dept. Agric.]

About 6 cases of blindness were seen in yearling beef cattle from 3 or 4 herds. Ophthalmoscopic examination of 2 of them showed degenerative changes and oedema of the optic disc. Dissection of the optic nerves of one animal showed that there was a constriction at the point of passage through the foramen, like that which has been ascribed by previous workers to deficiency of vitamin A.

T. Moore.

3410

WOOLLAM, D. H. M. and MILLEN, J. W. Effect of vitamin A deficiency on the cerebro-spinal fluid pressure of the chick. *Nature*, 1955, 175, 41-42. [Dept. Anat., Univ. Cambridge.]

In chicks maintained on a diet with 1.6 mg. carotene per kg. as sole source of vitamin A, the cerebrospinal fluid pressure was on the average at the age of 30 days 108 mm. water, at 62 days 157, at 88 days 180 and at 125 days 212. In 10 normal chicks of comparable ages the pressure remained under 100 mm. The chicks showed no sign of neurological disease while alive, and no abnormality could be found in the bones at necropsy. It is concluded that raised cerebrospinal fluid pressure is an early sign of vitamin A deficiency and that it appears before any overt sign of neurological disturbance.—T. Moore.

3411

KÖHLER, H. Die Hyperkeratose, ein Problem des Vitamin A-Stoffwechsels. [*Hyperkeratosis, a problem of vitamin A metabolism.*] *Arch. Tierernährung*, 1954, No. 5, Beihfte, 283-291. [Pathol. Inst., Tierärztl. Hochschule, Hanover.]

The hyperkeratosis induced by wood preservatives or by pure chlorinated naphthalenes was studied with several farm animals, mainly with cocks. Confirmation was obtained that the lesions resemble those seen in vitamin A deficiency and that the concentration of vitamin A in the blood is greatly reduced. Trichlorinated naphthalene was not toxic, but toxicity was present with 4 atoms of chlorine and increased with 5 or 6 atoms. The effect of the poison could usually be seen first in the epithelium of the sub-mucosal glands of the oesophagus, which became keratinised. In young cocks spermatogenesis was arrested, and in older birds the germinal epithelium degenerated and desquamated. Growth stopped, and resistance to infections fell. The lesions varied considerably in different species.—T. Moore.

3412

FERRANDO, R. Hypothèses à propos des relations pouvant exister entre la maladie X, les phénomènes de desintoxication et la vitamine A. [*Hypotheses on the relations between X disease,*

the phenomena of detoxication and vitamin A.]

Bull. Soc. Chim. biol., 1954, **36**, 1245-1247.

[École Vét., Lyons.]

It is suggested that the production of X disease (hyperkeratosis) in cattle may be caused not by a direct antagonism between chlorinated naphthalenes and vitamin A, but by the strain caused by the naphthalenes on the detoxicating mechanism of the organism, which, in turn, causes an increased demand for vitamin A, as was shown by previous work on the detoxication of bromobenzene (Abst. 1625, Vol. 20). It is considered that the value of methionine or cystine in the treatment of X disease should be investigated.—T. Moore.

3413

LÓZSA, A. and KOLLER, K. Die Wirkung von Thyroxin auf die Serumweißfraktionen von an kompletter, eiweißfreier und Vitamin A-freier Diät gehaltenen Ratten. [Effect of thyroxine on the serum protein fractions in rats on a complete, a protein-free and a vitamin-A-deficient diet.] *Acta physiol. hung.*, 1954, **6**, Suppl., 88. [Inst. Volkshyg., Med. Univ., Szeged.]

3414

VAN DYKE, J. H. Experimental thyroid metaplasia in the rat: preliminary report. *Arch. Pathol.*, 1955, **59**, 73-81. [Div. Anat., Hahnemann Med. Coll., Philadelphia, Pa.]

Very young Sprague Dawley rats were maintained on a vitamin-A-deficient diet for from 10 to 40 days; some were killed every 10 days for examination of the thyroid gland. After periods of depletion some were given a diet of Purina dog chow, adequate in vitamin A and fortified with carotene, together with a single initial dose of cod liver oil. Some were killed every 2 days and the thyroid glands were examined for signs of repair.

After the 20th day of vitamin A depletion there was degeneration or atrophy of the parenchyma of the gland in the centres of the lobes. When the vitamin-A-deficient rats received the adequate diet, these cysts gradually disappeared, the time required depending on the severity of the deficiency and the extent of the metaplastic lesion. Aberrant cell remnants of the lesion sometimes persisted after repair, and it is suggested that they might be a source of certain thyroid neoplasms. The paper is illustrated by photomicrographs of histological sections from thyroid cysts developing, and undergoing the process of repair.—B. W. Simpson.

3415

KAHN, R. H. Effect of locally applied vitamin A and estrogen on the rat vagina. *Amer. J. Anat.*, 1954, **95**, 309-335. [Dept. Zool., Univ. California, Berkeley.]

Female albino rats, ovariectomised when about

4 months old, were used to test the effect of α -oestradiol, alone or in conjunction with vitamin A, applied in sesame oil to the vaginal epithelium. By itself the oestrogen increased the percentage of cornified cells in the vaginal smear. The response in groups of animals could be graded with the dose, and 0.2 I.U. divided between two days gave a positive response in 75 per cent. of the animals. The oestrogenic effect of 0.1 I.U. of oestradiol daily for 6 days could be counteracted by the simultaneous administration of 0.15 I.U. vitamin A daily for the last 4 days, but not by 0.015 I.U. daily. With oestradiol the vaginal epithelium almost doubled its thickness and the thickening was not prevented by vitamin A. By itself the vitamin had little effect on the thickness of the epithelium, even when applied in large doses. Histological studies gave no evidence that alkaline phosphatase activity could be correlated with the synthesis of fibrous protein, as has been suggested. Except in the basement membrane, furthest removed from the surface of the epithelium, however, phosphatase appeared to be associated with mucopolysaccharides. Vitamin A decreased the concentration of protein-bound sulphhydryl groups. Vitamin A is thought to be involved in protein anabolism and hence to play a general role in inhibiting the formation of keratin.—T. Moore.

3416

TSCHIRREX, B. Die Schutzwirkung von Vitamin A bei Streptomycin- und Neomycinvergiftung des Gehörorgans. [Protective action of vitamin A in poisoning of the hearing apparatus by streptomycin and neomycin.] *Schweiz. med. Wochenschr.*, 1954, **84**, 1414-1415. [Otorhinolaryngol. Klin., Univ. Zürich.]

A group of about 20 guinea pigs were given daily an intramuscular injection, per kg. bodyweight, of 120,000 "units" vitamin A. After 14 days, while continuing to receive the vitamin, they and a similar untreated group were given subcutaneously, per kg. bodyweight, 300 mg. streptomycin daily for 25 days. The sensitivity to sound of all the animals was tested by the reflex twitching of the ear lobe at a sudden noise. The sound used was the crackling noise made during the charging of a condenser, transmitted through an amplifier, measurement being with a potentiometer. Before the treatment with streptomycin, the hearing of those given vitamin A became more acute than of those not given it. While streptomycin was being given the hearing of both groups deteriorated, but that of those not given vitamin A much the more severely.

When neomycin was given in the same way for 6 days the result was the same, but the deterioration of hearing in both groups was more severe.

E. M. Hume.

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3417

REISS, R., GRAFFI, A. and HEBEKERL, W. Über chemische Frühveränderungen der Rattenleber nach Verfütterung cancerogener Azofarbstoffe. 8. Veränderung des Vitamin-A-Gehaltes. [Early chemical changes in rat liver after administration of carcinogenic azo pigments. 8. Changes of vitamin A content.] *Arch. Geschwulstforsch.*, 1954, 7, 321-325. [Inst. Med. Biol., Berlin-Buch.]

For previous parts see Absts. 4798, Vol. 23; 324, Vol. 25.

Vitamin A was estimated by the $SbCl_3$ method in the livers of rats which were given 20 mg. 3'-methyl-4-dimethylaminoazobenzene daily for 4 days or were untreated. The carcinogen appeared to have the surprising effect of raising the concentration of vitamin A. The averages were for males in I.U. per g. liver 1034 and 666 in treated and untreated animals, respectively, and for females 874 and 568.—T. Moore.

3418

NIEMAN, C. and KLEIN OBBINK, H. J. The biochemistry and pathology of hypervitaminosis A. *Vitamins and Hormones*, 1954, 12, 69-99. [Netherlands Inst. Nutrit., Univ. Amsterdam.]

3419

GIROUD, A. and MARTINET, M. Fentes du palais chez l'embryon de rat par hypervitaminose A. [Cleft palate in the embryo rat as a result of vitamin A excess.] *C.R. Soc. Biol.*, 1954, 148, 1742-1743. [Coll. de France.]

Albino rats were given from 20,000 to 35,000 I.U. vitamin A daily from the 4th to the 16th day of gestation, and were killed on the 21st day. In 24 pregnancies 65 per cent. of the embryos were totally resorbed. In those pregnancies in which some embryos were retained, 61 per cent. were alive and the remainder dead and in process of resorption. In the survivors there was a high incidence of abnormalities, with cleft palate in 51 per cent. Exencephaly and ocular abnormalities occurred also, but less frequently.—T. Moore.

3420

SMIRNOV, A. M., KUZMETSOVA, Z. N., MAKUSH, L. T. and MILOVIDOVA, E. G. Lechenie telyat, bol'nykh dispepsiei A-gipovitaminoznoi etiologii. [Treatment of calves against dyspepsia caused by vitamin A deficiency.] *Veterinariya*, 1954, 31, No. 9, 49. [Leningrad Vet. Inst.]

The calves were given horses' gastric juice at the rate of from 30 to 60 ml. once to 3 times a day, from 20 to 40 min. before feeding. After from 6

to 12 hr. their condition improved. Where the illness was severe the calves were given also a disinfectant such as disulphan.—H. Scherbatoff.

3421

STRUMPE, A. I. Poliavitaminoz svinei. [Multiple vitamin deficiency in pigs.] *Veterinariya*, 1954, 31, No. 6, 33-37. [Vetbaklab., Kherson Reg.]

Multiple vitamin deficiency occurs chiefly in the winter and spring. The main deficiency in the Kherson region was of vitamin A. The signs at different ages are described; at from 6 to 8 months there is deformity of the bones, with thickening of the joints, softening of the hoof, failure of sight and poor appetite. A full description of the anatomical pathology is given. The sick animals were fed on concentrated, easily digested food. Malted food, whey, buttermilk, infusion of hay, bone meal, germinated seeds, carrots, potatoes and beet were found useful. [It is not stated whether the pigs were cured or not by the treatment.]

H. Scherbatoff.

3422

WAGNER, K. H. Die Bedeutung und der Nachweis der biologischen Wertigkeit des Vitamins A für die Tierernährung. [Significance and demonstration of the biological value of vitamin A in animal nutrition.] *Arch. Tierernährung*, 1954, No. 5, Beilhefte, 270-282. [Med. Akad., Justus Liebig Hochschule, Giessen.]

The need for vitamin A by young farm animals, the possible sources of it and means for detecting deficiency are discussed. The vitamin can be given as carrots, dried lucerne, liver oil, or vitamin A in oil, in emulsions or a dry powder. In powder form the vitamin can be given direct or mixed with bran or with skimmed milk powder. Several commercial concentrates were found to have lost most of their vitamin A. The vitamin in dry form was protected by coating the particles, but intestinal absorption was considerably hindered. Such protected preparations must be tested biologically, since chemical tests may give misleading results.—V. H. Booth.

3423

WORDEN, A. N., BUNYAN, J., DAVIES, A. W. and WATERHOUSE, C. E. The urinary excretion of vitamin A by the dog. *Biochem. J.*, 1955, 59, 527-528. [Cromwell House, Huntingdon.]

In 24-hr. specimens of urine of 4 normal healthy dogs, after extraction by the method of Lawrie *et al.* (Abst. 3452, Vol. 11), vitamin A was estimated by the $SbCl_3$ method with a diffraction-grating spectrophotometer, at different times of year. Expressed as I.U. per 100 ml. the results ranged from 3.75 to 7.5 for a 4-year-old male mongrel

terrier, 2.5 to 24.0 for a 3-year-old male Scotch terrier, 2.7 to 47.5 for a 6-year-old female Cocker spaniel and 1.75 to 12.5 for a 2-year-old male Husky. The total output of vitamin A for the 24-hr. periods ranged from 10.9 to 235 I.U. The significance of these large variations is discussed. No detectable amount of vitamin A was found in a 24-hr. specimen of urine from a cat.

I. M. Sharman.

3424

NARAYANAN, K. M., ANANTAKRISHNAN, C. P. and SEN, K. C. **Vitamin A in dairy products. 4. Influence of feed on the stability of vitamin A in ghee on storage.** *Indian J. Dairy Sci.*, 1954, 7, 205-212. [Indian Dairy Res. Inst., Bangalore.]

For earlier parts see Absts. 2943, Vol. 24; 356 and 1865, Vol. 25.

Ghee was prepared from the milk of cows and buffaloes which had been given a diet with a high carotene content, or a low carotene content, or with a supplement of shark liver oil, or of cottonseed or cottonseed cake, or of coconut. The ghee was stored in glass, aluminium, tin or mud containers for 6 months. Analyses were made monthly for vitamin A and carotene, and for the peroxide value of the fat. The carotene intake had little influence on the effect of storage; the peroxide value and loss of vitamin A were higher for the buffalo than for the cow ghee. Shark liver oil did not affect the stability of vitamin A in the ghee, but again the cow ghee was the more stable. After 6 months the loss of vitamin A from the ghee of animals given cottonseed was 4.6 per cent., and 10.7 per cent. from the ghee of those given cottonseed cake. The average loss of vitamin A from the ghee of animals given coconut was 13.7 per cent. Loss of vitamin A and carotene was about the same from samples stored in glass, aluminium and tin containers, being about 2.2, 5.3 and 15.1 per cent., after 2, 4 and 6 months, respectively. When storage was in mud pots, the loss of vitamin A after 2 months was about 75 per cent. and after 3 months it was complete; percentage loss of carotene was 41, 57 and 94 after 1, 2 and 3 months' storage, respectively.

R. J. Ward.

3425

DE, N. K. and KSHIRSAGAR, S. G. **Effect of cooking on the vitamin A values of fortified vanaspati and some foodstuffs of animal origin.** *Indian J. Med. Res.*, 1954, 42, 569-575. [Nutrit. Res. Labs., Indian Council Med. Res., Coonoor, S. India.]

Vanaspati, hydrogenated groundnut oil, was fortified by addition of a preparation of vitamin A acetate so that the final product contained between 8 and 45 I.U. vitamin A per g. On heating part

of the sample to 100° C. in an open aluminium vessel over a bunsen burner, the vitamin A content per g. fell from 34.0 I.U. to 32.9. Further heating from 100° to 130° for 5 min. resulted in a fall to 30.8 and after heating to 215° the value was only 5.4. No vitamin A was detected in a sample heated for 3 min. at 225°. In different dishes in which the fortified vanaspati was added to semolina, onions, potatoes and other vegetables, loss of vitamin A on cooking varied from 8 to 69 per cent. Ghee, made from buffalo milk, when fried with potato wafers lost 74 per cent. of its vitamin A. Percentage loss of vitamin A on cooking sheep's liver curry in a large open vessel ranged from 23 to 48, but was only 3 when the liver was boiled in water for 15 min. When egg omelettes were prepared by shallow frying, percentage loss of vitamin A was 37, but the loss was 74 in deep frying. Despite the large loss of vitamin A when fortified vanaspati is cooked, it is considered that the amount which remains makes a material contribution to the diet.—I. M. Sharman.

3426

AURE, L. **Vitamin A i innvoller av torsk og sei. [Vitamin A in the internal organs of cod and coalfish.]** *Fiskeridirektoratets Skr. Ser. Teknol. Undersøk.*, 1951, 2, No. 1, pp. 12. English summary.

Data are presented for weights of fish and of their liver and caeca, fat in these, and vitamin A content of the caecal fat. On the average of 24 fish, caecal oil from Lofoten cod had 28,900 I.U. per g., equivalent to 525 I.U. per g. caecal substance. Caeca preserved by boiling, pressing and acidifying with HCl, or in pickle, had the same average value. Stomach, intestine, roe and milt from Lofoten cod contained much less, the intestine 27 to 32 I.U. per g. or 2900 to 3500 I.U. per g. oil.

Caeca from fjord cod contained per g. caecal substance 410, from coalfish 800 or 1260 and from salmon 1700 I.U.; per g. caecal oil in the same order 21,700, 21,400 or 54,000, and 9500 I.U.

I. Leitch.

3427

BICKOFF, E. M., LIVINGSTON, A. L. and THOMPSON, C. R. **Bisphenol derivatives as antioxidants for carotene.** *J. Amer. Oil Chem. Soc.*, 1955, 32, 64-68. [W. Utilisation Res. Branch, U.S. Dept. Agric., Albany 6, Calif.]

The effect of changes in the molecular structure of different bisphenols on their power to stabilise an oil solution of carotene was determined. A methylene or S link between the phenolic nuclei gave efficient anti-oxidants, which were most effective when the hydroxyl groups were in the ortho-position and somewhat less so when they

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were in the *para*-position. The addition of alkyl groups improved efficiency but 3 in one ring almost destroyed it. Activity was decreased by phenyl substitution in the methylene bridge and was almost wholly destroyed by chlorine substitution in the ring. Some of the active substances were effective for stabilising carotene in alfalfa meal but others were of little value.—A. Hepburn.

3428

BICKOFF, E. M., LIVINGSTON, A. L., GUGGOLZ, J. and THOMPSON, C. R. **Alfalfa carotene. Quinoline derivatives as antioxidants for carotene.** *J. Agric. Food Chem.*, 1954, 2, 1229-1231. [W. Utilisation Res. Branch, U.S. Dept. Agric., Albany 6, Calif.]

Thirty-nine quinolines were tested for their power to protect carotene in solution in mineral oil against oxidation. The criterion was the time in hours in which 20 per cent. loss of carotene occurred. The most effective was 6-hydroxy-2:2:4-trimethyl-1:2-dihydroquinoline, which postponed the destruction from 1 hr. in its absence to 155 hr. in its presence. When the same quinolines were tested for their power to prevent the oxidation of carotene in dried alfalfa meal, they were ranked in about the same order as in the test with oil, but protection was much less in the meal. The most effective were 5 alkoxy derivatives. With 6-ethoxy-2:2:4-trimethyl-1:2-dihydroquinoline, for instance, only 40 per cent. of the carotene was lost during storage from meal against 67 per cent. in untreated meal.

The relation between the structure of quinolines and their anti-oxidant activity is briefly discussed. V. H. Booth.

3429

BICKOFF, E. M., THOMPSON, C. R., LIVINGSTON, A. L., VAN ATTA, G. R. and GUGGOLZ, J. **Effect of added animal fats and vegetable oils on stability of carotene in dehydrated alfalfa meal.** *J. Agric. Food Chem.*, 1955, 3, 67-69. [W. Utilisation Res. Branch, U.S. Dept. Agric., Albany 6, Calif.]

Samples of alfalfa meal were treated with 5 per cent. of several vegetable oils, mineral oil and animal fats and yellow greases. After 4 months' storage at 25° C. carotene was estimated. An untreated sample had then lost 53 per cent. of its carotene. Without exception the oils afforded protection; only 10 per cent. of the carotene was lost from meal treated with mineral oil, and from 23 to 30 per cent. from meals treated with plant oils, including peanut, sesame and cottonseed. Animal fats with 5, 15 or even 40 per cent. of free fatty acid were as effective as refined oils.

It is suggested that the fats raised the stability

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by bringing carotene and naturally occurring antioxidants in the meal into solution together. The view is supported by the finding that carotene in an extract of dried alfalfa when dissolved in oil was more stable than in the original meal or than pure carotene dissolved in oil.—V. H. Booth.

3430

BOOTH, V. H., COATES, M. E., COX, C. P., THOMPSON, S. Y. and HEALY, M. J. R. **Stability of carotene from dried grass meal and of synthetic vitamin D₃ in chick mash.** *J. Sci. Food Agric.*, 1955, 6, 10-14. [Dunn Nutrit. Lab., Milton Rd., Univ. Cambridge.]

A mash for chickens was prepared by 7 compounds to their own recipes, but with about 5 per cent. of dried grass and 1 I.U. per g. of synthetic vitamin D₃ replacing the cod liver oil normally used. After 16 weeks' storage the average percentage loss of carotene from the dried grass was 8 and from the mash 13.5. In order to assess the antirachitic and vitamin A potency after 16 weeks' storage, 6 groups of 15 cockerels were given the mash unfortified or with 25, 50, 75 or 100 per cent. of it replaced by the fortified mash. The sixth group received the fortified mash with 1 per cent. cod liver oil. At the end of the experiment the tarsometatarsal distance was measured to determine the extent of rickets, and the vitamin A content of the liver was estimated chemically. Addition of only 25 per cent. of the fortified to the unfortified gave normal bone formation. The vitamin A content of the liver ranged from 10 I.U. in the birds receiving unfortified mash to 508 I.U. in those receiving it fortified.—R. J. Ward.

3431

MITCHELL, H. L. and SILKER, R. E. **Effects of antidust oils on stability of carotene in dehydrated alfalfa meal.** *J. Agric. Food Chem.*, 1955, 3, 69-71. [Kansas Agric. Exp. Stat., Manhattan.]

Vegetable and animal oils with the anti-oxidant 6-ethoxy-1:2-dihydro-2:2:4-trimethylquinoline were applied in a mixture of acetone and light petroleum to alfalfa meal so as to give a final quinoline concentration of 0.02 or 0.05 per cent. in the meal. Carotene in all samples, including controls, was estimated after storage under standardised conditions. Oil or grease in a concentration of 0.8 per cent. with no quinoline had little or no effect on carotene retention during storage. Some oils applied at the rate of 4 per cent. of the sample weight protected the carotene. Untreated meal, for instance, lost 61 per cent. of its carotene, whereas meals treated with cottonseed oil or white grease lost 45 and 35 per cent., respectively. Salmon body oil slightly increased the loss. The loss was much reduced in each of the oils by the

anti-oxidant, and the greater the amount of anti-oxidant, the greater the effect.

It was confirmed that heating the treated meals resulted in even greater protection. In pellets made from meal treated with quinoline and oil the carotene was more stable than in treated loose meal. The stabilising effect was believed to be the result of the heat produced during pelleting.

Oil with or without quinoline varied considerably in its protective effect on alfalfa meals from different sources.—V. H. Booth.

3432

McCOLLUM, J. P. **Distribution of carotenoids in the tomato.** *Food Res.*, 1955, 20, 55-59. [Dept. Hortie., Univ. Illinois, Urbana.]

The outer pericarp of ripe tomatoes had the best colour and was richest in total carotenoids. The locular contents were richest in carotene, excluding lycopene, but were poorest in colour. The ripest parts of the fruit were richest in carotene. Development begins at the apical end and at early stages the carotene content was highest there. Later, the parts receiving most illumination were richest in carotene. The carotene content was greater in presence than in absence of chlorophyll. When tomatoes are sampled for carotenoids it is recommended that equal opposite sectors be taken to compensate for these variations.

V. H. Booth.

See also Absts. 3312, 3351, 3376, 3382, 4284, 4318, 4324.

VITAMIN D

3433

NUMEROF, P., SASSAMAN, H. L., RODGERS, A. and SCHAEFER, A. E. **The use of radioactive phosphorus in the assay of vitamin D.** *J. Nutrition*, 1955, 55, 13-21. [Squibb Inst. Med. Res., E.R. Squibb and Sons, New Brunswick, N.J.]

Rats of the Sprague Dawley strain, 21 days old and weighing from 45 to 60 g., were fed on a diet, per cent., of yellow maize 76, wheat gluten 20, CaCO_3 3, NaCl 1, and lysine monohydrochloride 0.5, vitamin in mg. per kg. diet, of vitamin B, 2, riboflavin 4, nicotinic acid 10 and Ca pantothenate 4. The supplements of lysine and B vitamins accelerated the development of rickets. Some rats were examined by the line test to confirm the presence of rickets. When rickets was established the single test dose of vitamin D was given orally in 0.2 ml. maize oil; 48 hr. later from 20 to 25 μC . radio-active P were given by intraperitoneal injection. After administration of vitamin D the rats were given 10 g. of the diet daily for 9 days. The degree of radio-activity was then measured with a Geiger Müller counter, under anaesthesia, in the rat's wrist suitably fixed. Total counts in 2 min. were recorded. The line test was made on the same rats or on groups maintained concurrently without injection of ^{32}P . The results of 14 experiments showed a substantially linear relationship between the log dose and the number of counts per min., and the response curve for any given material resembled that obtained by the line test. The useful range of dosage is said to be from 4 to 16 "units". The validity of the method, originally proposed by Snyder *et al.* (Abst. 4729, Vol. 21), is confirmed. It has the advantage of being quantitative with no subjective element in the assessment.

E. M. Hume.

3434

FRIEDMAN, L. and SHUE, G. M. **Sample preparation in the bioassay for vitamin D.** *J. Assoc. Off. Agric. Chem.*, 1955, 38, 165-172. [Food and Drug Admin., Dept. Health, Educat. and Welfare, Washington, D.C.]

Foods and commercial preparations to be tested for vitamin D are liable to contain other nutrients that may affect healing in the biological test. Recently a further difficulty has been introduced by the incorporation into commercial preparations for human or animal use of vitamin D stabilised by coating the vitamin particles with substances not soluble in fat-solvents, so that complete extraction of the vitamin is very difficult.

Samples of evaporated milk specially fortified and of other materials of known vitamin D content were extracted in a number of ways and the extracts were tested biologically. The most satisfactory modification was the introduction of a saponification procedure with alcoholic KOH. It is described in detail. It did not cause any destruction of vitamin D. Samples of 17 materials were extracted by the U.S.P. method and by the saponification procedure. In every instance but one the values obtained with the latter were higher, and usually substantially higher, than with the former.—E. M. Hume.

3435

ROGERS, A. R. **The spectrophotometric determination of vitamin D in pharmaceutical preparations. 1. Solution of calciferol B.P.** *J. Pharm.*, 1954, 6, 780-784. [Anal. Dept., Allen and Hanburys, Ltd., London.]

A method of estimating vitamin D in calciferol solutions B.P. is described, based on the absorption at 500 m μ . of the colour developed by adding calciferol dissolved in ethylene dichloride to a solution

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of 20 per cent. SbCl_3 in ethylene dichloride with 2 per cent. acetyl chloride. Maximum extinction was reached in about 1 min. The method was applied to solutions in oil, the absorption due to the oil being eliminated by graphical extrapolation.—K. H. Coward.

3436

RAOUL, Y., LE BOULCH, N., BARON, C., CHOPIN, J. and GUERILLOT-VINET, A. Isolement du composé anti-rachitique formé au cours de l'action de la floridine sur le cholestérol. [Isolation of the antirachitic substance formed during the action of floridin on cholesterol.] *Bull. Soc. Chim. biol.*, 1954, **36**, 1265-1271. [Lab. Zool. Appl., Fac. Pharm., Paris.]

The preparation is exactly described of an antirachitic substance from cholesterol by boiling it with floridin in CCl_4 . Two substances were produced, one the precursor of the active substance, which was liable to become converted into the second, a stable inactive substance. The precursor was converted into the active substance, called 82, by a procedure including boiling with 5 per cent. methanolic potash, followed by acid extraction and passage through a chromatogram of Brockman alumina. The final product was an oil with absorption max. in the ultraviolet spectrum at 250 μ .

Vitamin D_3 left in solution in light petroleum showed a change in the absorption max. from 265 to 250 μ ., and from the solution the same substance, 82, was obtained as was prepared from cholesterol with floridin. If, at certain steps in the preparation of 82 by either of the means just described, hard water, such as Paris tap water, was used instead of distilled water, an oily substance, 83, was obtained with absorption max. at 265 μ ., and a considerably higher biological activity. It included traces of metals and had a strong affinity for Ca. In an acid medium 83 lost the metals and reverted to 82. Both 82 and 83 have been found in natural products, and their presence complicates any attempt at estimating vitamin D activity by physico-chemical methods. Saponification by transforming them might change the natural vitamin D potency.—E. M. Hume.

3437

SCHUBERT, K. Zur Konfiguration des Dihydrovitamins D_2II . [Configuration of dihydrovitamin D_2II .] *Biochem. Ztschr.*, 1954, **326**, 132-138. [Inst. Mikrobiol., Jena.]

Crystalline dihydrovitamin D_2II can be prepared by partial catalytic hydrogenation of vitamin D_2 with Raney nickel (Abst. 364, Vol. 25). The configuration of the substance is now theoretically discussed.—E. M. Hume.

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3438

ENGELFELT, B. and ZETTERSTRÖM, R. A note on the uptake of radioactive phosphate in the skeleton of rachitic rats. *Acta physiol. scand.*, 1954, **32**, 320-324. [Dept. Phys. Cell Res., Karolinska Inst., Stockholm.]

Male rats, 3 weeks old, received the rachitogenic diet of Steenbock and Black. After 4 weeks they were injected with 0.10 mC. of $\text{Na}_2\text{H}^{32}\text{PO}_4$; some were given 30 I.U. vitamin D_2 3 days previously and some normal rats also were injected. After 1.5, 3 and 6 hr. animals were killed and specific activity was estimated in the blood serum and in the diaphyses and epiphyses separately of the femur and tibia. Specimens of bone were treated with ammonium sulphate and 15 per cent. trichloroacetic acid, which extracted the minerals completely. The portion insoluble in ammonium sulphate but extracted by trichloroacetic acid is referred to as the remaining fraction; it has a much slower rate of renewal than the fraction soluble in ammonium sulphate, which is regarded as coming from the less highly mineralised part of bone.

In the fraction extracted with ammonium sulphate, whether from the epiphysis or diaphysis, the rate of uptake of specific activity was high in all 3 groups, but in the remaining fraction it was much less rapid in both epiphysis and diaphysis of the rachitic rats than of the normal rats or of those given vitamin D; in these last 2 groups it was about the same.—E. M. Hume.

3439

CARLSSON, A. (with LINDQVIST, M. and MAGNUSSON, T.) The effect of vitamin D on the absorption of inorganic phosphate. The cause of hypophosphatemia and hypocalcemia in vitamin D deficiency. *Acta physiol. scand.*, 1954, **31**, 301-307; 308-311. [Dept. Pharmacol., Univ. Lund.]

Rats, 3 weeks old, received a "Ca-free" diet containing 0.04 per cent. Ca and 0.5 per cent. P, with or without CaCO_3 to raise the Ca content to 2.0 per cent. After 3 weeks for those without added Ca and after 5 weeks for those with it, ^{45}Ca and ^{32}P were given as a mixture of Ca lactate and Na_2PO_4 supplying 5, 10 or 20 mg. Ca and 2.5 mg. P. About half the rats in both series were given 100 I.U. vitamin D 3 days before the isotopes. Some of those given the diet without added Ca had another dose of 100 I.U. vitamin D 11 days before the isotopes. The urine and faeces were collected and the rats were killed 18 hr. after the isotopes were given. The percentage of either isotope absorbed was taken to be 100 minus the percentage of the dose found in the gastro-intestinal tract and faeces.

With the "Ca-free" diet, the percentage of Ca or P absorbed was not greatly affected by the

amount of Ca given. The percentage of Ca was nearly doubled when vitamin D was given, and that of P was increased, but less. The increased absorption of P produced by vitamin D could not be attributed to reduction of the amount of Ca in the intestine. With the diet high in Ca, the only dose of Ca given was 5 mg. with 2.5 mg. P; when vitamin D was given the absorption of Ca was increased but that of P was not. With the "Ca-free" diet the growth and wellbeing of the rats was much improved by addition of vitamin D, and it is therefore suggested that the effect on the absorption of P in that experiment was indirect and related in some way to the effect on growth.

Rats, 3 weeks old, were maintained for 6 weeks on the same "Ca-free" diet as in the preceding experiment, with CaCO_3 added to bring the Ca content up to 0.8 per cent. They were then given instead a mixture of, per cent., sucrose 93, NaCl 1 and Ca lactate 6. It contained 0.8 per cent. Ca and no P. After 24 hr. half the rats received 100 I.U. vitamin D. After another 3 days they were given by stomach tube a few μC . of ^{32}P and 0.3 g. of the sugar and salt mixture. Urine and faeces were collected and after 24 hr. the rats were bled.

With and without vitamin D the dose of P disappeared almost entirely from the gut and the amount in the urine did not increase, but with vitamin D the amount in the blood serum increased from 3.6 to 5.6 mg. per 100 ml.; the amount in the tibia and fibula increased also and that in the incisor teeth decreased slightly. It was concluded that without vitamin D rats could not utilise their bone stores and, to test the conclusion, rats which had been maintained up to 70 days of age on the diet with a satisfactory ratio of Ca to P were transferred to the "Ca-free" diet for 24 hr., and were then bled; half of them had been given 100 I.U. vitamin D 3 days previously. In spite of well filled bone stores, the respective Ca and P values, in mg. per 100 ml. serum, were 6.9 and 8.7 for the rats not given vitamin D, and 9.4 and 8.7 for the rats given vitamin D, compared with 8.0 and 7.3 for rats on the original well balanced diet. Failure to utilise bone stores in absence of vitamin D was thus held to be further confirmed.

E. M. Hume,

3440

CARLSSON, A. (with LINDQVIST, M. and MAGNUSSON, T.) The influence of vitamin D on the uptake of ^{35}S -labelled sulfate in the bones. *Acta physiol. scand.*, 1954, **31**, 312-316. [Dept. Pharmacol., Univ. Lund.]

Groups of 4 or 5 rats, 2 months old, were given a diet containing 0.5 per cent. P and 0.04 per cent. Ca, or the same with CaCO_3 to bring the Ca percentage up to 0.8 or 2.0. A single oral dose of

100 I.U. vitamin D_2 was given to some rats on each diet 3 or 4 days before intraperitoneal injection of 50 μC . of ^{35}S as carrier-free, inorganic sulphate. The rats were killed 16 hr. later.

In the pooled femur, tibia and fibula of both legs, increased uptake of ^{35}S was associated with administration of vitamin D in the groups on the 2 diets of lower Ca content, but with the highest Ca content there was no difference. Raising the Ca content of the diet to 0.8 per cent. from 0.04, without vitamin D, had the same effect. The treatments which increased ^{35}S uptake in the bones promoted appetite and growth. When intake of the diet with 0.8 per cent. Ca was reduced for the rats given vitamin D to that of the rats not given vitamin D, the difference in the ^{35}S content of the bones disappeared. The ^{35}S content of the urine was not significantly affected by the different treatments.—E. M. Hume.

3441

CARLSSON, A. and HOLLUNGER, G. (with LINDQVIST, M. and MAGNUSSON, T.) The effect of vitamin D on the citric acid metabolism. *Acta physiol. scand.*, 1954, **31**, 317-333. [Dept. Pharmacol., Univ. Lund.]

The "Ca-free" diet containing 0.04 per cent. Ca and 0.5 per cent. P (see Abst. 3439) was used, and the Ca and P contents were raised by adding CaCO_3 and $\text{NaH}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$. Rats 3 weeks old were maintained for 3 weeks on the diets. A single dose of 100 or 100,000 I.U. vitamin D_2 was given at varying intervals before the rats were killed. Ca, P and citric acid were estimated in the blood serum, and Ca and citric acid in the tibia and fibula and 4 incisors. Citric acid was estimated by the pentabromoacetone method modified by using *m*-hydroxybenzoic acid instead of H_2O_2 .

Vitamin D caused citric acid to increase in the serum and bones with all the diets used. With a favourable ratio of Ca to P in the diet, a rise occurred in the serum within 24 hr., but could not be detected so soon in the bone. With the diets low in Ca or P the rise was less rapid. The rise in the serum was preceded by a slight drop which occurred sooner with the large dose of vitamin D. With the diet low in Ca, the serum Ca value reflected the citric acid value, and with the diet low in P the serum P value did so. When both minerals were sufficient and the ratio was correct, the serum values for both minerals behaved like the citric acid value, the effect on the P value being the greater. The early drop in the citric acid value was shown also by the Ca or P or both values.

To some animals 100 I.U. vitamin D_2 were given 3 times a week for 3 weeks. The effect in raising the citric acid content of the serum and bones was more marked in the rats having the diet low in Ca.

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The values for serum Ca and P were varied by maintaining the rats for 3 weeks on diets of different Ca and P content without any vitamin D. Raising the P content of the serum seemed to have little effect on the citric acid content of the bones or serum, but raising the Ca value in the serum increased both. The change was, however, much slower than that induced by vitamin D, so that it seemed improbable that the effect of vitamin D on citric acid was indirect through the effect on Ca.

The provisional conclusion was reached that vitamin D acts primarily by promoting the production of citric acid in the bones, and that the influence of the vitamin on the bone salt is thus explained.—E. M. Hume.

3442

SOBEL, A. E. and BURGER, M. **Calcification. 13. The influence of calcium, phosphorus, and vitamin D on the removal of lead from blood and bone.** *J. Biol. Chem.*, 1955, **212**, 105-110. [Dept. Biochem., Jewish Hosp. Brooklyn, N.Y.]

Rats aged from 23 to 25 days were fed on a stock diet containing 0.8 per cent. lead as basic lead carbonate. After 29 days 3 groups were made and given diets without lead, low in Ca and P, or high in Ca and low in P, or low in Ca and high in P; half the rats in each group were given 100 I.U. vitamin D daily. After 18 days they were killed. Ca and P were estimated in the serum, lead in the whole blood, and lead and ash in the femur. The lead concentration in the blood was inversely related to the concentration of P in the serum, and was, therefore, highest in the rats having the diet high in Ca and low in P, without vitamin D; the total amount of lead in the bone was lowest in the same group. The blood concentration of lead was lowest with the diet high in P and low in Ca, with vitamin D. Such a diet might, therefore, be used in acute lead poisoning to reduce the blood concentration from a dangerous height. When the aim is to remove lead from the bones, the diet high in Ca and low in P, without vitamin D, is the most suitable.

E. M. Hume.

3443

NESENT, R. and GASTMEIER, W. **Wachstumssteigerung durch Vitamin D. [Stimulation of growth by vitamin D.]** *Arch. Tierernährung*, 1954, No. 5, Beihefte, 234-243. [Inst. Tierzuchtforsch., Rostock-Dummerstorf.]

Three groups of 10 pigs were given for 112 days from the time they could eat, a diet including 1 litre skimmed milk daily. One group received 1000 I.U. vitamin D₂ daily in the milk, amounting in all to about 90,000 I.U.; another group received 3 injections of vitamin D₂ at monthly intervals,

amounting in all to about 225,000 I.U. The third group had no treatment. The rate of weight increase was superior in the group given vitamin D in milk; injection of vitamin D conferred little benefit. Feed utilisation and quantity of meat at slaughter did not differ greatly between the groups.

In a second similar experiment with 3 groups, one group of 11 young pigs received a vitamin D preparation, Mykostin, containing irradiated dried yeast to give 10,000 I.U. vitamin D₂ daily instead of the injection given in the first experiment. Some slight superiority was again shown by the pigs having vitamin D in milk or as Mykostin, but it is recognised that larger numbers and a statistical analysis of the results are necessary before reliable conclusions can be drawn.

E. M. Hume.

3444

NESENT, R., ALTENKIRCH, W. and OTTO, E. **Wachstumssteigerung durch Vitamin D. 2. Versuche mit Hammeln. [Stimulation of growth by vitamin D. 2. Experiments with wethers.]** *Arch. Tierernährung*, 1954, **4**, 258-264. [Inst. Tierzuchtforsch., Rostock-Dummerstorf.]

Groups of merino wethers had been maintained on a diet consisting, in kg. per 100 kg. bodyweight daily, of oat straw 1, Troblako 1, sugar-beet slices 1, oats 0.5, soya grits 0.2 and rapeseed 0.2. The diet contained Ca 22 g. and P 14.4 g. per 100 kg. bodyweight daily. It appeared to be mildly rachitogenic. Groups of from 4 to 6 of the wethers were maintained further on the diet in stall, and were given in addition for 80 days a single injection of 270,000 I.U. vitamin D₂ in oil, or a teaspoonful daily of Mykostin, containing minerals and irradiated yeast, or no addition. The percentage weight increase and the feed utilisation in g. digestible protein per kg. weight increase were, respectively, for vitamin D₂ 35.6 and 836.6, for Mykostin 31.6 and 917.2, and for no supplement 25.6 and 1113.4, but the differences were not significant. There were small differences in the composition of the carcass.—E. M. Hume.

3445

HANSSLER, H. **Untersuchungen über die Wirkung sehr hoher Vigantolgaben bei verschiedenen Kostformen. [Effect of massive doses of Vigantol with different types of diet.]** *Ztschr. Kinderheilk.*, 1955, **76**, 33-38. [Kinderklin., Univ. Tübingen.]

Seventy-eight rats weighing from 35 to 50 g. were used in experiments with Steenbock's rachitogenic diet No. 2965, low in P, to which Ca was added until the Ca content was 4 times the P content, and with a diet (György diet No. 2,

Klin. Wochenschr., 1930, p. 102) whose Ca content was only one-quarter that of the Steenbock diet. The amount of vitamin D given was 1 or 5 mg. daily, or 2 mg. every other day. With the high-Ca diet and 1 mg. vitamin D daily all the rats were dead or dying within 8 days; they had heavy deposits of Ca in the kidneys and heart muscle. With the same diet and 5 mg. vitamin D daily the outcome was even more rapidly fatal. With the low-Ca diet and 1 mg. vitamin D daily the rats showed no untoward effect, but when 2 mg. were given every other day the results were almost as unfavourable as with the high-Ca diet and 1 mg. daily. An increase in the size of the nuclei in the parathyroid glands was attributed to toxic injury and not to excessive activity of the glands.—E. M. Hume.

3446

BRUNE, H. and EGER, W. Der Einfluss von Adsorbentien (Bolus alba) auf wachsende Ratten bei der chronischen Vitamin D₂-Vergiftung: Das Verhalten des Knochens und innersekretorischer Drüsen, insbesondere der Epithelkörperchen, untersucht mittels chemisch-analytischer, histologischer und röntgenologischer Methoden. [Effect of adsorbents (bolus alba) on growing rats during chronic poisoning with vitamin D₂: behaviour of the bones and endocrine glands, especially the parathyroid glands, studied by chemical, histological and X-ray methods.] *Arch. Tierernährung*, 1954, No. 5, Beihefte, 244-269. [Inst. Tierphysiol., Univ. Göttingen.]

Six groups of 30 rats, 30 days old, were maintained for 5 weeks on a diet of natural foods having a percentage content in the dry diet of Ca 0.882, Mg 0.176 and P 0.949. Vitamin D₂ in ethanol was given daily by stomach tube. One group received ethanol only. At the end of the third week, vitamin D administration was stopped for 2 days and 100 I.U. vitamin A was given. The amount of vitamin D₂ given daily ranged from 5000 to 15,000 I.U. in 4 groups of which 2 received 0.8 g. bolus alba daily. One group had the parathyroid glands removed and received 5000 I.U. vitamin D₂ daily for 1 week, and 7500 daily for the rest of the time, but no bolus alba. Rats from each group were killed every week for examination.

The group without vitamin D was the only one which increased much in weight. More animals died in the groups given bolus alba than in the other groups. Histological and X-ray examination and analysis of the bones showed the changes due to vitamin D excess to be more severe in the rats given bolus alba than in the others. The parathyroid glands of the untreated animals increased in weight with their growth, but in the other groups there was no increase and even finally a loss,

particularly in the rats given the largest doses of vitamin D with bolus alba. The nuclei in the parathyroid glands were measured, and the range of size for 200 nuclei was determined each week in 2 of the untreated animals; the size increased with lapse of time. With vitamin D excess the nuclei were smaller and more so when bolus alba was given. The effects of parathyroidectomy were largely counteracted by excess of vitamin D.

It is concluded that bolus alba promoted the absorption of vitamin D and increased the severity of the toxic signs.—E. M. Hume.

3447

HIBBS, J. W. and POUNDEN, W. D. Studies on milk fever in dairy cows. 4. Prevention by short-time, prepartum feeding of massive doses of vitamin D. *J. Dairy Sci.*, 1955, 38, 65-72. [Dept. Dairy Sci., Ohio Agric. Exp. Stat., Wooster.]

In the years, 1947-53, Jersey cows which had had at least 2 previous lactations, and most of which had previously had clinical signs of milk fever, were given, for from 3 to 8 days before parturition, vitamin D in amounts of from 5 to 30 million U.S.P.U. daily as irradiated dried yeast or irradiated ergosterol.

Of 14 cows given 20 or 30 million U.S.P.U. daily, none developed milk fever; of 12 given 10 million one did so, and of 5 given 5 million, also one. Of 22 cows given no vitamin D, which had previously had milk fever, 14 developed it, and of 50 given no vitamin D, which had previously not had milk fever, 27 developed it. Estimations for some cows were made of serum constituents during the week before and the week after parturition. With all the doses of vitamin D, serum Ca and serum P were better maintained before and after parturition than in untreated cows. In samples of butterfat from a few of the cows given 30 million U.S.P.U. vitamin D daily for 7 days before parturition, the mean vitamin D content in I.U. per g. was on the first day of lactation 300, on the 3rd and 4th day 93, and on the 6th and 7th 55.

It is concluded that administration of 30 million U.S.P.U. vitamin D daily for at least 3, and not more than 7, days before parturition and for one day after it, is a safe and effective means of preventing milk fever, but the minimum effective dose was not accurately determined.—E. M. Hume.

3448

BARBER, R. S., BRAUDE, R., COATES, M. E., HARRISON, G. F., MITCHELL, K. G. and THOMPSON, S. Y. Comparative value of three sources of vitamins A and D for fattening pigs. *Proc. Brit. Soc. Animal Prod.*, 1954, 45-47. [Nat. Inst. Res. Dairying, Univ. Reading.]
See also Abst. 4263.j

VITAMIN E

3449

NAIR, P. P. and MAGAR, N. G. **Colorimetric determination of vitamin E.** *Indian J. Med. Res.*, 1954, **42**, 577-584. [Dept. Biochem., Inst. Sci., Bombay.]

To 1 ml. of a solution containing not more than 150 μ g. α -tocopherol were added 2 ml. of a 0.2 per cent. phosphomolybdic acid solution in glacial acetic acid. The reaction mixture was diluted with 3 ml. pure ethanol exactly 5 min. later, and the intensity of the yellowish green colour developed was measured in a photo-electric colorimeter with a red filter. The colour was stable for about 20 min. A recovery experiment made by adding known amounts of tocopherol to an unknown amount of tocopherol from shark liver oil showed that with the phosphomolybdic acid reagent about 102 per cent. of the tocopherol was recovered. A spectrophotometric study of the colour reaction showed two maxima at 490 and 725 μ . Calciferol, carotenoids, cholesterol and vitamin A had no effect on the colour reaction. Estimation of the vitamin E in 5 specimens of fat from shark liver oils by the present method gave an average value of 1.69 mg. per g., compared with 1.67 by the FeCl_3 $\alpha\alpha'$ -dipyridyl method. When the liver oil was saponified, without the use of an anti-oxidant, the present method gave an average value of 1.33 mg. per g., and the $\alpha\alpha'$ -dipyridyl method gave an average of 0.346 when the oil was untreated and 0.661 after the removal of sterols.—R. J. Ward.

3450

DE CICCO, A. and RENDI, R. **Cromatografia su carta dell' α -tocopherolo.** [Paper chromatography of α -tocopherol.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 672-674. [Ist. Fisiol. Gen., Univ. Rome.]

3451

IRVING, J. T. **Inability of methylene blue to protect the enamel organ against vitamin E deficiency.** *S. African J. Med. Sci.*, 1954, **19**, 107. *Proc. [Joint Dent. Res. Unit. C.S.I.R., Johannesburg.]*

3452

TAPPEL, A. L. **Studies of the mechanism of vitamin E action. 3. In vitro copolymerization of oxidized fats with protein.** *Arch. Biochem. Biophys.*, 1955, **54**, 266-280. [Dept. Food Technol., Univ. California, Davis.]

It was desired to study the formation of yellow-brown copolymers with properties like those of the pigments characteristic of vitamin E deficiency.

An emulsion of an unsaturated lipid, either linoleic acid or cod liver oil, was made to react with the oxygen of the air and one of the amino-compounds sodium caseinate, bovine serum albumin, egg albumin, casein hydrolysate or glycine, in the presence of one of the catalysts haemin, cytochrome c or haemoglobin, or of one of the inhibitors α -tocopherol, nordihydroguaiaretic acid, propyl gallate, di-*t*-butyl-*p*-cresol or butylated hydroxyanisole. Cytochrome c and haemoglobin significantly increased the rate of copolymer formation over that brought about by autocatalysis, when the reactants were linoleic acid and caseinate, and all the three haematin compounds gave large increases in the rate of copolymer formation from the mixture of cod liver oil and caseinate. Copolymer was formed when linoleic acid or cod liver oil reacted with haemoglobin without the presence of caseinate. The amount of copolymer formed was found to increase as the molecular weight of the N source increased from amino-acid to protein hydrolysate and protein. The inhibition of copolymer formation was studied with the cod liver oil and aqueous caseinate emulsion, with haemoglobin as catalyst. α -Tocopherol was considerably less effective as an inhibitor of copolymer formation than the other phenolic anti-oxidants tested.

R. J. Ward.

3453

MILLER, R. F., SMALL, G. and NORRIS, L. C. **Studies on the effect of sodium bisulfite on the stability of vitamin E.** *J. Nutrition*, 1955, **55**, 81-95. [Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

When day-old chicks were given a basal diet which contained mixed tocopherols and alpha-protein from soya bean, 26 per cent. died and 58.9 per cent. had exudative diathesis. Addition of 6 per cent. brewer's yeast reduced the mortality to 8.6 per cent. and exudative diathesis did not occur. The substitution of tocopheryl acetate for mixed tocopherols reduced the mortality to 6.7 per cent., as did the substitution of starch for Cerelese. When the alpha-protein was purified by washing with water, to reduce the sulphite content from about 1 to 0.04 per cent., no death resulted and no exudative diathesis occurred. When 15 chicks were fed on the purified basal diet with 0.1 per cent. added sodium bisulphite, 5 died, 5 had encephalomalacia and 3 had exudative diathesis. With 0.2, 0.3 and 0.4 per cent. added bisulphite there were 14, 15 and 15 deaths, 10, 12 and 11 cases of encephalomalacia and 2, 0 and 0 cases of exudative diathesis. When 0.125 per cent. methylene blue was added to the basal diet with 0.2 per

cent. bisulphite, there was no case of encephalomalacia or exudative diathesis, and rancidity of the diet was prevented. Lecithin, cephalin or sodium bicarbonate added to the basal diet with 0.2 per cent. bisulphite gave a lower incidence of encephalomalacia with more exudative diathesis but had no effect on rancidity. When the basal diet contained unsaturated fat and bisulphite with or without tocopherols, nearly all the chicks developed encephalomalacia and some exudative diathesis, and the feed became very rancid. Hydrogenated fat with bisulphite caused no vitamin E deficiency, and only one chick developed encephalomalacia and 3 exudative diathesis when rancidified fat and bisulphite were used in the diet.—R. J. Ward.

3454

DNINING, J. S. The nature of the creatinuria of nutritional muscular dystrophy in the rat. *J. Nutrition*, 1955, 55, 209-215. [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

For 70 days weanling rats were given a basal diet with or without vitamin E, vitamin B₆ or both. After an injection, per 100 g. bodyweight, of 10 μ C. of either sodium ¹⁴C-formate or ¹⁴C-methyl-labelled choline chloride, urine was collected for 16 hr. and creatine and creatinine were estimated by the Jaffe reaction. Creatinine and total creatine were isolated as the zinc chloride salt after the addition of carrier, and purified to constant radio-activity.

For the rats injected with radio-active choline the creatine excreted, in mg. per 100 g. bodyweight, by the doubly deficient group was 4.45, by the vitamin-E-deficient group 1.18, by the vitamin-B₆-deficient group 1.82, and by the non-deprived group 0.17. Corresponding creatine values were 2.04, 2.87, 2.20 and 2.70 mg. per 100 g. bodyweight. Creatine specific activity, in counts per min. per micromole, was 159, 72, 69 and 35 for the 4 groups, respectively. When sodium ¹⁴C-formate was injected, the effects of the dietary supplements on bodyweight and on creatine and creatinine excretion were like those obtained with radio-active choline. The specific activity of creatine was again high in the doubly deprived group and again seemed to be related to the quantity of creatine excreted.

It was concluded that the creatinuria which accompanied nutritional muscular dystrophy in the rat was the result of inability of the muscle to retain creatine.—R. J. Ward.

3455

LA GRUTTA, G. and CILENTO, A. Sui rapporti tra metabolismo glicidico e vitamina E. [Relation between carbohydrate metabolism and

vitamin E.] *Arch. Fisiol.*, 1954, 54, 92-112. [Ist. Fisiol., Univ. Palermo.]

See Title 689, Vol. 21; Absts. 4168, Vol. 23; 2979, Vol. 24; *Boll. Soc. ital. Biol. sper.*, 1948, 24, 1044; 1953, 29, 1573.

3456

GRAY, D. E. and DeLUCA, H. A. An antagonistic action between vitamin E and alloxan in carbohydrate metabolism of rat diaphragm. *Arch. Biochem. Biophys.*, 1955, 54, 534-540. [Dept. Biochem., Univ. W. Ontario, London.]

Rats of the Sprague Dawley strain were divided into 3 groups and fed on a diet deficient in vitamin E for 4 to 6 weeks, the first group without vitamin E supplement, the second with a maintenance dose of 0.5 mg. tocopherol daily per rat. The third group received excess of the vitamin equivalent to a daily dose of 100 mg. per rat. At the end of the time one animal from each group was killed daily. The diaphragm was removed, divided into 2 approximately equal portions, and washed with an alloxan monohydrate solution at pH 3.5. One portion was subsequently placed in hot 30 per cent. solution of KOH. Oxygen consumption was measured for both tissues and the amounts of glycogen and glucose taken up by the portions were calculated. A separate series of diaphragms were similarly treated except that the alloxan washing was omitted. It was found that in the vitamin-E-deficient rats the alloxan washing inhibited glucose uptake, glycogen synthesis and oxygen uptake. Uptakes of glucose and oxygen were almost normal in diaphragms from rats in the second group which had received sufficient vitamin E, and formation of glycogen was less inhibited. When rats with excess of vitamin E were examined it was found that there was no additional effect.—I. M. Sharman.

3457

GORCO, J. A. and ASENJO, C. F. Effect of methionine, vitamin B₁₂ and α -tocopherol on the growth-promoting and hepatic-necrogenic activity of Puerto Rican *Torula* yeast. *J. Nutrition*, 1954, 54, 427-435. [Dept. Biochem., Sch. Trop. Med., Univ. Puerto Rico, San Juan.]

Male rats weighing 45 g. were given for 4 weeks a basal diet in which *Torula* yeast supplied 18 per cent. protein and which had a methionine content of 0.24 per cent. One group was given the basal diet only, and others received supplements of methionine as from 0.01 to 2 per cent. of the diet, or 2 mg. α -tocopherol a week, or 200 μ g. vitamin B₁₂ per kg. diet or combinations of the 2 last with 0.5 per cent. methionine.

Improvement in growth and efficiency of protein utilisation occurred with 0.05 per cent. methionine

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and maximum growth and protein efficiency with 1 per cent. Addition of 2 per cent. methionine retarded growth and reduced protein intake and efficiency. Addition of vitamin B₁₂ increased protein intake and gain in weight. α -Tocopherol alone was without effect, but when given with methionine it improved growth and protein efficiency. Methionine and vitamin B₁₂ quadrupled the weight gain and doubled the protein efficiency. With all 3 together protein efficiency was slightly higher than with methionine and α -tocopherol. Gross hepatic necrosis occurred in animals receiving less than 0.05 per cent. added methionine, and in one instance in a group of rats receiving a supplement of 200 μ g. vitamin B₁₂ per kg. diet.—R. J. Ward.

3458

ROSECAN, M., RODNAM, G. P., CHERNICK, S. S. and SCHWARZ, K. C¹⁴-acetate utilization in dietary necrosis of the liver. *J. Lab. Clin. Med.*, 1954, **44**, 919. *Proc.* [Bethesda, Md.]

3459

DINNING, J. S. The role of vitamin E in regulating the turnover rate of nucleic acids. *J. Biol. Chem.*, 1955, **212**, 735-739. [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

Weanling rats were given a purified diet deficient in vitamin E with or without a supplement of α -tocopheryl acetate rising from 4 mg. a week at the beginning of the experiment to 16 mg. a week after 5 months. At this time individual samples of urine were analysed for creatine, creatinine and allantoin. The rats were then injected with 0.2 ml. per 100 g. bodyweight of a solution of sodium ¹⁴C-formate and were killed 4 hr. later. Samples of liver, small intestine and skeletal muscle were taken for fractionation by the method of Schneider (Title 2915, Vol. 15).

The average bodyweight of the non-deprived rats was 378 g. and of the deprived 336 g. Excretion of creatinine, creatine and allantoin, respectively, in mg. per g. bodyweight daily, was 29.2, 4.7 and 110 for the non-deprived and 28.8, 9.5 and 174 for the deprived. Incorporation of ¹⁴C-formate into the tissue proteins was similar for the 2 groups, but into the nucleic acids, in counts per min. per micromole of phosphorus, for the small intestine, liver and skeletal muscle, respectively, it was 150.5, 14.6 and 10.8 for the non-deprived group and 140.5, 33.8 and 16.5 for the deprived. Incorporation of ¹⁴C-formate into the ribonucleic acid, deoxyribonucleic acid and ribonucleic acid purines of the liver by the non-deprived group was 13.5, 8.5 and 28.3 counts per min. per micromole of phosphorus and by the deficient group 36.2, 12.8 and 82.0.—R. J. Ward.

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3460

TENTORI, L., TOSCHI, G. and VIVALDI, G. L'effetto dell'ipertiroidismo sperimentale sulla comparsa di lesioni muscolari nel ratto mantenuto ad una dieta carente di vitamina E. [The effect of experimental hyperthyroidism on the appearance of muscle lesions in rats maintained on a diet deficient in vitamin E.] *Rend. Ist. Super. Sanità, Rome*, 1954, **17**, 106-114. French, English and German summaries.

Of 2 groups of 8 rats given a diet deficient in vitamin E, containing, per cent., casein 29, starch 36, lard 20, dried yeast 9, salt mixture 3.6 and cod liver oil 2, one group received 0.5 per cent. dried thyroid gland. Rats from each group were killed after 2 and 3 months, and the quadriceps, trapezius, pectoralis major and psoas muscles were examined histologically. Degenerative changes were advanced in the group given thyroid, but were absent from those not given it.

In a second experiment the diet contained, per cent., fat-extracted casein 25, starch 51, dried yeast 10, salt mixture 4, lard 10; 1200 I.U. vitamin A and 100 I.U. vitamin D were given separately. One group of 6 rats received the basal diet alone, and 2 other groups received separately 100 mg. thyroid daily by mouth, one of them having in addition 1 mg. α -tocopheryl acetate daily. All were killed after 2 months. The results resembled those in the first experiment. The rats given thyroid had advanced muscle lesions; those not given thyroid and those given thyroid with α -tocopherol had normal muscles.

It is concluded that thyroid accelerated the appearance of the muscle lesions characteristic of vitamin E deficiency, but did not modify the type of lesion.—D. Duncan.

3461

BOMPIANI, G. D. Ricerche sulla ultrastruttura della fibra muscolare striata nella avitaminosi E sperimentale del coniglio. [The ultrastructure of striped muscle fibres of the rabbit deprived of vitamin E.] *Rend. Ist. Super. Sanità, Rome*, 1954, **17**, 1021-1034. French, English and German summaries.

Preparations of psoas muscle from normal rabbits and from rabbits deprived of vitamin E were examined with the electron microscope, fresh and after fixation in 10 per cent. formalin. The myofibrils in deficient muscle were much more easily separated than in normal muscle and required much shorter treatment. The results are illustrated in 18 plates, which are interpreted as showing the effects of deficiency in the partial or total disappearance of myosin, while the disintegration of the actin filaments is ascribed to failure in the polymerisation of their protein constituent.—E. M. Hume.

3462

MULDER, A. G., GATZ, A. J. and TIGERMAN, B. Phosphate and glycogen determinations in the hearts of vitamin E-deficient rabbits. *Amer. J. Physiol.*, 1954, **179**, 246-248. [Dept. Physiol., Stritch Sch. Med., Loyola Univ., Chicago, Ill.]

Littermate rabbits were given a diet deficient in vitamin E with or without a supplement of 50 mg. tocopheryl acetate per kg. bodyweight. After about 4 weeks the deprived group showed a marked loss of weight with muscular weakness and paralysis. Electrocardiograms taken at this time showed inversion of the QRS₁ and QRS₂ waves with subsequent inversion of the axis deviation and reduction in the potential of the P and T waves. The rabbits were killed by a blow on the back of the head or by Nembutal anaesthesia, and the hearts were removed and frozen immediately in dry ice and ether. Comparison with non-deprived rabbits killed in the same way showed that the amount of cardiac glycogen was not modified in vitamin E deficiency. The mean creatine phosphate value in the non-deprived group was 6.1 mg. per cent. compared with 0.9 in the deprived group. No significant difference occurred in the inorganic phosphate and adenosinephosphate fractions of the hearts.—R. J. Ward.

3463

DESSAU, F. I., LIPCHUCK, L. and KLEIN, S. Heart lesions in mice given diets deficient in vitamins E and K. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 522-524. [Chem. and Biol. Res. Sect., Amer. Cyanamid Co., Res. Div., Lederle Labs., Pearl River, N.Y.]

Heart lesions were present in mice given a diet containing 0.1 per cent. sulphaguanidine and deficient in vitamins E and K. The lesions included massive capillary haemorrhages, necrosis of the muscle and leucocytic infiltration. The heart remained normal if either vitamin E or vitamin K was supplied.—T. Moore.

3464

LU, F. C., ALLMARK, M. G. and GRAHAM, W. D. The actions of α -tocopherol on mammalian hearts. *Canad. J. Biochem. Physiol.*, 1955, **33**, 21-24. [Food and Drug Labs., Dept. Nat. Health and Welfare, Ottawa, Ont.]

Various esters of dl- or d- α -tocopherol and a compound described as a water-soluble form of d- α -tocopherol were tested for their stimulatory action when injected or infused into isolated rabbits' hearts or into dogs' hearts *in situ*. No significant pharmacodynamic action could be demonstrated, on either the coronary flow or the hearts' contractions.—T. Moore.

3465

MASCARINI GRATTAROLA, M. and BRANCO, L. Azione degli estrogeni naturali e sintetici e della vitamina E sulle galline deponitrici. Effects of natural and synthetic oestrogens and vitamins E on laying hens. *Ann. Sper. agrar.*, 1954, **3**, 1257-1264. [Ist. Zootec. Cascar. Piedmont, Turin.] English summary.

Intramuscular injections of natural folliculin or synthetic stilboestrol increased the egg production of White Leghorn hens in their second laying year, shortened the period of moulting and increased fertility. The folliculin reduced the hatching capacity of the eggs. Injections of vitamin E, as α -tocopherol, did not have any beneficial effect on egg production, and reduced hatching capacity. The method of giving the oestrogens was too expensive to be economically worth while.

T. D. Bell.

3466

TELFORD, I. R., WISWELL, O. B. and SMITH, E. L. Tocopherol prophylaxis in multiple exposure to hypoxia. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 162-164. [Univ. Texas Dent. Branch, Houston.]

Rabbits were kept on a diet deficient in vitamin E, on the same diet with supplements of α -tocopherol, or on a stock diet. Resistance to reduced atmospheric pressure was less in the deprived group than in the other two. After 3 periods in the decompression chamber, none out of 20 in the deprived group survived; of 21 given stock diet 5 survived, and of 18 given tocopherol 10.

T. Moore.

3467

TEDESCHI, G. G. and DE CICCO, A. Ricerche sull'azione anti-vitaminica E del timolo, carvacolo, guaiacono. [Antivitamin E action of thymol, carvacrol and guaiaconol.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 727-729. [Ist. Fisiol. Gen., Univ. Rome.]

An injection of 50 mg. thymol acetate or carvacrol acetate given to female rats just before mating had no deleterious effect on the subsequent pregnancy or young. Injected with 50 mg. guaiaconol acetate, female rats of 120 g. weight died within a day or two; female rats of 200 g. weight, injected with the same dose just before mating, did not die, but when they were killed 19 days later, the embryos were very small or dead. Injection of the same dose during gestation caused disturbance of gestation and death of the young. Female rats mated 20 days after the injection had normal young. Administration of 10 mg. α -tocopherol at the same time as 50 mg. guaiaconol acetate, just before mating, successfully counteracted the effect of the latter. Injection of 3 spaced doses of 50 mg. guaiaconol acetate caused testicular degeneration in male rats.—E. M. Hume.

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VITAMIN K

3468

DODI, B. Vitamina K e sviluppo mammario. [Vitamin K and mammary development.] *Riv. Zootec.*, 1954, **27**, 348-350. [Ist. Zootec. Gen., Fac. Agrar., Piacenza.]

The ovaries were removed from 18 guineapigs at the age of 60 days. After 3 months 5 were killed and complete involution of the mammary parenchyma was found. The remaining 13 were given a mixed diet and divided into 3 groups, untreated or given vitamin K by intramuscular injection until in 70 days they had received a total of 36 or 135 mg. (20,000 or 75,000 Thayer Doisy units). All were then killed.

Macroscopically the only significant difference was the greater length and diameter of the uterus in the treated animals. No difference was evident in the mammary tissue, but microscopically it was seen that in both treated groups there was alveolar development and sometimes secretory activity. There was no significant difference in the degree of mammary development between the 2 treated groups.

The possible bearing of the finding on hitherto unexplained differences in mammary development in dairy cows is discussed.—D. Duncan.

3469

WRIGHT, H. P. and HAYDEN, M. The effect of diet upon the response to oral anticoagulants. *J. Clin. Pathol.*, 1955, **8**, 65-68. [Obstet.

Unit, University Coll. Hosp. Med. Sch., London.]

In order to assess the possible interference of diet in the response of patients to treatment with anticoagulants such as Tromexan and Dindevan, experiments were made on rats receiving diets containing 3 or 31 per cent. of fat with 10 of casein and 5 of yeast. The effect of the anticoagulant on the blood picture and on prothrombin time was slightly greater, and the lethal dose of anticoagulant was less, for rats given the low-fat diet. The differences in response between the 2 groups of rats were less when additional bile salts were given, showing that they facilitated the absorption of the anticoagulant. The rise in prothrombin time in response to anticoagulants was greater in rats receiving antibiotics. In view of the findings, it is considered that the diets of patients receiving anticoagulant treatment should be carefully controlled, especially the fat content.—A. M. Copping.

3470

QUICK, A. J., HUSSEY, C. V. and COLLENTINE, G. E. The effect of bile deprivation in the growing puppy. *J. Lab. Clin. Med.*, 1954, **44**, 909-910. *Proc.* [Milwaukee, Wis.]

It was concluded that an animal deprived of bile can grow and mature, provided vitamins A, K and possibly D are supplied by injection.

See also Abst. 3463.

VITAMIN B COMPLEX: GENERAL

3471

MARTEN, G. Zur quantitativen, biographischen Auswertung von Vitamin-Chromatogrammen. [Quantitative biographic evaluation of chromatograms of vitamins.] *Internat. Ztschr. Vitaminforsch.*, 1955, **25**, 392-401. [Anst. Vitaminforsch., Potsdam-Rehbrücke.] English and French summaries.

A method for estimating nicotinic acid, riboflavin and vitamin B₁ was developed in which strips from round paper chromatograms were applied to the surface of agar medium in large petri dishes. Full details are given of the method of plotting and calculating the results.

A. M. Copping.

3472

MITOLO, M., DE FELICE, F., RUCCIA, D., TERLIZZI, L., CAMASSA, M. C. and TERLIZZI, F. Elettrocorticogrammi del ratto albino nelle singole avitaminosi del complesso B. [Electrocorti-

cograms of the albino rat deprived of individual members of the vitamin B complex.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 484-486. [Ist. Fisiol., Univ. Bari.]

Readings with the electrocorticograph were made on young male rats weighing from 45 to 55 g. at the beginning of the experiment. The rats were maintained on a normal diet, or on a complete purified diet with or without omission of individual B vitamins. In the deprived rats, disturbances in the electrocorticogram appeared early before other signs of deficiency. They disappeared again on treatment with most of the missing vitamins, but not with riboflavin or vitamin B₁₂. With lack of vitamin B₁ there was a definite increase in the amplitude of the cortical wave with a decrease in frequency. With lack of folic acid frequency increased and amplitude decreased. With deprivation of the other B vitamins there was a decrease in both amplitude and frequency.

E. M. Hume.

3473

TRIBE, D. E. and GORDON, J. G. **Choice of diet by rats. 3. The importance of the sense of smell in the choice of diets deficient in the vitamin B complex.** *Brit. J. Nutrition*, 1955, 9, 1-4. [Rowett Res. Inst., Bucksburn, Aberdeen-shire.]

For earlier parts, not numbered, see Absts. 373, 696, Vol. 24. A choice of 2 diets identical except that one lacked the vitamin B complex was given to 7 rats each deprived of its olfactory bulbs. When deprived of B vitamins the rats greatly preferred the diet with the vitamins and when not deprived preference was slight but definite. Since normal rats gave similar results (see Abst. 373, Vol. 24), a sense of smell was concluded not to be necessary for diet selection.—A. Hepburn.

3474

SCHENDEL, H. E. and JOHNSON, B. C. **Studies of antibiotics in weanling rats administered suboptimum levels of certain B vitamins orally and parenterally.** *J. Nutrition*, 1954, 54, 461-468. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

The effect of aureomycin was studied on the response to pantothenic acid, and of penicillin on the response to vitamin B₁, by rats having a purified diet lacking in the vitamin under test. Aureomycin was given as 200 µg. per g. diet to rats receiving 2 or 40 µg. pantothenic acid per g. diet by mouth or 1 or 20 µg. per g. diet by subcutaneous injection. With 1 or 2 µg. addition of aureomycin significantly increased the growth response, but it had no effect with 20 or 40 µg., which was adequate by itself for a full growth response. Inclusion of aureomycin in the diet increased also the amount of pantothenic acid found in the intestinal contents of rats given the small amounts.

Penicillin was given as 50 µg. per g. diet to rats receiving 0.5 or 25 µg. vitamin B₁ per g. diet by mouth or 0.25 or 10 µg. per g. diet by subcutaneous injection. The antibiotic stimulated the growth of rats receiving the suboptimum doses of vitamin B₁ given orally or parenterally but had only a very slight effect with the large doses. The possible mode of action of the antibiotics is discussed in relation to intestinal synthesis, protection and absorption of pantothenic acid and vitamin B₁.

A. M. Copping.

3475

HALEVY, S., DIAMANT, E. J. and GUGGENHEIM, K. **The effect of antibiotics on the metabolism of nicotinic acid, biotin and folic acid in rats.** *Brit. J. Nutrition*, 1955, 9, 57-62. [Lab. Nutrit., Dept. Biochem., Hebrew Univ.-Hadassah Med. Sch., Jerusalem.]

In a previous study (Abst. 379, Vol. 24) the effect of antibiotics was studied on the metabolism of

those B vitamins which are synthesised to a limited extent in the rat intestine. The effect on nicotinic acid, biotin and folic acid, which are abundantly synthesised, was now examined. Rats were given purified diets with aureomycin, oxytetracycline, penicillin or streptomycin. Aureomycin increased the amount of nicotinic acid in the liver, and in rats receiving sulphonamide it increased the excretion of biotin and folic acid in the urine. Oxytetracycline had an effect like that of aureomycin. Penicillin appeared to have no effect on the metabolism of nicotinic acid, biotin or folic acid. Streptomycin reduced the urinary excretion and the liver stores of folic acid, and the biotin content of the urine and faeces. There was no evidence that the antibiotics affected the conversion of folic acid to citrovorum factor.

A. M. Copping.

3476

KON, S. K. and PORTER, J. W. G. **The intestinal synthesis of vitamins in the ruminant.** *Vitamins and Hormones*, 1954, 12, 53-68. [Nat. Inst. Res. Dairying, Univ. Reading.]

3477

BOHMAN, V. R., HUNTER, J. E. and WALKER, L. **Antibiotics and B-vitamins for lambs.** *J. Animal Sci.*, 1955, 14, 111-117. [Dept. Animal Husb., Univ. Nevada, Reno.]

Two trials were made with fattening lambs and one with orphan lambs to compare supplements of 0, 5, 10 and 20 mg. aureomycin per lb. concentrates, with or without supplements of vitamin B complex. None of the treatments improved rate of gain, dressing percentage or carcass grade, and no ill effect was seen.—T. D. Bell.

3478

HALL, A. P., MOORE, J. G. and MORGAN, A. F. **B vitamin content of California-grown avocados.** *J. Agric. Food Chem.*, 1955, 3, 250-252. [California Agric. Exp. Stat., Univ. California, Berkeley.]

Means and ranges for proximate composition and content of vitamin B₁, riboflavin, nicotinic acid, pantothenic acid, vitamin B₆, folic acid and biotin are tabulated for 3 varieties of avocado grown in California in 4 crop years. The methods of analysis were as previously described (Abst. 4212, Vol. 23).

No consistent effect on composition of crop year, time of harvesting, cold storage or ripening at room temperature was found. The chief differences between varieties was in fat content. The varieties Fuerte, Hass and Anaheim (low-fat) had, respectively, mean contents, in mg. per cent., of vitamin B₁ 0.12, 0.09, 0.08, riboflavin 0.22, 0.23, 0.21, nicotinic acid 1.45, 2.16, 1.56, pantothenic

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acid 0.90, 1.14, 1.11, vitamin B₆ 0.61, 0.62, 0.39 and folic acid 0.03, 0.04, 0.078, and of biotin 0.055, 0.056, 0.034 μ g. per g. fresh material. Rat growth tests were made with some samples; the results did not always agree with those of the microbiological tests, possibly owing to poor absorption.

Avocados are considered to compare favourably with most fruits and vegetables and certain other foods as a source of vitamin B₁, riboflavin and nicotinic acid, and possibly of the other B vitamins mentioned, but for the last the data are not so far adequate for valid comparisons.—W. M. Deans.

See also Absts. 3351, 3376, 3382.

VITAMIN B₁ (ANEURIN, THIAMINE)

3479

GAUDIANO, A. Determinazione della tiamina mediante misura spettrofotometrica del tiocromo. [Estimation of vitamin B₁ by spectrophotometric measurement of thiochrome.] *Rend. Ist. Super. Sanità, Rome*, 1954, **17**, 591-600. French, English and German summaries.

Thirteen sources of error are discussed which make fluorimetric estimation of vitamin B₁ unreliable. Three variations are described of a method for spectrophotometric estimation of the vitamin as thiochrome, after oxidation with alkaline potassium ferricyanide. No standard is necessary, and the procedure requires from 10 to 200 μ g. vitamin B₁, depending on the photometer. D. Duncan.

3480

GAUDIANO, A., TOFFOLI, F. and BOCCACCI, M. Determinazione chimica della cocarbossilasi sintetica. [Chemical estimation of synthetic cocarboxylase.] *Rend. Ist. Super. Sanità, Rome*, 1954, **17**, 498-520. French, English and German summaries.

A method is described for estimating synthetic cocarboxylase purified by paper chromatography, with as solvent either equal parts of isobutanol, pyridine and water, with 1 per cent. acetic acid, or 20 per cent. urea, 85 per cent. formic acid and *n*-propanol in the proportions 1:2:3. Fractions could be estimated quantitatively by estimation of phosphorus or by densitometry or by spectrophotometric estimation of eluted vitamin B₁. Six vitamin B₁ compounds have been found in some commercial cocarboxylase products.—D. Duncan.

3481

DEODATA DE AZEVEDO, M. Sur le dosage de la thiamine par la méthode de thiochrome, sans adsorption. [Estimation of vitamin B₁ by the thiochrome method without adsorption.] *Arch. portugaises Sci. biol.*, 1952-53, **11**, 3-5. [Inst. Rocha Cabral, Lisbon.]

A warning is given that disappearance of vitamin B₁ in testing a thiaminase system may be due to adsorption of the vitamin on to colloids in the system and not to its destruction by the enzyme. E. M. Hume.

3482

YURUGI, S., MATSUOKA, T. and TOGASHI, M. Studies on vitamin B₁ and related compounds. 61. Studies on the reaction between thiamine and ingredients of the plants of *Allium* genus. (6). *J. Pharm. Soc. Japan*, 1954, **74**, 1017-1021. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

3483

YOSHIDA, S. Studies on the allied compounds of vitamin B₁. 16. S-Acylthiamine derivatives. *J. Pharm. Soc. Japan*, 1954, **74**, 993-997. [Takamine Res. Lab., Sankyo Co., Ltd., Tokyo.] English summary.

3484

KAWASAKI, C. and HORIO, T. Oxidation of thiamine by chlorite and chlorine dioxide.

KAWASAKI, C., HORIO, T. and HAMADA, G. Oxidation of thiothiamine by chlorine dioxide and other oxidising agents. *J. Pharm. Soc. Japan*, 1954, **74**, 904-907; 907-911. [Pharm. Inst., Med. Fac., Univ. Osaka.] English summaries.

3485

BUDĚŠŇSKÝ, Z. and KOPECKÝ, J. Nová syntese pyrimidinové složky vitamínu B₁. [New synthesis of the pyrimidine component of vitamin B₁.] *Chem. Listy*, 1954, **48**, 1364-1369. [Pharmacol. Res. Inst., Prague.]

3486

BALAKRISHNAN, S. and RAJAGOPALAN, R. Influence of protein quality on the biosynthesis of thiamine in rats. *Indian J. Physiol. Allied Sci.*, 1954, **8**, 111-116. [Dept. Biochem., Indian Inst. Sci., Bangalore.]

Rats weighing between 60 and 80 g. were given diets containing 15 per cent. protein, as casein, whole egg or soya bean protein, with 1.5 μ g. vitamin B₁ per g. diet and other essential vitamins. The urinary and faecal excretion of vitamin B₁ and the faecal and caecal flora were studied. No significant difference was found between the groups to suggest that the nature of the dietary protein had any effect on the intestinal synthesis of vitamin B₁.—A. M. Copping.

3487

BALAKRISHNAN, S. and RAJAGOPALAN, R. Influence of some typical Indian diets on the intestinal flora and thiamine synthesis in rats. *Indian J. Med. Res.*, 1955, **43**, 31-38. [Dept. Biochem., Indian Inst. Sci., Bangalore.]

Four groups of rats were fed on Indian diets of 4 types, the vegetarian rice diet consumed in Madras and Southern India, the fish and rice diet of Bengal, the whole wheat vegetarian diet of Central India and the Punjab, and the ragi and rice diet of the poorer classes of Mysore. The highest weight gain, urinary excretion of vitamin B₁, vitamin B₁ content of the liver and total counts of faecal flora were found in rats given the wheat diet; the results with ragi and rice were almost as good. Weight gain and synthesis of vitamin B₁ were poor with the rice and fish and the vegetarian rice diets.—A. M. Copping.

3488

SAKENA, K. C., GHATAK, S. and AGARWALA, S. C. Inhibition of thiamine synthesis by vitamin B₁₂ in wild strains of *Escherichia coli*. *Experientia*, 1954, **10**, 488-489. [Central Drug Res. Inst., Lucknow.]

In cultures of freshly isolated wild strains of *Bacterium coli* in the glucose and salt medium of Davies and Mingioli (*J. Bacteriol.*, 1950, **60**, 17) addition of vitamin B₁₂ inhibited synthesis of vitamin B₁. With 0.01 µg. vitamin B₁₂ per ml. there was a decrease of 23 per cent. in the amount of vitamin B₁ formed in 24 hr.; with 1.0 µg. per ml. the decrease was 55 per cent. No explanation of the inhibition could be found and the growth of the *Bact. coli* cultures was not affected by vitamin B₁₂ in the medium.—A. M. Copping.

3489

GERSHOFF, S. N. and HEGSTED, D. M. The failure of thyroxine and high-fat diets to modify the rate of thiamine loss from the body. *J. Nutrition*, 1954, **54**, 609-619. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Young adult male mice were fed on diets containing 5 or 20 per cent. fat and no vitamin B₁. In another test, the low-fat diet was given with 25 mg. thyroxine per kg. diet. Animals were killed on the first day and at intervals for 20 days. The total vitamin B₁ and cocarboxylase content of the carcass and liver were measured by microbiological methods. Mice on the high-fat diet lost weight less rapidly and survived longer than those on the low-fat diet, and thyroxine hastened weight loss and death. There was, however, no difference in the rate of loss of vitamin B₁ or cocarboxylase from the carcass or liver of the mice on the different diets. It was concluded that the rate of loss of

vitamin B₁ was dependent on the amount originally present in the body and not on the type of diet given during depletion.—A. M. Copping.

3490

COVER, S. and SMITH, W. H. (Jr.) Variation in thiamine and niacin content of raw lamb muscle. *J. Animal Sci.*, 1955, **14**, 173-177. [Dept. Animal Husb., Texas Agric. Exp. Stat.]

Variations previously reported in the B vitamin content of lamb muscle (Abst. 1771, Vol. 17) were further investigated with lambs from 3 experiments on treatment with aureomycin. Aureomycin did not appear to affect the vitamin B₁ or nicotinic acid content of the muscle; significant variations in both were found in muscle from lambs similarly treated. Leg muscle was slightly richer in vitamin B₁ and nicotinic acid than shoulder and breast. The causes of variation could not be resolved.—A. M. Copping.

3491

DE CARO, L., RINDI, G. and PERRI, V. Comportamento del piruvato ematico in ratti ipofisectomizzati ed in avitaminosi B₁. [Behaviour of blood pyruvate in hypophysectomised rats and in vitamin B₁ deficiency.]

DE CARO, L., RINDI, G. and FERRARI, G. Comportamento del piruvato ematico di ratti in avitaminosi B₁, in seguito a surrenectomia. [Behaviour of blood pyruvate in rats deprived of vitamin B₁ after adrenalectomy.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 465-468; 468-470. [Ist. Fisiol. Umana, Univ. Pavia.]

Blood pyruvate and the vitamin B₁ content of the tissues were estimated at intervals in rats which were deprived for between 30 and 40 days of vitamin B₁ and of which some had had the pituitary gland removed. In the latter the weight of the adrenal glands was much less than in intact rats. The vitamin B₁ content of the liver, muscle and brain did not fall quite so rapidly, and the pyruvic acid in the blood rose considerably more slowly.

In rats deprived of vitamin B₁, the adrenal glands of some were removed at intervals of up to 22 days, and blood pyruvate and vitamin B₁ in the tissues were estimated 3 or 4 days later. The same estimations were made on non-deprived, intact and adrenalectomised rats. Blood pyruvate was lower in the adrenalectomised rats, whether deprived or not. In the deprived animals the rate of depletion of vitamin B₁ from the tissues did not greatly differ whether they were adrenalectomised or not.

E. M. Hume.

3492

MONFOORT, C. H. The disappearance of pyruvic decarboxylase and α -ketoglutaric decarboxylase

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from pigeon muscles on thiamine-deficient diets. *Biochem. biophys. Acta*, 1955, **16**, 219-228; *Arch. internat. Physiol.*, 1954, **62**, 571-572. *Proc. [Lab. Physiol. Chem., Univ. Utrecht, Netherlands.] French and German summaries.*

Homogenates of breast and heart muscle from pigeons receiving a normal cereal diet or purified diets lacking vitamin B₁ were examined manometrically for production of acetoin and succinic semi-aldehyde with or without addition of vitamin B₁ pyrophosphate. The vitamin B₁ pyrophosphate content of the muscles was estimated also. As depletion of vitamin B₁ progressed, anaerobic metabolism of pyruvate to acetoin and of α -ketoglutarate to succinic semi-aldehyde decreased. The α -ketoglutaric decarboxylase activity decreased less rapidly than the pyruvic decarboxylase activity, and the inclusion of sucrose or peanut oil in the diet affected the rate of loss of activity. In extreme deprivation the pyruvic decarboxylase activity of breast muscle was less with fat in the diet than with sucrose. The α -ketoglutaric decarboxylase activity of breast muscle was less also with fat than with carbohydrate. In most pigeons the α -ketoglutaric decarboxylase of heart muscle was less with carbohydrate than with fat in the diet. It appeared that the decarboxylases were not completely lost even when the birds died of vitamin B₁ deficiency. Vitamin B₁ pyrophosphate decreased as deprivation became more severe, but it also was not completely lost.—A. M. Copping.

3493

LORENZI, G. L. and DE BERNARD, B. Studi sulla biochimica dell'ossificazione. 4. Contenuto di coccobossilasi nella cartilagine metafisaria e nel sangue del coniglio in relazione all'età. [*Biochemistry of ossification. 4. Cocarboxylase content of metaphyseal cartilage and blood of the rabbit in relation to age.*]

CASSELLANI, A. and ZAMBOTTI, V. 5. Presenza di succinodeidrasii nella cartilagine metafisaria. [5. Presence of succinic dehydrogenase in metaphyseal cartilage.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 451-453; 453-455. [*Inst. Chini. Biol., Univ. Pavia.*]

4. In 19 common rabbits aged from 25 to 30 days, the cocarboxylase activity of metaphyseal cartilage was 43 per cent. less than in 20 common rabbits aged from 10 to 15 days. In 7 Flemish Giant rabbits aged 30 days, which were growing very fast, the cocarboxylase activity was greater than in either of the groups of common rabbits. In blood of the common rabbits, the cocarboxylase activity was less in the younger rabbits.

5. The presence of succinic dehydrogenase was demonstrated with triphenyltetrazolium chloride

in fragments of cartilage from young rabbits by the method of Kun and Abood (Title 111, Vol. 19).

E. M. Hume.

3494

DE BERNARD, B. Contenuto di coccobossilasi nel fegato di animali normali e diabetici dopo trattamento con acido indolil-3-acetico. [*Cocarboxylase content of the liver of normal and diabetic animals after treatment with indolyl-3-acetic acid.*] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 457-459. [*Inst. Chim. Biol., Univ. Pavia.*]

Cocarboxylase was estimated in the liver of groups of from 10 to 14 male rats weighing about 150 g. One group was given no treatment, one group received daily for 3 days an injection of 10 mg. indolylacetic acid per 100 g. bodyweight; 2 groups were rendered diabetic with alloxan, and one of them was given indolylacetic acid in the same way. Cocarboxylase activity was greater in animals given indolylacetic acid than in those not given it; the difference was statistically significant in the non-diabetic animals but not in the diabetic ones.—E. M. Hume.

3495

BERTOLANI, F. and BENDANDI, A. Aneurina, coccobossilasi e rigenerazione epatica. 1. Variazioni dell'attività beta-glicerofosfatase alcalina, dell'incremento ponderale e della steatosi nel fegato dopo epatectomia parziale in corso di ipovitaminosi B₁. [*Vitamin B₁, cocarboxylase and liver regeneration. 1. Variations in the activity of alkaline β -glycerophosphatase, in weight increase and in the development of fatty liver, after partial removal of the liver during deprivation of vitamin B₁.*]

BERTOLANI, F., BENATTI, G. and BENDANDI, A. 2. Variazioni dell'attività beta-glicerofosfatase alcalina, dell'incremento ponderale e della steatosi nel fegato dopo epatectomia parziale in corso di ipovitaminosi B₁ ed intossicazione sperimentale con tetracoloro di carbonio. [2. Variations in the activity of alkaline β -glycerophosphatase, in weight increase and in the development of fatty liver, during deprivation of vitamin B₁, and experimental poisoning with carbon tetrachloride.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 166-167; 167-169. [*Inst. Clin. Med., Univ. Modena.*]

3496

NARDOO, D. and PRATT, O. E. Thiamine pyrophosphatase, acid and alkaline phosphatase activity in the chicken brain in vitamin B₁ deficiency. *Biochem. biophys. Acta*, 1955, **16**, 75-81. [*Inst. Psychiat. (Brit. Postgrad. Med. Federation, Univ. London), Maudsley Hosp.] French and German summaries.*

Chicks were maintained from 3 weeks old on a purified diet without vitamin B₁; some of them were given an intramuscular injection of 100 µg. vitamin B₁ daily. When signs of deficiency were established, birds were killed and phosphatases were estimated in the optic tectum by methods described previously (*Biochem. J.*, 1953, **55**, 140). The histological distribution of the phosphatases was examined in frozen sections of brain tissue. In the deficient chicks there was an increase in vitamin B₁ pyrophosphatase and in alkaline phosphatase but no significant change in acid phosphatase. In the brain of the chick a vitamin B₁ pyrophosphatase activated only by Mg⁺⁺ over a narrow range of pH close to 8.4 was found, in contrast with the vitamin B₁ pyrophosphatase of rat brain, which is activated by Ca⁺⁺ as well as Mg⁺⁺ and has activity over a wider pH range, from 6.9 to 9.1.—A. M. Copping.

3497

ERÄNKÖ, O. and HASAN, J. Enzymatic hydrolysis of thiamine pyrophosphate by frozen sections of rat's kidney, adrenal and liver. *Acta pathol. microbiol. scand.*, 1954, **35**, 563-572. [Dept. Physiol., Inst. Occupat. Health, Työterveyslaitos, Helsinki.]

The histochemical technique of Gomori (*Proc. Soc. Exp. Biol. Med.*, 1949, **70**, 7; **72**, 449) was used to study the distribution of phosphatases in sections of kidney, liver and adrenal gland taken from young and adult rats immediately after decapitation, and cut on a freezing microtome. Vitamine B₁ pyrophosphate and glycerophosphate were used as substrates in alkaline and acid solutions. In alkaline solution both substrates gave the same reaction, but in acid solution the phosphatases capable of splitting vitamin B₁ pyrophosphate showed a distribution differing from that of phosphatases able to split glycerophosphate. The results are considered to suggest the existence of an enzyme differing from non-specific acid phosphatase.—A. M. Copping.

3498

VAN HEYNINGEN, R., PIRIE, A. and BLACKWELL, J. Effect of cocarboxylase on the development of galactose cataract in rats. *Brit. J. Ophthalmol.*, 1955, **39**, 37-40. [Nuffield Lab. Ophthalmol., Univ. Oxford.]

The report of Hörmann (Abst. 3285, Vol. 24) that subcutaneous injection of cocarboxylase prevented the development of galactose cataract in rats was investigated with rats on a diet containing 30 per cent. galactose. The rats receiving cocarboxylase were pair-fed with those untreated and care was taken that the diet was homogeneous. No difference in the development of cataract was found between the groups.

The galactose content of lenses from rats receiving the sugar was investigated and it seemed that galactose was able to penetrate the rat lens *in vivo*. Experiments with intact calf lenses incubated with galactose showed that penetration occurred *in vitro* during incubation for up to about 4 hr. and to a maximum concentration of 42 mg. galactose per 100 g. wet lens.—A. M. Copping.

3499

MALAGUZZI-VALETTI, C. and ORABONA, M. L. Azione dell'aureomicina sul beri-beri sperimentale e sull'efficacia terapeutica dell'aneurina. [Effect of aureomycin on experimental beriberi and on the therapeutic efficacy of vitamin B₁.] *Internat. Ztschr. Vitaminforsch.*, 1955, **25**, 402-406. [Clin. Med., Univ. Bari.] German, English and French summaries.

Of 34 pigeons deprived of vitamin B₁, 12 were given no other treatment and 22 had 40 mg. aureomycin daily. One of the untreated birds died within 4 days and the remainder showed acute signs of deficiency between the 16th and 24th days. Eight of them were cured with vitamin B₁ and 3 left untreated died. Of those given aureomycin, 5 showed signs of deficiency in from 16 to 18 days and were cured with vitamin B₁. The remainder were then given 80 mg. aureomycin daily. About the 20th day 6 showed signs of deficiency and were given vitamin B₁; 4 recovered, 1 remained paralysed and 1 died. Eleven birds were left, which continued to receive 80 mg. daily until, within a few days, they too showed signs of deficiency. Vitamin B₁ failed to restore them if 80 mg. had been given for more than a few days, and they died, but a single injection of cocarboxylase restored 5. It is suggested that a large dose of aureomycin interfered with phosphorylation of vitamin B₁.—E. M. Hume.

3500

PREZIOSI, P., ZARA, A. and PELLECCIA, M. Modificata narcosi barbiturica in condizioni di iper- e avitaminosi, B₁. [Modification of barbituric narcosis in vitamin B₁ deficiency and excess.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 668-671. [Ist. Farmacol., Fac. Med., Univ. Naples.]

3501

MOURIQUAND, G., EDEL, V. and CHIGIZOLA, R. Avitaminose B₁, thiamine et dissociation réactionnelle (mesures chronaximétriques). [Vitamin B deficiency, vitamin B₁ and dissociation of reaction (measurements of chronaxie).] *Internat. Ztschr. Vitaminforsch.*, 1955, **25**, 443-447. German and English summaries.

In normally fed pigeons most of the B vitamins including vitamin B₁, arsenic and other toxic substances cause a rise of vestibular chronaxie. It was desired to know whether the same is true for an unbalanced diet. Pigeons were deprived of the vitamin B complex by a diet of polished rice until signs of beriberi appeared. After that stage a rise of chronaxie could not be caused by vitamin B₁ though the signs of beriberi disappeared, or by arsenic. The effect of vitamin B₁ on chronaxie was again apparent when the nutrition of the birds was restored to normal. The so-called dissociation of reaction to vitamin B₁ in the conditions described is discussed, and is attributed to the other deficiencies of the vitamin B complex inherent in a diet of polished rice.—A. M. Copping.

3502

WOOLLEY, D. and MERRIFIELD, R. B. Mise en évidence d'une nouvelle action de la thiamine par l'emploi de la pyrithiamine. [Evidence for a new action of vitamin B₁ from the use of pyrithiamine.] *Bull. Soc. Chim. biol.*, 1954, 36, 1207-1212. [Rockefeller Inst. Med. Res., New York.]

In mice showing severe signs of vitamin B₁ deficiency after administration of pyrithiamine, the cocarboxylase content of the liver and the pyruvate content of the blood did not differ greatly from those of normal mice. It is suggested that pyrithiamine may exercise its antagonistic effect not by inhibiting the cocarboxylase activity of vitamin B₁ but by some more direct action against a second function of the vitamin concerned with the nervous system. Oxythiamine appeared to be antagonistic to the cocarboxylase activity of vitamin B₁. By use of the two antagonists it was, therefore, possible to demonstrate two functions of the vitamin. Tests on administration of pyrithiamine to frogs gave further evidence of its suppression of the antineuritic activity of vitamin B₁.—A. M. Copping.

3503

NELSON, M. M. and EVANS, H. M. Relation of thiamine to reproduction in the rat. *J. Nutrition*, 1955, 55, 151-163. [Inst. Exp. Biol., Univ. California, Berkeley.]

Adult female rats were given diets lacking vitamin B₁ during pregnancy or for from 11 to 22 days before mating and during pregnancy. Of those with no preliminary deprivation, from 97 to 100 per cent. produced litters but the young were dead or of low birthweight. The mothers lost weight and some died during late gestation. When the deficient diet was given for 11 or more days before mating, from 89 to 100 per cent. of the implantations were resorbed and many failed to implant. There was severe loss of weight and high

maternal mortality. Pair-fed rats given vitamin B₁ did not produce normal litters, so that reduction of food intake was an important factor contributory to the failure of reproduction. Injection of oestrone or progesterone or both hormones into deficient rats produced a great improvement in the viability of the young, in spite of a low food intake by the mother.—A. M. Copping.

3504

NABER, E. C., CRAVENS, W. W., BAUMANN, C. A. and BIRD, H. R. The effect of thiamine analogs on embryonic development and growth of the chick. *J. Nutrition*, 1954, 54, 579-591. [Dept. Biochem., Univ. Wisconsin, Madison.]

Chicks were given for 4 days a ration deficient in vitamin B₁ and on the 5th day a single dose of 20 µg. in order to equalise the body reserves of the vitamin. On the 6th day treatment with the vitamin or the antivitamin analogue or both was started. Neopyrithiamine and oxythiamine injected into eggs increased embryonic mortality and reduced hatching capacity. Oxythiamine was most toxic early in embryonic life and sensitivity to its action diminished considerably after the 5th day and continued to diminish after hatching. Neopyrithiamine remained toxic during the entire incubation period. The inhibitory effect of both antagonists was counteracted by simultaneous injection of vitamin B₁ or cocarboxylase. Inhibition ratios of the amount of vitamin required to counteract a given amount of the antivitamin, determined for the 5-day old embryo, were 1 to 10 for vitamin B₁ or cocarboxylase and neopyrithiamine, and 1 to 20 for vitamin B₁ or cocarboxylase and oxythiamine. Neopyrithiamine injected during the later stages of incubation left the hatching capacity almost normal, but the chicks showed signs of polyneuritis and did not survive. With oxythiamine there were no neurological signs, but oedema developed near the site of injection. Growth-inhibition ratios for young chicks were 1 to 4 for vitamin B₁ and neopyrithiamine and 1 to 200 for vitamin B₁ and oxythiamine. The changing effectiveness of the two antivitamins with age is consistent with known changes in developmental metabolism and with the hypothesis that the two antivitamins affect different enzyme systems.—E. M. Cruickshank.

3505

SUOMALAINEN, P. and PIHLGREN, A. M. On the thiaminase activity of fish and some other animals and on the preservation of thiaminase in silage made from fish. *Acta agral. fenn.*, 1955, 83, 221-229. [Zool. Lab., Univ. Helsinki.]

Thiaminase was estimated by a modification of the method of Sealock *et al.* (Abst. 2078, Vol. 13),

of which full details are given, in the gills, liver and intestine of 13 species of freshwater and sea fish and in the spleen of 10 species.

The highest relative activity was found in the ide (*Leuciscus idus*); next came other cyprinid fish, the crucian carp (*Cyprinus carassius*) and the tench (*Tinca vulgaris*). Some fish had none. There were individual differences within the same species. Of the organs examined, the spleen had most activity.

Thiaminase activity was also found in the gills and mid-gut glands of the swan mussel (*Anodonta cygnea*), but not in frogs or crayfish. Rabbit kidney and spleen had some activity.

Fish offal ensiled with alkali or by the A.I.V. method for poultry feed had no thiaminase activity.

W. M. Deans.

3506

ZIZZA, F. Ricerche sulla tiaminasi. 1. pH ottimo della tiaminasi estratta dalla *Venerupis decussata*. [Researches on thiaminase. 1. Optimum pH for the thiaminase extracted from *Venerupis decussata*.] *Bol. Soc. ital. Biol.*

sper., 1954, **30**, 246-247. [Ist. Chim. Biol., Univ. Palermo.]

The enzyme extracted from the lamellibranch mollusc, *Venerupis decussata*, was purified by precipitation with Na acetoacetate. The enzyme was incubated with vitamin B₁ hydrochloride, buffered with Na acetoacetate for pH from 1 to 5, and with phosphate for pH from 5 to 7, at 40° C., for 60 min., after which the vitamin B₁ left in the mixture was estimated. The amount of vitamin B₁ destroyed increased from pH 1 to pH 3.4, then fell up to about pH 5, after which it increased again up to pH 6.2. The second increase is attributed to instability of vitamin B₁ at such high pH, and not to the action of the enzyme.—E. M. Hume.

3507

JACOBSON, K. P. and DEODATA DE AZEVEDO, M. Sur l'activation de la thiaminase. [Activation of thiaminase.] *Arch. portugaises Sci. biol.*, 1952-53, **11**, 6-8. [Inst. Rocha Cabral, Lisbon.]

See Abst. 3027, Vol. 24.

RIBOFLAVIN

3508

JANSEN, A. P. The riboflavin-analysis in foods by a microbiological and chemical (lumiflavin) method. *Internat. Ztschr. Vitaminforsch.*, 1955, **25**, 365-379. [Netherlands Inst. Nutr., Univ. Amsterdam.] French and German summaries.

The lumiflavin method of estimating riboflavin was found to give results in good agreement with those of microbiological tests and was more consistently reproducible. Results are tabulated of the riboflavin content of 50 foods estimated by both methods on extracts made with methanol or HCl. For comparison, values reported by other investigators are included in the table and discussed.—A. M. Copping.

3509

GAUDIANO, A. and CINGOLANI, E. Cromatografia ed elettroforesi su carta della riboflavina e suoi esteri fosforici. [Chromatography and electrophoresis on paper of riboflavin and its phosphoric esters.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 637-639. [Lab. Biol., Ist. Super. Sanità, Rome.]

3510

SILIPRANDI, N. and BIANCHI, P. A new method for preparing flavin-adenine-dinucleotide. *Biochim. biophys. Acta*, 1955, **16**, 424-428. [Inst. Biol. Chem., Univ. Rome.] French and German summaries.

3511

JANSEN, B. C. P. Riboflavine. [Riboflavin.] *Vooding*, 1955, **16**, 5-11.

A review intended as a chapter for a new textbook on nutrition.

See Abst. 3391.

3512

WORDEN, A. N. and WATERHOUSE, C. E. The effect of environmental temperature on the urinary excretion of riboflavin by the dog. *Brit. J. Nutrition*, 1955, **9**, 5-10. [Cromwell House, Huntingdon.]

When environmental temperature was raised by about 20° F. the volume of urine excreted by 3 adult dogs fed on a standard diet fell to from 1/3 to 1/2 and the concentration of riboflavin in the urine was more than doubled. The total daily amount of riboflavin excreted was significantly greater in 2 of the dogs.—A. Hepburn.

3513

NIEMAN, C. and JANSEN, A. P. Urinary excretion of riboflavin in normal, diuretic, and alloxan-diabetic rats. *Internat. Ztschr. Vitaminforsch.*, 1955, **25**, 448-458. [Lab. Physiol. Chem., Netherlands Inst. Nutr., Univ. Amsterdam.] German and French summaries.

A diet containing 2.6 µg. riboflavin per g. was given to 40 weanling rats in 4 groups, one with no treatment, one with mild alloxan diabetes, one with severe diabetes and one in which diuresis was

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induced by administration of urea. The diabetic rats showed increases in urinary volume and in output of riboflavin, but in simple experimentally induced diuresis the increase in volume was not accompanied by a large increase in output of riboflavin. It is suggested that in alloxan diabetes some mechanism operates to cause displacement of riboflavin.—A. M. Copping.

3514

TEDESCHI, G. G. Eliminazione dell'acido lattoflavinfosforico attraverso le vie biliari. [Elimination of riboflavin phosphate through the bile.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 30, 663-665. [Ist. Fisiol. Gen., Univ. Rome.]

In 5 dogs weighing about 10 kg., a cannula was inserted into the bile duct under Pentothal anaesthesia, and the riboflavin solution under investigation was introduced into a vein in a loop of the intestine. Bile was drawn off for an hour, and riboflavin in it was investigated chromatographically. Normal bile contained traces of free riboflavin. Riboflavin that had been injected in the free form scarcely appeared at all in the phosphorylated form in the bile. When phosphorylated riboflavin was injected, it appeared in the bile to a small extent as nucleotides and to a large

extent as free riboflavin. Four spots representing other flavin derivatives appeared also in the chromatogram.—E. M. Hume.

3515

GUARESCHI, C. and ANICHINI, C. Sull'azione antitumorale di alcuni complessi fosfo-riboflavin-metallici. [Action antagonistic to tumours of certain phospho-riboflavin-metal complexes.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 752-755. [Ist. Zool., Univ. Cagliari.]

Phospho-riboflavin-metal complexes, described elsewhere (*G. ital. Chemoterap.*, 1954, **1**, 214) and called L', L'' and R, appeared to have some effect in causing regression of benzpyrene sarcoma in rats. On tissue cultures of chicken's myocardium in plasma with embryo juice, the substances had an unfavourable action, causing the cells to lose their power of multiplication.—E. M. Hume.

3516

MUSSER, E. A., PETERING, H. G. and HEINLE, R. W. Effect of a riboflavin antagonist upon leukocytes of normal and Shay myeloid chloroleukemic rats. *J. Lab. Clin. Med.*, 1954, **44**, 903. *Proc.* [Kalamazoo, Mich.]

See also Abst. 3364.

NICOTINIC ACID (NIACIN)

3517

KOEPE, O. J. and HENDERSON, L. M. Niacin-tryptophan deficiency resulting from imbalances in amino acid diets. *J. Nutrition*, 1955, **55**, 23-33. [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

Male weanling rats, on reaching a weight of 45 g., received a diet containing, per cent., a mixture of pure amino-acids 18 (see Abst. 3676, Vol. 19), salts 4, nicotinic-acid-free vitamin mixture 2 (see Abst. 4260, Vol. 23), maize oil 5, and sucrose to 100. The tryptophan was reduced to 0.10 or 0.11 per cent. of the DL-form, but all other essential amino-acids, except the one under study, were present in concentration equal to, or greater than, that recommended by Rose (Abst. 5316, Vol. 7).

When the DL-threonine in the diet, of which the optimum percentage is 1.0, was reduced to 0.5, 0.6, 0.7, or 0.8 per cent., the average weight increase over 4 weeks was 15, 30, 21 or 10.5 g.; in the last case addition of 2.5 mg. per cent. of nicotinic acid raised it to 63 g. Results were similar in tests with L-lysine, of which the optimum percentage is 1.24; when the concentration was raised from 0.3 to 0.5 per cent., the weight increase changed from 26 to 31 g.; with 0.6 per cent. it fell to 12 g., but was raised to 55 g. by addition of nicotinic acid.

It is concluded from the results that, with the lowest concentration of either of the essential amino-acids, threonine and lysine, growth was limited by the one lacking, and that the tryptophan present, 0.1 per cent., served as a source of nicotinic acid when its use for protein formation was thus inhibited. Similar, but less consistent, results were obtained in corresponding trials with leucine and isoleucine in concentrations below the optimum.

When 10 per cent. gelatine was included in the diet, supplemented with 0.1 per cent. tryptophan and suitable concentrations of essential amino-acids known to be missing, inclusion of 5 per cent. of threonine depressed growth, and the depression was counteracted by addition of nicotinic acid. The loss of appetite which accompanied reduced food intake in nicotinic acid deficiency was shown by paired feeding experiments to be largely responsible for the suppression of growth observed when threonine was added to a diet containing protein as 9 per cent. casein with 0.2 per cent. cystine.—H. Chick.

3518

SEN, S. C. and SEN, S. Effect of niacin on the calcium level of blood. *Indian J. Med. Res.*, 1954, **42**, 605-612. [Dept. Physiol., Presidency Coll., Calcutta.]

The effect on healthy rabbits of intramuscular injection of 25, 50 or 100 mg. nicotinic acid was studied. A dose of 100 mg. caused a rise in blood Ca which coincided with a rise in blood sugar, maximum values occurring within 30 min. and returning to normal after 2 hr. Blood inorganic P fell. The lower doses of nicotinic acid did not affect blood Ca and had only a small effect on blood sugar.—A. M. Copping.

3519

BANERJEE, S. and BASAK, R. Nicotinic acid metabolism in the rhesus monkey. *J. Nutrition*, 1955, **55**, 179-184. [Dept. Physiol., Presidency Coll., Calcutta.]

Nicotinic acid, nicotinamide, nicotinic acid, N-methylnicotinamide, 6-pyridone, trigonellin and quinolinic acid were estimated in urine from 4 female rhesus monkeys receiving an adequate basal diet. After a preliminary test with no treatment, the effects of giving sulphaguanidine, nicotinic acid or tryptophan were studied. With sulphaguanidine there was a slight decrease in excretion of N-methylnicotinamide, but no other change. With nicotinic acid or tryptophan increases occurred in excretion of N-methylnicotinamide, 6-pyridone and quinolinic acid. Excretion of trigonellin was not affected, and it does not appear to be an end-product of nicotinic acid metabolism in monkeys.—A. M. Copping.

3520

BURCH, H. B., STORVICK, C. A., BICKNELL, R. L., KUNG, H. C., ALEJO, L. G., EVERHART, W. A., LOWRY, O. H., KING, C. G. and BESSEY, O. A. Metabolic studies of precursors of pyridine nucleotides. *J. Biol. Chem.*, 1955, **212**, 897-907. [Dept. Chem., Columbia Univ., New York.]

Nicotinic acid, nicotinamide and 3-hydroxy-methylpyridine tartrate were equally effective as precursors of diphosphopyridine nucleotide in rat erythrocytes and they gave similar gains in weight. Nicotinamide produced 15 times as much N^1 -methylnicotinamide in the urine as nicotinic acid did, and the others produced $2\frac{1}{2}$ times as much. With a deficiency of precursors gains in weight were small, with reduction of pyridine nucleotides in the blood cells and liver, of N^1 -methylnicotinamide in the serum and urine, and of nicotinic acid in the urine. Serum N^1 -methylnicotinamide seemed to reflect most rapidly the decreased intake. L-Tryptophan maintained gains in weight similar to those obtained with nicotinic acid but with it diphosphopyridine nucleotide in the red and white blood cells and liver, N^1 -methylnicotinamide in the serum and urine, and nicotinic acid in the urine were much less.

A. Hepburn.

3521

PORCELLATI, G. Contributo sperimentale sull'amidazione *in vitro* dell'acido nicotinic. [Amidation *in vitro* of nicotinic acid.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 642-644. [Inst. Chim. Biol., Univ. Naples.]

The spectrophotometric method of Hughes and Williamson (Abst. 1789, Vol. 24) for estimating nicotinic acid and nicotinamide when present together was slightly modified. In homogenates of liver, kidney and brain of rats, the percentage of added nicotinamide detected by the method ranged from 94.2 to 105.1. When Na nicotinate was added to homogenates of the same organs, suitably buffered and with $MgCl_2$ and NH_4Cl added, nicotinamide, estimated by the spectrophotometric method, was formed in amounts corresponding with the quantity of nicotinate which disappeared. The extent of the conversion was greater when adenosinetriphosphate also was present in the system.—E. M. Hume.

3522

ARRIGO, L. and RICCI, C. Nicotinamide e lipidi epatici. [Nicotinamide and liver lipids.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 639-641. [Inst. Chim. Biol., Univ. Siena.]

Male rats weighing about 160 g. were injected with nicotinamide in an amount [not stated] sufficient to promote a demonstrable increase of diphosphopyridine nucleotide in the liver. They were killed at intervals of from 6 to 72 hr. later. In the liver, diphosphopyridine nucleotide increased and reached its peak value after 12 hr.; total fats and total and free cholesterol increased to a peak after 24 hr. Glycogen decreased and had not quite regained its initial value after 72 hr. All other values had returned to normal after 72 hr.—E. M. Hume.

3523

IACHELLO, I. Azione difasica del nicotinato sodico sul cuore isolato. [Diphasic action of sodium nicotinate on the isolated heart.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 656-657. [Inst. Fisiol. Gen., Univ. Catania.]

The isolated heart of the common toad, *Bufo vulgaris*, was perfused with Ringer solution, suitably buffered, and with concentrations of Na nicotinate ranging from 10^{-1} to 10^{-10} . At concentrations of from 10^{-1} to 10^{-5} Na nicotinate had a negative inotropic and chronotropic action which disappeared on washing, but at concentrations below 10^{-5} there was a positive inotropic and chronotropic action which did not disappear on washing, and the heart showed great resistance to fatigue.—E. M. Hume.

3524

FITZPATRICK, F. K. (with PIETRYK, S. T.) **Nicotinamide in murine tuberculosis.** *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 54-56. [Dept. Virol., Sharp and Dohme Div., Merck and Co., West Point, Pa.]

The observation that nicotinamide had an inhibitory effect on mycobacterial infection in rodents (Absts. 1671, Vol. 16; 4325, Vol. 18) was further investigated. Mice were inoculated as described previously (*Amer. Rev. Tuberc.*, 1953, **68**, 451) with a dose calculated to be lethal to untreated mice in about 3 weeks. Drugs were given in the diet or by subcutaneous injection. Survival time was increased by nicotinamide in a daily dose of 25 mg. given orally, or of 10 mg. given subcutaneously. Initiation of the treatment a day or two before inoculation increased survival time, but when delayed till afterwards there was little effect. Seventeen compounds related to nicotinamide, even as nearly as nicotine acid, had no effect. Coenzyme I alone had no effect but it enhanced the effect of nicotinamide. Choline, methionine and ethanolamine, being substances containing methyl groups, were tested to see if they would counteract the effect of nicotinamide, but they did not do so. Nicotinamide did not enhance the effect of tuberculostatic drugs such as streptomycin. Speculation as to the mode of action of nicotinamide led to no conclusion.

E. M. Hume.

3525

ANTONIANI, C., FEDERICO, L. and VALLE, T. Contributi alla conoscenza del contenuto vitaminico dei prodotti agrari e d'uso agrario.

6. Contenuto in vitamina PP degli ortaggi e delle frutta. [The vitamin content of produce and products used on the farm. 6. Vitamin PP content of vegetables and fruit.] *Ann. Sper. agrar.*, 1954, **8**, 919-927. [Staz. Sper. Freddo, Milan.] English summary.

For previous parts see Absts. 417, 597, Vol. 22; 1604, Vol. 23.

Nicotinamide was estimated by the method with CNBr in 25 genera and species of vegetables and 20 fruits. The Latin names of the vegetables are given. The values are tabulated for the dry and fresh tissue. In the dry material values in mg. per 100 g. ranged for vegetables from 1.05 for onions to 30.0 for tomatoes, and for fruits from 0.25 for Winesap apples to 17.75 for plums of the variety Florentia.—E. M. Hume.

3526

FEDERICO, L. and VALLE, T. Sul contenuto in vitamina PP dei formaggi italiani. [Vitamin PP content of Italian cheeses.] *Ann. Sper. agrar.*, 1954, **8**, 1489-1491. [Staz. Sper. Freddo, Milan.] English summary.

Nicotinamide was estimated by the same method as before (see preceding Abst.) in 10 Italian cheeses, some of them fast ripening and some slow. The values are tabulated with the moisture and lactic acid contents. The values for nicotinamide were low and ranged, in $\mu\text{g. per } 100 \text{ g. cheese}$, from 150 for Fontina to 785 for Robiola. The value for Bel Paese was 260, for Gorgonzola 320 and for Emmenthal 315. The value did not seem to be related to the rate of maturing.—E. M. Hume.

See also Absts. 3475, 3490, 3559.

VITAMIN B₆ (PYRIDOXINE, ADERMIN)

3527

PUSZTAI, Á. Papierchromatographische Untersuchung der Vitamin B₆-Gruppe und einiger ihrer Derivate. [Paper chromatography of the vitamin B₆ group and some of their derivatives.] *Acta physiol. hung.*, 1954, **6**, Suppl., 78. [Biochem. Inst., Ungarische Akad. Wissenschaften, Budapest.]

3528

CHIANCONE, F. M., GINOUHLIAC, E., MAINARDI, L. and TENCONI, L. T. The elimination of some tryptophan metabolites after removal of endocrine glands. *Arch. Biochem. Biophys.*, 1955, **54**, 15-23. [Biol. Dept. Res. Labs., Lepetit S.p.A., Milan.]

The effect on tryptophan metabolism of removing the pituitary or adrenal glands was studied in rats given a purified diet with or without pyridoxine. In animals on the complete diet, removal of the

pituitary or adrenal glands reduced the excretion of kynurenine and diazotisable substances in response to a dose of tryptophan. After hypophysectomy, excretion of xanthurenic acid increased but after adrenalectomy it decreased, nicotinic acid increased and values for N¹-methyl-nicotinamide were unchanged. In the rats without pyridoxine, whether intact or not, the excretion of xanthurenic acid was always high, but adrenalectomy greatly reduced the excretion of kynurenine, which could be restored to normal by giving pyridoxine. A scheme for the reactions probably occurring in the breakdown of tryptophan is suggested.—A. M. Copping.

3529

KOTAKE, Y. (Jr.) and NOGAMI, K. Research on xanthurenic acid. 9. On the conjugated compounds of xanthurenic acid formed in the body.

KOTAKE, Y. (JR.), INADA, T. and MATSUMURA, Y.
10. Research on the mechanism of xanthurenic-acid-initial hyperglycemia. *Proc. Japan Acad.*, 1954, **30**, 492-497; 626-631. [Dept. Biochem., Med. Coll., Wakayama.]

9. Rats were fed on a purified diet for 2 weeks, and were then given a subcutaneous injection of xanthurenic acid; urine was collected for the ensuing 24 hr., and xanthurenic acid in it was estimated by the method of Glazer *et al.* (*Abst.* 5328, Vol. 21) before and after hydrolysis with 3*N* *NCl*. The amount after hydrolysis was always somewhat greater than before. A filtrate of the urine obtained after standing as a mixture with alcohol to 50 per cent. was chromatographed on paper. The solutions used as developer were mixtures of *n*-butanol, acetic acid and water, and of methanol, *n*-butanol, benzene and water. With both developers 4 spots appeared. From examination of them it was concluded that there were 2 kinds of conjugated compounds of xanthurenic acid, one giving the diazo reaction and the other not. The former was easily hydrolysed with weak *HCl*, and was probably conjugated with glucuronic acid at the position of the OH radical at 4 in the quinoline ring. The OH radical at 8 in the quinoline ring was thought to play an important part in the diabetogenic action of xanthurenic acid. The substance not giving the diazo reaction was thought to be conjugated with the OH radical at 8, and was believed to be "a compound built up in the body as a sort of antitoxic substance".

10. Groups of from 5 to 10 rats were maintained on a purified diet for 2 weeks. The pituitary or adrenal glands were removed or the rats were injected with xanthurenic acid or adrenaline. The liver glycogen values were about half the normal in all except those injected with adrenaline, in which they were lower still. Ascorbic acid in the adrenal glands of those injected with adrenaline or xanthurenic acid was considerably less than in the normal rats. In rats from which the adrenal glands had been removed, the blood sugar value was maintained when adrenaline was injected but fell steadily for 2 hr. when xanthurenic acid was injected. When xanthurenic acid was injected after the pituitary gland had been removed, the blood sugar value fell, but not as low as after adrenalectomy. It was concluded that the pituitary and adrenal glands were essential in the production of the high blood sugar value which follows injection of xanthurenic acid in normal rats, and that the glycogen reserve in the liver was concerned also.

On the assumption that the sympathetic nervous system is somehow involved, adrenaline or xanthurenic acid was injected into normal rats with or without benzylimidazolidine, which inhibits the

action of adrenaline. With benzylimidazolidine, the rise in blood sugar, and fall in liver glycogen and adrenal ascorbic acid, normally induced by adrenaline, did not occur, but with xanthurenic acid the fall in liver glycogen and rise in blood sugar were not inhibited by imidazolidine; the fall in adrenal ascorbic acid did not occur.

E. M. Hume.

3530

TRONCI, L. T. Contributo allo studio dell'attività transaminasica di omogenati di fegato di ratto in rapporto alla piridossina. [*Contribution to the study of transaminase activity in rat liver homogenates in relation to pyridoxine.*] *Acta vitaminol.*, 1954, **8**, 275-276. [Lab. Direzione, Med. Centrale, Lepetit S.p.A., Milan.] French, English, German and Spanish summaries.

Groups of male rats 3 months old were fed on a stock diet or a diet deficient in vitamin *B₆*, the latter with no supplement or with, daily, 100 µg. pyridoxine hydrochloride, or 100 µg. riboflavin, or 125 µg. vitamin A suspended in gum arabic. The experiment lasted for from 170 to 235 days, after which homogenates of the liver were prepared, and the glutamic-alanine-transaminase was estimated in them, the amount of pyruvic acid liberated being the criterion. The activity in the liver of the rats given vitamin *B₆* was the same as of those given stock diet, but when riboflavin or vitamin A had been given the activity was reduced by 50 per cent., as in the rats given no supplement.

E. M. Hume.

3531

BATCHEN, J. M., CHEESMAN, E. M., COPPING, A. M. and TRÜSSLER, A. D. The effect of vitamin *B₆* on the growth and the blood picture of the rat. *Brit. J. Nutrition*, 1955, **9**, 49-57. [Dept. Physiol., Queen Elizabeth Coll. (Univ. London), Campden Hill Rd., W.8.]

Rats fed on a purified diet containing all other essential vitamins gave a growth response which paralleled the amount of pyridoxine given. Red blood cell counts rose in rats deficient in vitamin *B₆*; the cells were microcytic and hypochromic. Hb decreased only in severe deficiency. Mean corpuscular Hb and lymphocyte count were low in deficient rats.—A. Hepburn.

3532

BEATON, J. R. and GOODWIN, M. E. Renal glutaminase activities in vitamin *B₆*-deficient rats. *J. Biol. Chem.*, 1955, **212**, 195-200. [Dept. Pub. Health Nutrit., Univ. Toronto, Canada.]

The phosphate-activated glutaminase of kidney tissue was measured by the method of White and Rolf (*Amer. J. Physiol.*, 1952, **169**, 174) in rats

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having a purified diet with or without vitamin B₆. After 35 days' deprivation, renal glutaminase was less in rats given no vitamin B₆ than in pair-fed, non-deprived animals. When deoxypyridoxine was added to the diet signs of deficiency developed in about 20 days and renal glutaminase decreased. Addition of pyridoxal phosphate *in vitro* to kidney homogenates of deprived rats restored the glutaminase activity to normal. It had only a slight effect on kidney tissue from pair-fed, non-deprived rats.

In a test with 16 rats, deprivation of vitamin B₁ had no effect on renal glutaminase.

A. M. Copping.

3533

HOPE, D. B. **Pyridoxal phosphate as the coenzyme of the mammalian decarboxylase for L-cystine sulphinic and L-cysteic acids.** *Biochem. J.*, 1955, **59**, 497-500. [Dept. Pharmacol., Univ. Oxford.]

From experiments with liver extracts from the dog, rat, mouse, guinea-pig, rabbit and cat it seemed probable that a single enzyme was responsible for the decarboxylation of L-cysteic and L-cysteine sulphinic acids. The decarboxylase activity of the liver was higher in male than in female rats. In livers from rats deprived of vitamin B₆, decarboxylase activity decreased progressively as the time of deprivation increased. In the early stages of vitamin B₆ deficiency addition of pyridoxal-5-phosphate *in vitro* re-activated the liver decarboxylase, showing that pyridoxal phosphate was the coenzyme concerned. There was no re-activation with pyridoxal phosphate when liver extracts were taken from rats deprived of vitamin B₆ for 2 weeks or longer.—A. M. Copping.

3534

DIETRICH, L. S. and SHAPIRO, D. M. **Testosterone augmentation of deoxypyridoxine antagonism of various vitamin B₆-containing enzyme systems in tumor and host tissue.** *Cancer Res.*, 1955, **15**, 133-138. [Dept. Biochem., Coll. Phys. Surg., Columbia Univ., New York.]

The effect of testosterone in increasing the inhibition of certain enzyme systems by deoxypyridoxine was studied in C57 BL mice with mammary adenocarcinoma 755. Testosterone was given in sesame oil by intramuscular injection and deoxypyridoxine in saline solution by intraperitoneal injection. Testosterone alone did not affect the activity of glutamic-aspartic or glutamic-alanine transaminase, decarboxylase or cysteine desulphhydrase in the liver, kidneys, heart, lungs or tumour tissue. In combination with deoxypyridoxine, testosterone increased the inhibition of the transaminases and decarboxylase. Deoxypyridoxine had no effect on the desulphhydrase. The antagonistic effect of deoxypyridoxine on

liver transaminase could be reversed if pyridoxine was injected 30 min. before deoxypyridoxine with or without testosterone.—A. M. Copping.

3535

WOOTEN, E., NELSON, M. M., SIMPSON, M. E. and EVANS, H. M. **Effect of pyridoxine deficiency on the gonadotrophic content of the anterior pituitary in the rat.** *Endocrinology*, 1955, **56**, 59-66. [Inst. Exp. Biol., Univ. California, Berkeley.]

Anterior pituitary glands of from 8 to 12 normal or vitamin-B₆-deficient rats were ground in isotonic saline and injected into immature female rats or immature squabs [presumably pigeons] in saline suspension with 2 per cent. butanol. The follicle-stimulating activity of pituitary preparations from the deficient rats was 7 times that of preparations from the normal rats. The stimulation of interstitial cells and the mammatropic activity of the pituitary appeared to be little affected by vitamin B₆ deficiency. The change in follicle-stimulating activity was much greater than any effect hitherto ascribed to inanition.—A. M. Copping.

3536

BIANCHI DONNASIBILLA, L. and CORTESI, M. **Studio dei poteri immunitari nella carenza piridossinica sperimentale da desossipiridossina e da dieta.** [Capacity for immunisation in experimental pyridoxine deficiency produced by deoxypyridoxine and by diet.] *Acta vitaminol.*, 1954, **8**, 269-274. [Clin. Pediat., Univ. Pavia.] French, English, German and Spanish summaries.

Fifty-six male rats weighing from 180 to 200 g. were maintained on a basal diet lacking only vitamin B₆. Two groups were given for 30 days 15 µg. pyridoxine daily, and one in addition received daily, half an hour earlier, 150 µg. deoxypyridoxine. Every third day all the rats were given a dose of *Salmonella typhi-murium* vaccine, and on the 15th, 20th and 30th day blood samples were taken. There was no difference in agglutinating titre between the groups.

Some of the rats were maintained for 55 days on the basal diet with daily addition of 4 µg. pyridoxine and of 40 µg. deoxypyridoxine given half an hour earlier. Blood samples were taken on the 15th, 30th and 55th day, and tested for complement and for capacity to haemolyse foreign red cells. Compared with that of "controls", the haemolytic capacity was increased slightly but the complement titre was unchanged.

The last experiment was repeated with deprivation of vitamin B₆ instead of administration of the antivitamin. The experiment lasted 5 months. The results were the same as when deficiency was created with the antivitamin.—E. M. Hume.

3537

BRUN, J., CAYRÉ, R. M. and VIALIER, J. Influence de la vitamine B₆ sur l'activité antituberculeuse de l'isoniazid. [Effect of vitamin B₆ on the antituberculosis activity of isoniazid.] *C.R. Soc. Biol.*, 1954, **148**, 1817-1818. [Inst. Pasteur.]

No diminution in the bacteriostatic action of isoniazid was demonstrated when pyridoxine was added *in vitro* to cultures of *Mycobacterium tuberculosis*. In experiments with guinea pigs infected with human tuberculosis the bacteriostatic effect of isoniazid *in vivo* was not affected by pyridoxine given simultaneously.—A. M. Copping.

3538

ABDERHALDEN, R. Über eine antagonistische Beziehung zwischen Pyridoxin und der Pyrimi-

dinkomponente des Aneurins. [An antagonistic relationship between pyridoxine and the pyrimidine component of vitamin B₁.] *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1954, **6**, 295-296. [Basle.]

A preliminary note is given of the power of pyridoxine to counteract the toxic effects in rats of 2-methyl-4-amino-5-hydroxymethylpyrimidine or of its derivative 2-methyl-4-amino-5-bromomethylpyrimidine, especially with a certain diet called "D.K.". Injection of 1 mg. pyridoxine simultaneously with 10 mg. of the pyrimidine derivative protected a 90 g. rat given D.K. diet from the lethal effects of the pyrimidine. Further investigations are in progress to determine the mechanism of the antagonistic effect.

A. M. Copping.

PANTOTHENIC ACID

3539

ZUNIN, C. and BORRONE, C. Embriopatie da carenza di acido pantotenico. Effetto della pantoitaurina, antivitamina dell'acido pantotenico. [Embryonic malformations from pantothenic acid deficiency. Effect of pantoitaurine, antivitamin for pantothenic acid.] *Acta vitaminol.*, 1954, **8**, 263-268. [Ist. Clin. Pediat. "G. Gaslini", Univ. Genoa.] French, English, German and Spanish summaries.

Female rats in 7 groups of from 4 to 12 were given a simplified basal diet and received daily 150 µg. Ca pantothenate. Amounts of pantoitaurine dibromoanilide ranging from 0.5 to 2.5 mg. daily were given for varying periods beginning just before and just after mating. All the young were born alive; they were immediately killed for examination. Abnormalities in the young occurred only when pantoitaurine was given from before, or from one day after, mating till parturition. The abnormalities included malformation of the brain, visible externally as a lump, with oedema and haemorrhages, particularly of the limbs. The changes resembled those described by others in pantothenic acid deprivation.

E. M. Hunne.

3540

LATA, G. F. and ANDERSON, E. Effect of prolonged pantothenic acid deprivation upon cholesterol synthesis in the rat. *Arch. Biochem. Biophys.*, 1954, **53**, 518-520. [Dept. Biochem., Coll. Med., State Univ. Iowa, Iowa City.]

The synthesis *in vitro* of cholesterol from acetate marked with ¹⁴C was studied with liver slices from rats given a diet lacking in pantothenate, a complete diet with restricted intake or a complete,

unrestricted diet. The diets were instituted at maturity and given for from 4 to 5 months to secure severe depletion of pantothenic acid. The synthesis of cholesterol was more than doubled in liver from deprived rats, and the glycogen content also was high. It is suggested that in prolonged deprivation of pantothenate there might be interference with some pathways of acetate metabolism so that more acetate might be available for cholesterol formation.—A. M. Copping.

3541

MOOKERJEE, S. and SADHU, D. P. Cholesterol synthesis in pantothenic acid deficiency. *Indian J. Physiol. Allied Sci.*, 1954, **8**, 137-140. [Dept. Physiol., Bengal Vet. Coll., Calcutta 37.]

A purified diet was given to 18 weanling rats for 2 weeks with no vitamin supplement and then for 6 weeks with a complete supplement or one lacking pantothenic acid. Those without pantothenic acid showed retarded growth, and analysis of their tissues gave lower values for glycogen and cholesterol in the liver, and for cholesterol in the blood, kidneys, adrenal glands and intestine, than in rats receiving pantothenic acid.—A. M. Copping.

3542

HURLEY, L. S. and MACKENZIE, J. B. Adrenal function in the pantothenic acid-deficient rat. Liver glycogen, blood glucose, adrenal cholesterol and adrenal ascorbic acid levels. *J. Nutrition*, 1954, **54**, 403-415. [Div. Chem. Embryol., Dept. Paediat., Sch. Med., Univ. Colorado, Denver.]

Weanling rats were maintained on purified diets with or without pantothenic acid for 6 weeks, and

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were then killed without further treatment or after fasting for 24 hr. at atmospheric pressure or at a reduced oxygen tension corresponding to 20,000 ft. altitude. Blood sugar, liver glycogen, and the weight, ascorbic acid content and cholesterol content of the adrenal glands were measured. Great seasonal variations were found in the ascorbic acid and cholesterol content of the adrenal glands in both normal and pantothenic-acid-deficient animals, but the liver glycogen and blood sugar values showed a fairly constant pattern in the different groups. Rats deprived of pantothenic acid had lower values for liver glycogen, blood sugar and adrenal cholesterol, and higher values for adrenal weight and ascorbic acid content than comparable normal animals. After exposure to low oxygen tension normal, fasting rats showed a great increase in liver glycogen and blood sugar in comparison with rats kept at normal oxygen tension. The increase in glycogen and blood sugar was not found in pantothenic-acid-deficient rats in a state of anoxia. All animals showed a significant decrease in adrenal cholesterol in a state of anoxia.

It is suggested that in normal animals subjected to the stress of anoxia cholesterol is used in the synthesis of adrenal steroids with coenzyme A as a necessary component of the system, but that in pantothenic-acid-deficient animals the synthesis of cortical steroids is begun but is blocked by lack of coenzyme A at some intermediate stage, so that glyconeogenesis is not induced. The hypothesis is discussed with reference to the apparently conflicting findings of different observers on the effect of pantothenic acid deprivation on adrenal function.—A. M. Copping.

3543

DEB, C., BANERJEE, S. and MUKHERJEE, A. K. Adrenal-cortical activity in pantothenic acid deficient rats. *Indian J. Med. Res.*, 1954, 42, 589-597. [Dept. Physiol., Presidency Coll., Calcutta.]

Female rats of 100 to 150 g. weight were given a purified diet with and without pantothenic acid. Those having 250 μ g. pantothenic acid daily were pair-fed with deprived animals. The experiment continued for 6 months, during which the deprived rats did not lose weight, though alopecia and rusty staining of fur and whiskers were present by the end of the period. Acetylation of injected *p*-aminobenzoic acid was found to be defective in the deprived rats, and the excretion of ketosteroids was significantly decreased, though that of sodium and potassium changed very little. Blood glucose values were low in deprived rats and red cell counts were raised, but reticulocyte counts and Hb values showed no significant difference between deprived rats and pair-fed controls. Total white cell and

polymorphonuclear leucocyte counts were low in deprived rats; cholesterol and ascorbic acid content of adrenals and glycogen content of liver were also low. The findings are discussed and considered to show that hypofunction of the adrenal cortex is an essential lesion in rats deprived of pantothenic acid.—A. M. Copping.

3544

ANGELICO, R. and QUINTILIANI, M. Azione dell'acido pantotenico sul contenuto in glicogeno epatico di ratti surrenectomizzati. [Effect of pantothenic acid on the liver glycogen content in adrenalectomised rats.] *Rend. Ist. Super. Sanità, Rome*, 1954, 17, 13-18. French, English and German summaries.

Rats weighing from 65 to 70 g. were maintained for 32 days on a diet without pantothenic acid, containing 18 per cent. casein. The adrenal glands were removed and the rats were kept for 4 days on the same diet with a solution of 1 per cent. NaCl to drink. Of 13 rats thus treated, 7 were given subcutaneously 4 doses of 2 mg. Ca pantothenate at intervals of 2 hr. All were killed fasting, 2 hr. after the time of the last injection. For those given and not given pantothenate, respectively, the value for glycogen in the liver was 22.3 and 23.8 mg. per 100 g. fresh tissue, and for blood sugar 62 and 60 mg. per 100 ml.

Two further groups of rats were treated in the same way with addition of cortisone acetate in a total dose of 1 mg., administered in 4 parts at the same time as the 4 doses of pantothenate. The blood sugar values were raised to the same extent, to 98 and 99 mg. per 100 ml., but the liver glycogen value was for those given pantothenate only 45.9 mg. per 100 g. fresh tissue and for those not given it, 168.6.—E. M. Hume.

3545

ANGELICO, R. and QUINTILIANI, M. Influenza del tasso proteico della dieta sull'azione dell'acido pantotenico sul contenuto in glicogeno del fegato di ratti surrenectomizzati. [Effect of the protein content of the diet on the action of pantothenic acid on the liver glycogen content in adrenalectomised rats.] *Bol. Soc. ital. Biol. sper.*, 1954, 30, 680-682. [Lab. Biol., Ist. Super. Sanità, Rome.]

In previous experiments (see preceding Abst.) the diet used, devoid of pantothenic acid, contained 18 per cent. of casein; in the present experiment the amount of sucrose was reduced and the percentage of casein was increased to 58. The adrenal glands were removed from 42 rats and all were given cortisone; 10 were maintained on the diet without pantothenic acid, and Ca pantothenate was given simultaneously with cortisone to 6 of them. Thirty-two were maintained on the diet

with pantothenic acid and Ca pantothenate was given simultaneously with cortisone to 16 of them. The glycogen content of the liver, in mg. per 100 g. fresh tissue, was for the adrenalectomised rats deprived of pantothenic acid and given cortisone 219.5, for the same with Ca pantothenate given simultaneously 263.5, for the adrenalectomised rats not deprived of pantothenic acid and given cortisone 403.8, and for the same given Ca pantothenate simultaneously 407.4. The low values previously obtained for glycogen in the liver of adrenalectomised rats deprived of pantothenic acid and given cortisone and Ca pantothenate simultaneously, in comparison with rats treated in the same way but not given Ca pantothenate simultaneously, were thus not obtained when the diet contained 58 per cent. of casein as against 18 per cent.—E. M. Hume.

3546

ANGELICO, R. and QUINTILIANI, M. Studi sulla gluconeogenesi nel ratto floricizzato, carente di acido pantothenico. 2. Esperienze su animali carenti, intatti e surrenectomizzati. [Glyconeogenesis in phloridzinised rats deprived of pantothenic acid. 2. Experiments on deprived animals, intact and adrenalectomised.] Cortisone e acidopantothenico nella gluconeogenesi del ratto surrenectomizzato. [Cortisone and pantothenic acid in the gluconeogenesis of the adrenalectomized rat.] *Rend. Ist. Super. Sanità, Rome*, 1954, 17, 91-98; 99-105. French, English and German summaries.

Groups of from 8 to 17 rats weighing from 55 to 60 g. were maintained for from 5 to 8 weeks on a diet described elsewhere (*ibid.*, in the press) with or without pantothenic acid. They were treated with phloridzin after fasting for 24 or 48 hr. The adrenal glands were removed from a deprived and a non-deprived group, treated with phloridzin, after 24 hours' fast. In the intact rats given phloridzin, the amounts of glucose and N in the urine were greater in the deprived than in the non-deprived, but ketone bodies were less. The differences tended to disappear with the 48-hr. fast. After adrenalectomy all the differences were much less, and did not differ significantly between deprived and non-deprived animals. Histological examination of the adrenal glands showed the necrotic, haemorrhagic lesions characteristic of pantothenic acid deficiency. It is concluded that no damage to the gluconeogenesis function of the adrenal cortex could be demonstrated in pantothenic acid deficiency.

Six groups of from 6 to 24 male rats weighing from 65 to 70 g. were maintained on a complete, purified diet containing 18 per cent. casein with or without Ca pantothenate. After 32 days for the deprived, and from 35 to 50 days for the non-

deprived, the adrenal glands were removed and a solution of 1 per cent. NaCl was given for drinking for 4 days. Food and water were then withdrawn and cortisone was given to 2 deprived and 2 non-deprived groups, one each of which received extra Ca pantothenate. The cortisone and pantothenate were given simultaneously in 4 spaced doses at intervals of 2 hr. The animals were then all killed and glycogen in the liver was estimated. In the rats subjected to adrenalectomy, whether deprived of pantothenic acid or not, the respective values for glycogen in mg. per 100 g. liver were 23.8 and 36.8, and for blood sugar in mg. per 100 ml. 60 and 70. When cortisone was given to the adrenalectomised rats the values were higher, being for deprived and non-deprived, respectively, glycogen 168.6 and 385.3, and blood sugar 92 and 99. With simultaneous administration of extra Ca pantothenate with the cortisone, the blood sugar values and the liver glycogen values did not differ greatly from those in the corresponding 2 groups not given Ca pantothenate simultaneously, except the liver glycogen value for deprived rats, which was very low indeed, only 45.9. The significance of this result is discussed.—E. M. Hume.

3547

HAZELWOOD, R. L., BENNETT, L. L. and NELSON, M. M. Reduction of the nitrogen-retaining effect of growth hormone in normal and adrenalectomized pantothenic acid-deficient rats. *Endocrinology*, 1955, 56, 197-203. [Dept. Physiol., Inst. Exp. Biol., Univ. California, Berkeley.]

Male rats aged 30 days were given for 57 days a purified diet with or without pantothenic acid. They were then kept in individual metabolism cages and N excretion in the urine was measured for 6 days before some animals received injections of growth hormone. In rats deprived of pantothenic acid and showing typical signs of deficiency, injection of growth hormone caused a decrease in N excretion of 33 mg. from an original daily output of 256 mg. More than twice this decrease occurred in pair-fed rats given pantothenic acid. Similar effects were obtained in a further experiment, and a higher dose of hormone did not increase N retention unless pantothenic acid was given. In a third experiment removal of the adrenal glands had no effect on the resistance to growth hormone of rats deprived of pantothenic acid.—A. M. Copping.

3548

GIUNCHI, G., FIDANZA, A., SCURO, L. A. and SORICE, F. The influence of some antibiotics on the growth and the production of antibodies in rats fed a pantothenic acid deficient diet. *Exp. Med. Surg.*, 1954, 12, 430-433. [Inst.

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Gen. Physiol., Univ. Rome.] French and German summaries.

Rats which received a purified diet lacking pantothenic acid from 4 weeks of age showed failure of growth and decreased ability to form circulating antibodies in response to immunisation with *Salmonella typhi* or *Brucella melitensis*. Both growth and antibody production were improved when 0.05 per cent. of chloromycetin, aureomycin, penicillin or dihydrostreptomycin was added to the deficient diet.—A. M. Copping.

3549

ASENJO, C. F. and MUÑIZ, A. I. **Pantothenic acid content of tropical foods.** *Food Res.*, 1955, **20**, 47–54. [Dept. Biochem. Nutrit., Sch. Med., Univ. Puerto Rico, San Juan.]

The results of microbiological estimation of pantothenic acid with *Lactobacillus arabinosus* are tabulated for over 100 Puerto Rico foods, mainly cereals, fruits and vegetables but including a few animal foods, in $\mu\text{g.}$ per 100 g. edible portion, means and ranges. Spanish names of foods and Latin names of plants are given. High values, between 1000 and 2000, were found for avocado pear, passion fruit, dried black beans (*Dolichos lablab*, L.), wild pepper (*Capsicum frutescens*, L.), breadfruit seed (*Artocarpus communis*, Forst) and cashew nut (*Anacardium occidentale*, L.); the seed of stinking weed (*Ditremexa occidentalis*, L.) had a value of 2655. Food yeast (*Torula utilis*) had a value of 9000 and brewer's yeast of nearly 16,000. The value for egg yolk was over 3000 and for egg white under 300.—W. M. Deans.

BIOTIN

3550

LOCHSTEIN, H. C. **The presence of bound biotin in purified preparations of oxalacetic carboxylase.** *J. Biol. Chem.*, 1955, **212**, 217–222. [Dept. Bacteriol. Immunol., Univ. Minnesota, Minneapolis.]

Biotin was estimated with *Saccharomyces cerevisiae* and *Lactobacillus arabinosus* in samples of oxalacetic carboxylase before and after acid hydrolysis. With *S. cerevisiae* the presence of bound biotin was demonstrated in many of the enzyme preparations. There appeared to be a relationship between the amount of bound biotin present and the purity of the preparation. *L. arabinosus* was not satisfactory for estimating biotin in the enzyme preparations, being less sensitive to low concentrations than *S. cerevisiae*. The specificity of the response of *S. cerevisiae* was tested with the antagonist homobiotin. It is suggested that the reported absence of bound biotin from oxalacetic carboxylase may have been based on the use of an unsuitable test organism.

A. M. Copping.

3551

MOAT, A. G. and EMMONS, E. K. **The amino acid nutrition of yeast in relationship to biotin deficiency.** *J. Bacteriol.*, 1954, **68**, 687–690. [Dept. Microbiol., Hahnemann Med. Coll., Philadelphia, Pa.]

The effect of amino-acids given singly or together on the growth of *Saccharomyces cerevisiae*, Fleischmann strain 139, was studied in a medium containing suboptimum amounts of biotin. Only aspartic acid was capable of producing a specific stimulation of growth in these conditions; other amino-acids had no effect when added individually to the medium, with or without aspartic acid.

Aspartic acid, tryptophan, arginine, leucine and methionine together were necessary to produce growth equivalent to that obtained with a complete amino-acid mixture. If aspartic acid was omitted tyrosine, isoleucine, glycine, valine, phenylalanine, alanine, histidine and glutamic acid were important; with aspartic acid present they seemed not to be essential.—A. M. Copping.

3552

GOTHOSKAR, S. S., REGE, D. V. and SREENIVASAN, A. **Biotin metabolism in micro-organisms. 6. Nucleic-acid synthesis.** *Indian J. Med. Res.*, 1954, **42**, 599–604. [Dept. Chem. Technol., Univ. Bombay.]

Synthesis of pentosenucleic acids and deoxy-pentosenucleic acids by *Lactobacillus arabinosus*, *L. casei* and *Bacillus subtilis* was reduced by addition of biotin to the basal media. Aspartate, oleate and inositol, which can replace biotin as growth substances for certain micro-organisms, had a similar depressing effect on nucleic acid synthesis.

A. M. Copping.

3553

RAVEL, J. M. and SHIVE, W. **A study of biotin sulfone inhibition of *Lactobacillus arabinosus*.** *Arch. Biochem. Biophys.*, 1955, **54**, 341–348. [Biochem. Inst., Univ. Texas, Austin.]

Lactobacillus arabinosus could grow in a synthetic medium containing aspartic acid and a source of oleic acid but no exogenous source of biotin. Addition of biotin sulphone to the medium inhibited growth. The inhibition could be overcome by threonine, lysine and uracil and partly also by an increase in the aspartic acid concentration.

A. M. Copping.

See also Abst. 3475.

FOLIC ACID (PTEROYLGLUTAMIC ACID)

3554

MONTE, I. W., NELSON, M. M. and EVANS, H. M. Abnormalities of the urinary system of rat embryos resulting from maternal pteroylglutamic acid deficiency. *Anat. Rec.*, 1954, 120, 119-129. [Dept. Anat., Univ. California, Berkeley.]

Multiple congenital abnormalities were found in young from rats deprived of pteroylglutamic acid from the 11th day of gestation (Abst. 1637, Vol. 23). A detailed study of the urinary system was made in embryos of foetal age 12 to 21 days from mothers deprived of pteroylglutamic acid at 11 days after positive mating. The first sign of abnormality was retardation of development of the ureters in 15-day embryos. The development of the kidney was retarded in 17-day embryos, and that of the urethra at 18 days. At 21 days two-thirds of the embryos from deprived rats showed severe renal and uterine hypoplasia and one-third had moderate hypoplasia, hydronephrosis and occasionally hydro-ureter. The changes in these embryos are discussed with reference to non-obstructive hydronephrosis and to the formation of posterior urethral valves in man.—A. M. Copping.

3555

TENTORI, L. and VIVALDI, G. La vitamina B₁₂ ed il fattore intrinseco antipernicioso nella anemia macrocitica sperimentale del ratto carente di acido folico. [Vitamin B₁₂ and intrinsic factor in the experimental macrocytic anaemia of rats deprived of folic acid.] *Rend. Ist. Super. Sanità, Rome*, 1954, 17, 115-122. French, English and German summaries.

Folic acid deficiency was produced in 56 rats fed on the diet described by Black *et al.* (Title 2390, Vol. 11), with the addition of 2 per cent. succinylsulphathiazole. They were then divided into 7 groups and were given every 3 days 0.05 or 0.5 µg. vitamin B₁₂ by intramuscular injection, or 0.75 or 15 µg. vitamin B₁₂ by mouth, or 2 ml. normal human gastric juice, or 0.75 µg. vitamin B₁₂ with 2 ml. gastric juice; the seventh group received weekly 250 µg. folic acid by intramuscular injection. The response of the blood picture was studied; results are shown in graphs and in a table.

The smaller dose of vitamin B₁₂ given parenterally had no significant effect, nor had 0.75 µg. vitamin B₁₂ given by mouth, even with gastric juice. The doses of 0.5 µg. given by intramuscular injection and 15 µg. given by mouth produced a good response. It is concluded that to secure a response in the anaemia produced in rats by folic acid deficiency, relatively larger doses of vitamin B₁₂ are required on a bodyweight basis than in

pernicious anaemia in man, and that the intrinsic factor in human gastric juice does not increase the efficacy of vitamin B₁₂ given to rats by mouth.

D. Duncan.

3556

WILLIAMS, J. N. (Jr.) Some metabolic interrelationships of folic acid, vitamin B₁₂, and ascorbic acid. *Amer. J. Clin. Nutr.*, 1955, 3, 20-29. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Recent literature is reviewed on the metabolic relations of folic acid and vitamin B₁₂ with special reference to folinic acid and ascorbic acid, to thymine and thymidine, and to purines, glycine, serine, methionine, choline, betaine and histidine.

A. M. Copping.

3557

DOCTOR, V. M. and TRUNNELL, J. B. *In vivo* and *in vitro* conversion of folic acid to citrovorum factor by rat. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 498-500. [Sect. Exp. Med., Univ. Texas, Houston.]

Adult male rats, given a normal diet and 100 µg. folic acid daily alone or with addition of 15 mg. L-cysteine or DL-homocysteine, were kept in metabolism cages and citrovorum factor in their urine was estimated with *Leuconostoc citrovorum*. Folic acid caused a sixfold increase in the urinary excretion of citrovorum factor and the increase was enhanced by L-cysteine or DL-homocysteine. If L-cysteine was given without folic acid there was some increase in excretion of citrovorum factor, but DL-homocysteine without folic acid had no effect.

Homogenates of rat liver showed increased ability to convert folic acid to citrovorum factor in presence of formate, serine or homocysteine; the effect of homocysteine was enhanced by serine but reduced by formate.—A. M. Copping.

3558

FATTERPAKER, P., MARFATIA, U. and SREENIVASAN, A. Role of folic acid and vitamin B₁₂ in trans-methylations. 1. Formation of creatine *in vitro* and *in vivo*. *Indian J. Med. Res.*, 1955, 43, 43-50. [Dept. Chem. Technol., Univ. Bombay.]

Adult Swiss mice were given, for from 2 to 3 weeks, a purified diet lacking in folic acid or vitamin B₁₂ or both. Creatinine was measured in the urine before the mice were killed and afterwards in the skeletal muscle. There was a considerable decrease in creatine excretion and storage with deficiency of either vitamin or of both, and little difference between the values for the 3

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groups. Liver slices from animals deprived of either nutrient showed a low rate of synthesis of creatine *in vitro*; with slices from mice lacking both nutrients the rate of synthesis was lowest.

A. M. Copping.

3559

FATTERPAKER, P., MARFATIA, U. and SREENIVASAN, A. Observations on the relationship between pteroylglutamic acid and nicotinamide metabolism. *Biochem. J.*, 1955, **59**, 470-475. [Dept. Chem. Technol., Univ. Bombay.]

Pteroylglutamic acid deficiency was induced in young rats with a purified diet containing iodinated casein and, in older animals given a stock diet, by injection of aminopterin. Nicotinamide was added as 0.5 per cent. of the purified diet or given by mouth in a dose of 25 mg. daily. The animals were killed after from 32 to 38 days, or after 12 days in the groups given aminopterin. In all the deficient rats there was an increase in the weight of liver, kidney and adrenal glands and the increases were greater when excess of nicotinamide was given. The neutral fat of the liver increased and the choline and methionine content decreased. There was a decrease in choline oxidase and a slight decrease in xanthine oxidase activity in the liver. The adrenaline content of the adrenal glands increased. All these effects of nicotinamide toxicity combined with pteroylglutamic acid deficiency were overcome by large doses of 100 μ g. pteroylglutamic acid daily. Addition of 0.5 per cent. choline to the diet also overcame the toxic effects of nicotinamide, which were closely related to methylation reactions.

In simple deprivation of pteroylglutamic acid there was no change in the content of pantothenic acid and coenzyme A in the liver, but excess of nicotinamide produced low values for both. The effect was counteracted by choline added to the diet.—A. M. Copping.

3560

NICHOL, C. A., ANTON, A. H. and ZAKRZEWSKI, S. F. A labile precursor of citrovorum factor. *Science*, 1955, **121**, 275-279. [Dept. Pharmacol., Sch. Med., Yale Univ., New Haven, Conn.]

As a result of studies designed to investigate the reaction of a cell or an organism to folic acid antagonists, a tentative scheme is suggested for interrelationships of compounds related to folic acid. A labile precursor of citrovorum factor was an essential component in such a scheme. A compound formed during anaerobic incubation of folic acid with cells of *Streptococcus faecalis* was labile to heat and oxidation, and was converted in anaerobic conditions to the stable citrovorum factor. The labile compound appeared to be a tetrahydro-derivative of folic acid. The existence of the

labile precursor is discussed with reference to enzymic and non-enzymic degradation of essential metabolites in the folic acid system.

A. M. Copping.

3561

JUKES, T. H. Antimetabolites and antibiotics as tools for research on blood formation. *Amer. J. Clin. Nutr.*, 1955, **3**, 56-63. [Nutrit. Physiol. Sect., Amer. Cyanamid Co., Res. Div., Lederle Labs., Pearl River, N.Y.]

One part of the review is concerned with the function of folic acid antagonists in the study of haemopoiesis in experimental animals, and the other with the beneficial effects of antibiotics such as aureomycin and penicillin on blood formation. The particular effect of antibiotics in causing production of citrovorum factor is considered also.

A. M. Copping.

3562

GOLDIN, A., VENDITTI, J. M., HUMPHREYS, S. R., DENNIS, D., MANTEL, N. and GREENHOUSE, S. W. Factors influencing the specificity of action of an antileukemic agent (aminopterin). Multiple treatment schedules plus delayed administration of citrovorum factor. *Cancer Res.*, 1955, **15**, 57-61. [Lab. Chem. Pharmacol., Nat. Cancer Inst., Bethesda, Md.]

The effect of one or more doses of aminopterin, with or without citrovorum factor given 12 hr. later, was examined in mice inoculated with leucæmia tumour cells. A total of from 0.78 to 214 mg. aminopterin per kg. bodyweight was given with a protective dose of 400 mg. citrovorum factor. Citrovorum factor given after aminopterin appeared to reverse the damage done by aminopterin in the host but not in the tumour. Use of 2 or 3 doses of aminopterin at intervals of 2 days, or addition of citrovorum factor, increased the antileucæmic effect of aminopterin. Multiple doses of aminopterin with citrovorum factor were the most effective treatment.—A. M. Copping.

3563

CHUBE, L. G. and LAURSEN, A. L. Further observations on the effect of aminopterin, A-methopterin and citrovorum factor on the growth of transplantable avian lymphoid tumours. *Brit. J. Pharmacol. Chemotherap.*, 1954, **9**, 419-422. [Poultry Res. Stat., Animal Health Trust, Houghton, Hunts.]

Injected aminopterin was toxic for chicks, so that its effect on tumour growth could not be determined. Aminopterin in the diet was toxic only occasionally and in most birds it decreased the number of tumours which developed and prolonged survival time. Some inhibition of tumour growth was shown by A-methopterin, which was less toxic when injected intraperitoneally than

aminopterin. It inhibited tumour growth when given in the diet. The toxic effects of injected A-methopterin and aminopterin were counteracted by the injection of citrovorum factor. The use of citrovorum factor prevented the tumour-inhibiting action of the two folic acid antagonists.

A. M. Copping.

3564

PENHOS, J. C. Action de l'aminoptérine sur l'ovulation et la sécrétion de l'oviducte du crapaud. [Effect of aminopterin on ovulation

and secretion of the oviduct of the toad.] *C.R. Soc. Biol.*, 1954, **148**, 1660-1661. [Inst. Biol. Méd. Exp., Buenos Aires.]

Treatment of female toads with an injection of 0.25, 0.5 or 1 mg. aminopterin 3 times a week for 3 weeks decreased the ovulation response to pituitary gonadotropic hormone and diminished the secretion produced in the oviduct by progesterone, prolactin or pituitary hormone.

A. M. Copping.

See also Abst. 3475.

VITAMIN B₁₂

3565

CREMA, A. Sul dosaggio microbiologico della vitamina B₁₂ nei materiali biologici. [Microbiological estimation of vitamin B₁₂ in biological materials.] *Arch. Sci. biol., Bologna*, 1955, **39**, 80-92. [Ist. Farmacol., Univ. Pavia.]

Strains of *Bacterium coli*, 313/3 and 213, requiring vitamin B₁₂ and methionine were found to be the most satisfactory organisms for estimating vitamin B₁₂ by the cup-plate method or by measuring the diameter of colonies. Methionine interfered with the method only when its concentration was relatively high. Vitamin B₁₂ was present in liver in a state in which it was not available to the organisms, and the liver was capable of rendering non-available free vitamin B₁₂ added to it *in vitro*. In experiments with guinea pig's liver, boiling on a water-bath set the vitamin free; more was liberated in 120 min. than in 80.—E. M. Hume.

3566

YRAGUI, M. M., WEEKS, O. B. and WIESE, A. C. Influence of the amino acids of synthetic media upon the response of *Lactobacillus leichmannii* to vitamin B₁₂. *J. Bacteriol.*, 1955, **69**, 20-27. [Dept. Bacteriol., Idaho Agric. Exp. Stat., Moscow.]

An exhaustive investigation was made of the amino-acids required in synthetic media by 2 strains of *Lactobacillus leichmannii*. The amino-acid requirement was judged by the response to vitamin B₁₂. Growth could be obtained in media containing 12 or 14 amino-acids but the maximum effect was obtained with a mixture of 22 amino-acids and the same basal medium. Strain 4797 required L(-)proline and DL-threonine but not DL-lysine or β-alanine. Strain 7830 required DL-lysine but not L(-)proline or DL-threonine. Solutions of amino-acids were more effective for the first week after preparation than after storage for several weeks.

Serial culture of the organisms in the complete synthetic medium produced adapted populations which no longer required vitamin B₁₂. Adaptation

did not occur in a medium containing an acid hydrolysate of soya bean or if ascorbic acid was omitted from the medium. Vitamin B₁₂ could be partly replaced in the synthetic media by thymidine or deoxyribonucleic acid.—A. M. Copping.

3567

THUILLIER, Y. and PERAULT, R. Facteur intrinsèque. Essai d'une méthode de titrage microbiologique dans les extraits pyloriques de porc. [Intrinsic factor. A method for microbiological estimation in pylorus extracts of the pig.] *Bull. Soc. Chim. biol.*, 1954, **36**, 1439-1446. [Serv. Sci. Lab. Albert Rolland.]

Intrinsic factor activity was estimated in dried pylorus and in purified extracts by estimating the amount of vitamin B₁₂ fixed by a given weight of tissue, and the amount of the vitamin which could be set free by autoclaving the mixture. Vitamin B₁₂ was estimated with *Bacterium coli* 113/3 on an agar plate. The vitamin-B₁₂-binding capacity was tested at pH 6.3 at 37° C. in a phosphate buffer. No intrinsic factor activity was demonstrated in an extract of pig's gastric mucosa; a sample of whole-stomach powder had slight activity. Among the tissues examined pyloric antrum contained most. The results obtained by the method were in agreement with clinical observation.

A. M. Copping.

3568

THUILLIER, Y. and PERAULT, R. Thermolabilité du facteur intrinsèque. [Thermolability of the intrinsic factor.] *C.R. Soc. Biol.*, 1954, **148**, 1553-1555. [Serv. Sci. Lab. Albert Rolland.]

The destruction by heat of binding capacity for vitamin B₁₂ was studied in crude and purified preparations of intrinsic factor from hog's stomach. Crude preparations retained slight activity even after heating to 100° or 120° C., but purified preparations, which lost relatively little activity on incubation at 50° or 70° C., were completely inactivated at 100° C. The thermolability of the intrinsic factor is considered to confirm that it is protein in nature.—A. M. Copping.

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3569

ROSENBLUM, C., WOODBURY, D. T., GILFILLAN, E. W. and EMERSON, G. A. **Effect of intrinsic factor concentrate upon utilization of orally administered vitamin B₁₂ by rats.** *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 268-273. [Res. Labs., Merck and Co., Inc., Rahway, N.J.]

Rats receiving a purified basal diet with soya bean protein were given by mouth vitamin B₁₂ containing ⁶⁰Co with and without a highly active preparation of intrinsic factor from pig's stomach. A second group of rats received the same diet with vitamin B₁₂ and had in addition the dose of radioactive vitamin B₁₂ with or without intrinsic factor. The animals were kept in metabolism cages and the excretion of vitamin B₁₂ in the urine and faeces and the retention in liver and kidney were used to assess the absorption of the vitamin. It seemed that intrinsic factor reduced the ability of the rat to absorb and utilise vitamin B₁₂. The inhibitory effect of intrinsic factor was shown whether vitamin B₁₂ was present in the basal diet or not, and even after injection of a massive dose of vitamin B₁₂.—A. M. Copping.

3570

CRESSERI, A. Osservazioni sulle caratteristiche biologiche e chimiche di frazioni mucoproteiche ottenute dalla mucosa gastrica di maiale. [Biological and chemical properties of mucoprotein fractions from the gastric mucosa of the pig.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 718-720. [Lab. Ricerche Biol., Ist. "Carlo Erba", Milan.]

The investigation was made by electrophoresis on paper, but isolation was not achieved by this means of a substance specially endowed with the property of binding vitamin B₁₂. A method of purification with different concentrations of phenol and ethanol is suggested.—E. M. Hume.

3571

FORD, J. E., HOLDSWORTH, E. S. and KON, S. K. **The biosynthesis of vitamin B₁₂-like compounds.** *Biochem. J.*, 1955, **59**, 86-93. [Nat. Inst. Res. Dairying, Univ. Reading.]

A mutant of *Bacterium coli* was able to synthesise vitamin B₁₂ and related compounds if the non-nucleotide cobalt complex, factor B, was present with an appropriate nucleotide. With compounds related to adenine or to 5:6-dimethylbenzimidazole, "unnatural" analogues of vitamin B₁₂ were obtained. Some of the new compounds promoted the growth of *Ochromonas malhamensis*, which had been thought to respond specifically to cyanocobalamin. Biosynthesis of vitamin B₁₂ analogues was obtained also with wild strains of *Bact. coli* and with *Aerobacter aerogenes*.—A. M. Copping.

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3572

BERNHAEUER, K., FRIEDRICH, W., BECHER, E., DELLWEG, H. and GROSS, G. Über die Vitamine der B₁₂-Gruppe. [The vitamin B₁₂ group.] *Angewandte Chem.*, 1954, **66**, 776-780. [Biochem. Forsch.-Lab., Aschaffenburg Zellestoffwerke A.G., Stockstadt (Main).]

A review is given of the authors' work (ibid., 1953, **65**, 627) in preparing a crude concentrate of B₁₂ vitamins from sewage sludge by heating, filtering, adsorption and elution. The vitamins were purified by extraction with phenol, transfer to water and precipitation with *p*-chlorophenol on to kieselguhr. The individual B₁₂ vitamins were separated by column chromatography and crystallisation. The use of halogen-substituted phenols for the purpose is described. Factors I, II, III, IV and V were isolated in this way. The vitamin B₁₂ activity in the dry matter of different sludges ranged from 1 to 30 mg. per kg. as tested with *Bacterium coli* mutants, and from 1 to 15 as tested with *Lactobacillus leichmannii*. The prevailing forms of the vitamin were I, II and III. The chemical constitution of the forms of vitamin B₁₂ is discussed and a table is given of their properties with a suggested rational system of nomenclature based on chemical constitution as far as it is known. Tests for biosynthesis of B₁₂ vitamins from a great number of precursors is reported.—E. M. Hume.

3573

BROWN, F. B., CAIN, J. C., GANT, D. E., PARKER, L. F. J. and SMITH, E. L. **The vitamin B₁₂ group. Presence of 2-methyl purines in factors A and H and isolation of new factors.** *Biochem. J.*, 1955, **59**, 82-86. [Glaxo Laboratories, Ltd., Greenford, Middlesex.]

Active substances extracted from pig and calf manure with boiling 50 per cent. ethanol were purified by partition chromatography. Some were identified as factors A, B and C (Title 2039, Vol. 22) and ψ -vitamin B₁₂ (Abst. 2035, Vol. 22) and others were called factors D, E, F, G, H and I. On deamination, factor A yielded factor H, which on mild hydrolysis gave 2-methylhypoxanthine. Deamination of ψ -vitamin B₁₂ gave rise to factor G, which contained hypoxanthine. On removal of nucleotides with warm concentrated HCl, ψ -vitamin B₁₂ and factors A, G and H all yielded factor B, which is the main cobalt-containing part of the vitamin B₁₂ molecule.—A. M. Copping.

3574

FANTES, K. H. and O'CALLAGHAN, C. H. **The effect of o-phenylenediamine on the biosynthesis of vitamin B₁₂: a new vitamin B₁₂ analogue.** *Biochem. J.*, 1955, **59**, 79-82. [Glaxo Laboratories, Ltd., Sefton Park, Stoke Poges, Bucks.]

The increase of vitamin B₁₂ activity produced in the course of fermentation by *Streptomyces griseus* in presence of *o*-phenylenediamine, reported by Dulaney and Williams (*Mycologia*, 1953, 3, 345), was found to depend on the formation of a new analogue of vitamin B₁₂. The biosynthesis of true vitamin B₁₂ was competitively inhibited by *o*-phenylenediamine. The biosynthesis of the analogue in presence of *o*-phenylenediamine was competitively inhibited by 1:2-diamino-4:5-dimethylbenzene. The analogue was crystallised as red needles, and its absorption spectrum was almost identical with that of vitamin B₁₂. Benzimidazole was a product of hydrolysis of the analogue, which was almost certainly identical with the substance reported by Ford *et al.* (Title 2016, Vol. 25). The material was clinically active in tests on 3 patients with pernicious anaemia.—A. M. Copping.

3575

FOLKERS, K. and WOLF, D. E. **Chemistry of vitamin B₁₂. Vitamins and Hormones**, 1954, 12, 1-51. [Org. and Biol. Chem. Res. Div., Merck and Co., Inc., Rahway, N.J.]

3576

GREGORY, M. E. and HOLDSWORTH, E. S. **The occurrence of a cyanocobalamin-binding protein in milk and the isolation of a cyanocobalamin-protein complex from sow's milk.**

Some properties of the cyanocobalamin-protein complex from sow's milk, and the mode of linkage of cyanocobalamin with protein. *Biochem. J.*, 1955, 59, 329-334; 335-340. [Nat. Inst. Res. Dairying, Univ. Reading.]

Protein capable of binding cyanocobalamin was demonstrated in milk from cow, goat, pig, rat and woman by an ultrafiltration method. Sow's milk had the highest binding capacity, and a pure cyanocobalamin-protein complex was isolated by electrophoresis from sow's milk whey. Electrophoresis of whey proteins of milk from other species indicated that the chief proteins did not combine with cyanocobalamin and that the pattern of the cyanocobalamin-protein complex was similar in all the samples examined.

The cyanocobalamin-protein complex from sow's milk whey in aqueous solution showed absorption maxima at 278, 362, 410, 520 and 555 m μ . Chemical analysis gave 16.1 per cent. N, 7 per cent. carbohydrate and 9 per cent. hexosamine. Sixteen amino-acids were detected by chromatographic analysis of the protein; the amount of tyrosine was higher than that in many proteins. From the absorption curve and from microbiological tests the complex was found to contain 23 μ g. cyanocobalamin per mg. On the assumption that one molecule of protein combines with one molecule of cyanocobalamin a molecular weight of 55,000 was

deduced for the protein. The mode of linkage was investigated by studying the effect of specific group inhibitors. It seemed that a phenolic or an amino-group in the protein might be the point of combination with the vitamin.—A. M. Copping.

3577

BLITZ, M., EIGEN, E. and GUNSBURG, E. **Vitamin B₁₂ studies. The instability of vitamin B₁₂ in the presence of thiamine and niacinamide.** *J. Amer. Pharm. Assoc.*, 1954, 43, 651-653. [Anal. Control Labs., U.S. Vitamin Corp., Yonkers, N.Y.]

Vitamin B₁₂ was found to be unstable in a solution at pH 4-25 containing vitamin B₁ and nicotinamide. The loss of activity was a function of the concentration of both the substances. Oxidation did not appear to have any part in the reaction.—K. H. Coward.

3578

CANNON, J. R., JOHNSON, A. W. and TODD, A. R. **Structure of vitamin B₁₂. A crystalline nucleotide-free degradation product of vitamin B₁₂.** *Nature*, 1954, 174, 1168-1169. [Univ. Chem. Labs., Pembroke St., Cambridge.]

Further fractionation of the mixture of cobalt-containing acids obtained by alkaline hydrolysis of vitamin B₁₂ gave 3 red fractions, one of which was a hexacarboxylic acid. Red crystalline prisms, obtained by extraction and purification, had ultra-violet absorption spectra close to those of vitamin B₁₂.—A. M. Copping.

3579

BRINK, C., HODGKIN, D. C., LINDSEY, J., PICKWORTH, J., ROBERTSON, J. H. and WHITE, J. G. **X-ray crystallographic evidence on the structure of vitamin B₁₂.** *Nature*, 1954, 174, 1169-1171. [Lab. Chem. Crystallography, Univ. Museum, Oxford.]

Results obtained by X-ray for air-dried vitamin B₁₂, vitamin B₁₂ crystals in the mother liquor, vitamin B₁₂-SeCN and the red degradation product of vitamin B₁₂ described by Cannon *et al.* (preceding Abst.), are presented and discussed. Peaks of electron density were recognised which corresponded to the CN groups, the nucleotide, the phosphorus atom, the ribose group and one nitrogen atom of the benzimidazole nucleus coordinated to the cobalt. A group of largely planar form surrounded the cobalt atom, and the highly unusual arrangement of atoms in this group, as shown by pure vitamin B₁₂, was confirmed in the degradation product. It is considered that further X-ray analysis can give a complete solution of the problem of the structure of vitamin B₁₂.

A. M. Copping.

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3580

MADDOCK, A. G. and COELHO, F. P. **The retention of cobalt-60 in vitamin B₁₂.** *J. Chem. Soc.*, 1954, 4702-4704. [Univ. Chem. Labs., Pembroke St., Cambridge.]

In samples of vitamin B₁₂ which had been irradiated *in vacuo* for 1 week, or for 4 weeks in an atomic pile, the retention of radio-activity as ⁶⁰Co was measured after purification by counter-current extraction or by chromatography. The percentage retention was only 0.74 ± 0.05 in the sample exposed for 1 week and 1.9 ± 0.1 in the second sample. Heat treatment did not affect the amount of radio-activity retained. The results confirmed the observations of Lester Smith (*Biochem. J.*, 1952, 52, 384), not those of other workers who reported higher retention values.

A. M. Copping.

3581

MASCHERPA, P. Cobalto ed attività vitaminica B₁₂. [Cobalt and vitamin B₁₂ activity.] *Bol. Soc. ital. Biol. sper.*, 1954, 30, 523-524. [Ist. Farmacol., Univ. Pavia.]

Results are briefly reviewed of further tests on a substance previously described (*Bol. Soc. ital. Biol. sper.*, 1953, 29, 1511).—E. M. Hume.

3582

WILSON, H. E. and PITNEY, W. R. (with LABAW, E. and LONG, M.) **Serum concentration of vitamin B₁₂ in normal and nutritionally deficient monkeys.** *J. Lab. Clin. Med.*, 1954, 44, 952-953. *Proc.* [Chicago, Ill.]

3583

DE BELLA, G. **Vitamina B₁₂ e metabolismo basale nel ratto. [Vitamin B₁₂ and basal metabolism in the rat.]** *Bol. Soc. ital. Biol. sper.*, 1954, 30, 184-187. [Ist. Fisiol., Univ. Naples.]

Basal metabolism was estimated in male rats weighing from 200 to 342 g., which had been maintained for 80 days on a purified diet with or without 15 µg. vitamin B₁₂ per 100 g. diet. The animals had fasted and were at rest. In mg. O₂ per hr., per 100 g. bodyweight, the mean value was 172 for 8 rats given vitamin B₁₂, and 190 for 18 rats of comparable weight not given it. The tests were repeated 10 days later with the same animals, the 8 without the vitamin having in the meantime been given it. The mean values were then 168 and 169.—E. M. Hume.

3584

RABBI, A., MARCHETTI, M. and VIVIANI, R. **Iper-tiroidismo sperimentale e vitamina B₁₂ nel fegato di ratto. [Experimental hyperthyroidism and vitamin B₁₂ in the rat's liver.]** *Bol. Soc. ital. Biol. sper.*, 1954, 30, 442-443. [Ist. Chim. Biol., Univ. Bologna.]

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Rats weighing from 80 to 120 g. were maintained on the diet of Rando and Causseret (Abst. 3159, Vol. 17) with or without 1000 µg. DL-thyroxine daily for 10 days. In the liver, vitamin B₁₂ was estimated with *Lactobacillus leichmannii*. For rats given and not given thyroxine, respectively, the values, in µg. per g. dry liver, were for total vitamin B₁₂ 658 and 347, for the vitamin after treatment with NaOH 200 and 181, and for the vitamin after treatment with KCN 711 and 399.

E. M. Hume.

3585

DENTON, C. A., KELLOGG, W. L., SIZEMORE, J. R. and LILLIE, R. J. **Effect of injecting and feeding vitamin B₁₂ to hens on content of the vitamin in the egg and blood.** *J. Nutrition*, 1954, 54, 571-577. [U.S. Dept. Agric., Agric. Res. Serv., Animal and Poultry Husb. Res. Branch, Beltsville, Md.]

Hens which had been depleted of vitamin B₁₂ for 6 months were given orally or parenterally amounts of crystalline vitamin B₁₂ ranging from 3 to 50 µg. daily. Eggs were collected during the period after administration when the vitamin B₁₂ content of the yolk was found to be fairly constant. The vitamin B₁₂ activity was estimated by the U.S. Pharmacopoeia 1950 method. Eggs from the hens injected with vitamin B₁₂ reached their highest vitamin B₁₂ content after 10 days, those from hens ingesting the vitamin after 18 days. On the average, about 33 per cent. of the daily dose was deposited in the eggs after injection and about 20 per cent. after ingestion. When the larger amounts of vitamin B₁₂ were given, the efficiency of transfer to the egg was diminished. Newly hatched chicks contained about as much vitamin B₁₂ as the eggs. When the dose of vitamin B₁₂ was 3 or 5 µg., the blood of injected hens contained twice as much activity as the blood of hens ingesting the vitamin, the proportion being about the same as for the eggs. When the hens ingested 10 or 25 µg., increases in the blood values were small; injection of these amounts caused large increases in the blood values, but they were not reflected in the vitamin B₁₂ content of the eggs.

E. M. Cruickshank.

3586

FERGUSON, T. M. and COUCH, J. R. **Further gross observations on the B₁₂-deficient chick embryo.** *J. Nutrition*, 1954, 54, 361-370. [Dept. Poultry Husb., Texas Agric. and Mech. Coll. System, College Station.]

Eggs from hens which had been depleted of vitamin B₁₂ for 4 weeks were incubated and the embryos removed on the 17th day. Of 291 embryos examined, 23 per cent. were classed as deficient in vitamin B₁₂, judged by the external characteristics described by Olcese *et al.* (Abst.

3487, Vol. 20). The embryos were poorly feathered and oedematous, with enlarged thyroid glands and haemorrhages in the yolk sacs. The digestive tract was thin-walled and the muscles small and tendinous. About 40 per cent. of the embryos had a fatty liver with haemorrhagic areas, and 46 per cent. had a pale, dilated, irregularly shaped heart, which was often haemorrhagic. Some of the embryos that were apparently normal externally showed these internal signs of the deficiency. Fatty kidneys, which were sometimes haemorrhagic, and haemorrhages in the crop, gizzard, duodenum, ileum and peritoneal regions occurred. When vitamin B₁₂ was injected into the parent hens or into their eggs before incubation, the abnormalities were prevented.—E. M. Cruickshank.

3587

MEHRING, A. L. (Jr.), TITUS, H. W. and WADDELL, J. The effect of adding methionine and vitamin B₁₂, singly and together, to a corn-soybean diet for laying chickens. *Poultry Sci.*, 1954, **33**, 1191-1197. [Lime Crest Res. Lab., Limestone Products Corporation of America, Newton, N.J.]

Groups of pullets were given for 48 weeks a basal all-vegetable ration, alone or supplemented with DL-methionine or vitamin B₁₂ or both. Although gain in weight, egg production and amount of feed required to produce a given number of eggs were not significantly influenced by the supplements, the hatching capacity of the fertile eggs was improved. On the basal diet alone the average percentage hatched was 70.2 compared with 77.5 and 81.2 on the diets supplemented with DL-methionine and vitamin B₁₂, respectively. When the supplements were combined the percentage was 88.—E. M. Cruickshank.

3588

WELCH, B. E., PERRETT, R. W., CLEMENTS, J. H. and COUCH, J. R. The relation of vitamin B₁₂ to egg yolk storage of folic acid. *J. Nutrition*, 1954, **54**, 601-608. [Dept. Poultry Husb., Texas Agric. Exp. Stat., College Station.]

Pullets were given a basal diet of soya bean protein, glucose, salts, soya bean oil and the required vitamins other than vitamin B₁₂ and folic acid. When 30 and 500 µg. of vitamin B₁₂ per kg. were added to the basal diet the folic acid content of the eggs increased, respectively, to 278 and 529 from 176 µg. per g. yolk, while the content of citrovorum factor increased to 48 and 47 from 36 µg. per g., respectively. The vitamin B₁₂ content of the yolk was not influenced by folic acid supplements up to 400 mg. per kg. diet. Addition of vitamin B₁₂ to the basal diet increased the hatching capacity of the eggs, but addition of folic acid was without effect.—E. M. Cruickshank.

3589

MISTRY, S. P., VADOPALAITHE, I., CHANG, I., FIRTH, J. and JOHNSON, B. C. Vitamin B₁₂ and transmethylation in pig, chick, and rat liver homogenates. *J. Biol. Chem.*, 1955, **212**, 713-722. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Weight gain and the vitamin B₁₂ content of the liver were studied in baby pigs, chicks and rats kept for from 4 to 6 weeks on basal diets with or without vitamin B₁₂. Growth was retarded in all the animals and there was a great decrease of vitamin B₁₂ in the liver of pigs and chicks deprived of the vitamin, but no significant change in the amount in the livers of deprived rats. Creatine formation was studied with homogenates of pig liver, and methionine formation with liver from pigs, rats and chicks and from normal guinea-pigs and oxen. No significant differences in transmethylation processes were found between normal and deficient pigs or chicks. In deprived rats transmethylation decreased, but it was considered that conditions other than lack of vitamin B₁₂ may have caused the change. From the whole study it appeared that vitamin B₁₂ was not involved in direct transmethylation.

A. M. Copping.

3590

JOHNSON, B. C., FIRTH, J. and MISTRY, S. P. Vitamin B₁₂ and choline synthesis from glycine *in vivo*. *Arch. Biochem. Biophys.*, 1955, **54**, 467-473. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

The effect of vitamin B₁₂ on methyl synthesis for choline formation was studied in baby pigs given a synthetic milk diet containing α-protein from soya bean, lard, Cerelease, methionine, mineral salts and vitamin supplements and 1 per cent. added glycine. One group received vitamin B₁₂ and the other did not. Those lacking vitamin B₁₂ showed loss of appetite and became very weak by the sixth week of the experiment, and their livers were fatty; those of pigs given vitamin B₁₂ showed no fatty infiltration. The vitamin B₁₂ content of the livers was about 10 times greater in pigs given vitamin B₁₂. The results suggest that vitamin B₁₂ is required for synthesis of methyl groups and that glycine serves as a methyl precursor only in presence of vitamin B₁₂.

A. M. Copping.

3591

SACHDEV, J. C. Vitamin B₁₂ and fatty livers in pancreatic duct ligated rats. *Indian J. Med. Res.*, 1955, **43**, 39-42. [Dept. Physiol., Mahatma Gandhi Mem. Med. Coll., Indore, M.B.]

The pancreatic duct was tied in 40 rats weighing from 200 to 250 g., and 10 had a sham operation.

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All received a choline-free basal diet and one group of the rats with the duct tied was given vitamin B₁₂ by subcutaneous injection. All the rats with the duct tied had severely fatty livers after 40 days whether they had received vitamin B₁₂ or not. The livers contained 50 per cent. more fat than those of the rats subjected to the sham operation. It appeared that ligation of the pancreatic duct interfered with absorption of essential nutrients to such an extent that vitamin B₁₂ was unable to exert any protective effect.

A. M. Copping.

3592

SORICE, F. Sulla azione di risparmio di alcuni antibiotici nei confronti della vitamina B₁₂. [Sparing effect of some antibiotics for vitamin B₁₂.] *Rend. Ist. Super. Sanità, Rome*, 1954, 17, 940-948. French, English and German summaries.

Of 4 groups of from 15 to 20 rats weighing from 40 to 60 g., given a complete, purified diet containing, per kg., folic acid 2 mg. and vitamin B₁₂ 100 µg., 3 groups received the diet without folic acid or vitamin B₁₂. Two of the groups thus deprived were given 0.05 per cent. of aureomycin or of penicillin. For the first 5 days the diet was given without either of the vitamins or of the antibiotics; the experiment was then continued for 45 days. Weight increase was somewhat superior in the group having the complete diet; differences between the other 3 groups were not statistically significant. In the blood there were no significant differences between the values for red or white cell count or Hb.—E. M. Hune.

3593

HOPPER, J. H. and JOHNSON, B. C. A study of the utilization of pseudo vitamin B₁₂ by the dairy calf. *J. Animal Sci.*, 1955, 14, 272-275. [Dept. Animal Nutrit., Univ. Illinois, Urbana.]

Calves maintained on a synthetic diet with soya bean protein were given supplements of vitamin B₁₂ or pseudovitamin B₁₂. Those having pseudovitamin B₁₂ showed poor growth and after 17 weeks their livers gave much less vitamin B₁₂ activity for both *Bacterium coli* and *Ochromonas malhamensis* than those of calves given vitamin B₁₂.

A. M. Copping.

3594

TEERI, A. E., ENOS, H. F. (Jr.), POMERANTZ, E. and COLOVOS, N. F. The excretion of vitamin B₁₂ by dairy cattle. *J. Animal Sci.*, 1955, 14, 268-271. [New Hampshire Agric. Exp. Stat.]

Vitamin B₁₂ was estimated with *Lactobacillus leichmannii* in urine and faeces from 8 cows. Very little was found in the urine but the amount in the faeces was 40 to 55 times the intake in cows

aged from 3 to 7 years and 10 to 30 times in yearling heifers. This is taken to indicate rich synthesis of vitamin B₁₂ in the rumen.

A. M. Copping.

3595

HINE, D. C. and DAWBURN, M. C. (with SMITH, J.) The determination of vitamin B₁₂-activity in the organs and excreta of sheep. 2. The influence of cobalt on the production of factors possessing vitamin B₁₂-activity in the rumen contents of sheep. *Austral. J. Exp. Biol. Med. Sci.*, 1954, 32, 641-652. [Div. Biochem., C.S.I.R.O., Adelaide.]

(For part 1 see Abst. 4482, Vol. 24.) Vitamin B₁₂ was estimated by 4 microbiological methods with a mutant of *Bacterium coli* in plate cultures, and *Bact. coli*, *Lactobacillus leichmannii* and *Ochromonas malhamensis* in tube cultures, in rumen contents from sheep with a rumen fistula and from intact sheep. The sheep were having cobalt-deficient diets with or without 1 mg. Co daily by mouth. With the Co supplement the vitamin B₁₂ activity of the rumen contents increased, and a steep fall occurred in the first 3 days after the supplement was withdrawn. If the sheep maintained its feed intake there was no further decrease in the vitamin B₁₂ activity of the rumen contents after a week without supplement. The true vitamin B₁₂ value, as measured by *Ochromonas*, was always less than the total vitamin B₁₂ activity measured by other methods. The highest activities were obtained with the *Bact. coli* plate-culture method.—A. M. Copping.

3596

KLEINSORGE, H., MORIGEROWSKI, E. and RÖSNER, K. Bleianämie und Vitamin B₁₂. [Lead anaemia and vitamin B₁₂.] *Ztschr. ges. inn. Med.*, 1954, 9, 903-906. [Med. Poliklin. Innere u. Nervenkrankh., Univ. Jena.]

Studies of bone marrow and blood were made in rabbits given sublethal doses of lead acetate. The lead anaemia could be cured rapidly by administration of vitamin B₁₂, and the vitamin appeared primarily to stimulate blood regeneration in the bone marrow. Vitamin B₁₂ given at the same time as lead acetate prevented the deterioration in general condition as well as the anaemia. The results are discussed with reference to findings of some earlier investigators, that liver extracts did not give protection against lead anaemia.

A. M. Copping.

3597

RIGDON, R. H., COUCH, J. R., BRASHEAR, D. and QURESHI, R. T. Effect of vitamin B₁₂ on selenium poisoning in the rat. *Arch. Pathol.*, 1955, 59, 66-72. [Lab. Exp. Pathol., Univ. Texas Sch. Med., Galveston.]

Rats received a standard ration of Purina chow, to which was added 0.05 mg. Se per g. Animals that took this diet for 33 or 48 days had nearly twice as much vitamin B₁₂ in their livers as animals on a similar diet without Se. In a longer experiment, rats given Se for 17 weeks stored somewhat less vitamin B₁₂ than rats not given Se. The loss of weight and liver damage in rats given Se was not prevented by subcutaneous injection

of 200 µg. vitamin B₁₂ daily, but in a group of 4 recovering after withdrawal of Se from the diet, vitamin B₁₂ hastened the process of repair.

It is suggested that the retention of vitamin B₁₂ in the liver is reduced when it is damaged by Se, and that the regenerating cells either utilise a greater quantity of it, or are unable to store vitamin B₁₂ like normal cells.—D. Dunnean.

See also Absts. 3556, 3558.

OTHER B VITAMINS

3598

SHERMAN, W. C., SCHILT, H. L. and SCHAEFFER, H. C. The use of depleted rats for investigations of vitamin B₁₂ and unidentified factors. *J. Nutrition*, 1955, 55, 255-264. [Nutrit. Res. Labs., Ralston Purina Co., St. Louis, Mo.]

Weanling rats depleted of vitamin B₁₂ were prepared by maintaining breeding females during pregnancy and lactation on a diet containing only vegetable protein. The young were given a more restricted diet at weaning with protein from vegetable sources only. Growth was increased by addition of vitamin B₁₂, but not by pseudovitamin B₁₂. Weight increase was greater when fish solubles, dried liver, liver extract, dried whey and other sources of unidentified growth factors were added to the diet. Addition of vitamin B₁₂ with dried whole liver, liver extract, fish solubles or dried whey produced the greatest weight gains. Antibiotics, malt sprouts, liver residue, lyxoflavin, 3-nitro-4-hydroxyphenylarsonic acid and mucin appeared to contain no unidentified growth factors. Grass juice factor and orotic acid gave very small responses.—A. M. Copping.

3599

RABBI, A. and PICCIONI, M. Azione della colina nella carenza del FPA della caseina. [Action of choline in deficiency of the animal-protein factor of casein.] *Bol. Soc. ital. Biol. sper.*, 1954, 30, 443-445. [Ist. Chim. Biol., Univ. Bologna.]

The protection has already been described (Abst. 2992, Vol. 23) that is exercised by choline against the fatal effects for the young of the first and second generation of rats fed on a diet containing purified casein (see Absts. 425, 3529, 3530, 4896, Vol. 21; 4386, Vol. 23; Title 1851, Vol. 24). The diet caused also histological changes in the liver which, it is now reported, were much less severe when choline was given.—E. M. Hume.

3600

MORUZZI, G., RABBI, A., PICCIONI, M. and DINA, M. A. Insorgenza di neoplasie nel ratto a dieta carente di fattore proteico animale

(FPA). [Occurrence of neoplasms in rats on a diet without animal-protein factor (APF).] *Internat. Ztschr. Vitaminforsch.*, 1955, 25, 384-391. [Inst. Biochim., Univ. Bologna, French, German and English summaries.]

A fuller account is given of experiments already briefly reported (Abst. 3115, Vol. 24), in which rats maintained on a diet containing 5 per cent. casein thrive when the casein was crude, but if it was purified they suffered ill effects which became more severe in later generations maintained on the same diet. When 50 rats of the first generation reared on the diet were kept for 7 months or more on the same diet, 25 of them developed neoplasms, and 8 of them showed pre-cancerous changes in the mucous membrane of the respiratory organs. The neoplasms were sarcomas and fibro-adenomas.

E. M. Hume.

3601

ERSHOFF, B. H. Protective effects of liver residue on rats administered multiple sublethal doses of X-irradiation. *Exp. Med. Surg.*, 1954, 12, 361-366. [Emory W. Thurston Labs., Los Angeles, Calif.] French and German summaries.

In rats receiving a purified diet, a supplement of all known vitamins of the B complex did not prolong survival after exposure to X-rays to the same extent as an insoluble fraction of liver residue. The protective factor in the insoluble residue was not present in significant amounts in water-soluble extracts of liver, or in dried thymus or spleen.

A. M. Copping.

3602

TENTORI, L. and VIVALDI, G. Sindrome mortale caratterizzata da manifestazioni a carico del sistema nervoso nel ratto alimentato con una dieta sintetica purificata contenente sulfonamidoguanidina. [Fatal syndrome characterised by neurological signs in rats fed on a purified synthetic diet containing sulphaguanidine.] *Bol. Soc. ital. Biol. sper.*, 1954, 30, 470-472. [Ist. Super. Sanità, Rome.]

Rats maintained on a purified diet, complete except for folic acid, were given in the diet 2 per

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cent. of sulphaguanidine or of succinylsulphathiazole, or 1 per thousand of streptomycin. Folic acid was restored to the diet when it had become clear that the intestinal contents had been sterilised. After from 5 to 6 months, the rats receiving the diet with sulphaguanidine developed a syndrome of low body temperature, weakness, torpor, muscular inco-ordination, tremors and finally attacks like those of tetany lasting a minute or two. Death occurred within from 24 to 48 hr. of the syndrome's onset. The syndrome did not occur with either of the other antibiotics. It was not prevented by any of the known vitamins, but was prevented by 5 per cent. in the diet of the dried, powdered faeces of normally fed rats. There were changes in the thyroid gland like those found in rats treated with thiouracil, and degenerative changes in the central nervous system.

E. M. Hume.

3603

TENTORI, L. and VIVALDI, G. *Sindrome mortale caratterizzata da manifestazioni a carico del sistema nervoso nel ratto alimentato con dieta altamente purificata contenente solfonamidoguanidina. [Fatal syndrome characterised by neurological signs in rats fed on a highly purified diet containing sulphaguanidine.]* 3. Sulla attività preventiva delle feci di ratti ad alimentazione normale e di alcune frazioni di esse. [3. The preventive effect of faeces of normally fed rats and of some fractions of them.] 4. Relazioni con uno stato di ipertiroidismo sperimentale. [4. Relation to experimental hyperthyroidism.] *Rend. Ist. Super. Sanità, Rome, 1954, 17, 19-32; 33-43.* French, English and German summaries.

3. In earlier experiments (*Rend. Ist. Super. Sanità, Rome, 1950, 13, 670; 1951, 14, 216*; and see preceding Abst.) a fatal disorder was induced in rats given diets lacking folic acid and containing sulphaguanidine.

A standard McCollum diet was used as control, with addition, per 100 g., of dried brewer's yeast

2 g., ascorbic acid 20 mg. and sulphaguanidine 2 g. A purified diet was prepared with percentage composition purified casein 18, sucrose 67, salt mixture 4, butter 9 and cod liver oil 2, to which was added, in mg. per kg., vitamin B₁ 10, riboflavin 20, pyridoxine 10, nicotinic acid 100, calcium pantothenate 100, *p*-aminobenzoic acid 100, ascorbic acid 100, choline hydrochloride 200, inositol 200, menadione sodium bisulphite 50, α -tocopherol 100, and ethyl linoleate 100. To the purified diet were added separately or together sulphaguanidine, folic acid, streptomycin and preparations or fractions of faeces from rats on normal diet or a diet containing streptomycin.

Sulphaguanidine with the McCollum diet produced no nervous syndrome, but with the synthetic diet it regularly produced fatal signs in a high proportion of the rats. Folic acid did not prevent the syndrome, but 5 per cent. in the diet of faeces from rats on stock diet did so. Ether extract of such faeces was not active; the ether-extracted residue was partly active and so were faeces heated to 100° C. for 1 hr. Faeces from animals given the purified diet with streptomycin were partly active; those from rats given the purified diet with sulphaguanidine were inactive.

It is concluded that the protective effect of the McCollum diet depended on the presence in it of an unidentified substance and that the protective effect of faeces depended on the presence of a normal intestinal flora or of some of its products.

4. With the same purified diet containing sulphaguanidine, the addition of 10 per cent. whole liver powder reduced the incidence of the fatal nervous syndrome, but did not prevent it in all animals. Iodinated casein (Protamone) as 0.05 per cent. of the diet prevented the disorder completely. After 3 months on the experimental diet, affected animals had lowered basal metabolism, with average values of — 65.5 per cent.

It is concluded that the syndrome bears some relation to hypothyroidism, but it is not known which is the primary factor.—D. Duncan.

VITAMIN C (ASCORBIC ACID)

3604

SCHAFFERT, R. R. and KINGSLEY, G. R. *A rapid, simple method for the determination of reduced, dehydro-, and total ascorbic acid in biological material.* *J. Biol. Chem., 1955, 212, 59-68.* [Clin. Biochem. Lab., Veterans Admin. Centre, Univ. California, Los Angeles.]

Filtrates from whole blood, serum, urine, vegetables and fruit were shaken with Norit charcoal to oxidise the ascorbic acid. Thiourea and 2:4-dinitrophenylhydrazine were added and filtrates

from blood were placed for 5 min., and from urine or food for 10 min., in a boiling-water bath. After cooling, 85 per cent. H₂SO₄ was added, the mixture was allowed to stand for 10 min. and total ascorbic acid was estimated photometrically as dehydroascorbic acid. When charcoal treatment was omitted only dehydroascorbic acid was measured and the amount of reduced ascorbic acid was calculated by difference. At 100° C., 2:3-diketogulononic acid did not significantly interfere with the coupling reaction between dehydroascorbic acid

and 2:4-dinitrophenylhydrazine. The method was accurate and compared favourably with the original one of Roe and Kuether (Abst. 261, Vol. 13).—A. Hepburn.

3605

SCHWARTZ, M. A. and WILLIAMS, J. N. (Jr.) **New procedure for ascorbic acid analysis by the osazone method.** *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 136–138. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Total ascorbic acid was estimated by oxidation with 2:6-dichlorophenolindophenol, addition of thiourea and 2:4-dinitrophenylhydrazine to form the osazone, incubation at 37°C. for 3 hr. and finally measurement in a colorimeter after colour development with a 2:3 mixture of 85 per cent. H_3PO_4 and concentrated HCl. Dichlorophenolindophenol was reduced by mixing it with thiourea before the test sample was added to prevent oxidation of ascorbic acid and allow dehydroascorbic acid to be estimated. The method was superior to that of Roe and Kuether (Abst. 261, Vol. 13) and its modifications (Abst. 1225, Vol. 14; 4256, Vol. 16; Bolin and Book, *Science*, 1947, **106**, 451).—A. Hepburn.

3606

GÉRO, E. L'action inhibitrice de l'aneurine sur l'oxydation de l'acide L-ascorbique. 2. L'influence du pH et de la concentration en aneurine; le rôle des diverses parties de la molécule de vitamin B_1 . [Inhibitory action of vitamin B_1 on the oxidation of L-ascorbic acid. 2. Effect of pH and of the concentration of vitamin B_1 ; role of different parts of the vitamin B_1 molecule.] *Bull. Soc. Chim. biol.*, 1954, **36**, 1335–1342. [Lab. Physiol. Nutrit., Centre Nat. Recherche Sci., Paris.]

The inhibition by vitamin B_1 of the oxidation of L-ascorbic acid in the presence of Cu^{++} (Abst. 1919, Vol. 25) was further studied at pH 7 with varying concentrations of vitamin B_1 . It occurred only with concentrations of vitamin B_1 greatly in excess of those of Cu, and the results showed that the theoretical complex of vitamin B_1 and Cu was highly dissociated. Tests with the separate components of the vitamin B_1 molecule showed formation of a complex between Cu and the thiazole portion which was different from the cuprothiamine previously described. Cuprothiamine was formed only when the concentrations of vitamin B_1 and Cu were high and of about the same order.

A. M. Copping.

3607

SCHENCK, G., MUSCHE, R. and BERG, G. Über die Oxydation von therapeutisch wirksamen Stoffen. 2. Einfluss der Ultrarotlicht-Erhitz-

ung auf Ascorbinsäure und Phenoloxylase von Kartoffeln. [Oxidation of therapeutically active substances. 2. Effect of heating in infrared light on the ascorbic acid and phenyl-oxidase of potatoes.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **100**, 188–194. [Pharm. Inst., Freie Univ., Berlin.]

Part 1 appeared in *Arch. Pharmaz., Ber. deutsch. pharmaz. Gesellsch.*, 1953, **286/58**, 117.

2. In potatoes dried by infrared light the loss of ascorbic acid was similar to that in potatoes dried by convection. In a potato homogenate exposed to infrared light the loss of ascorbic acid was substantially less than in a homogenate treated for the same time with hot air.

The inactivation of partly purified phenol oxidase by infrared light is described.

D. Duncan.

3608

CIMINO, S. Acido deidroascorbico e metabolismo glicidico. [Dehydroascorbic acid and carbohydrate metabolism.] Acido deidroascorbico e processi deidrogenativi. [Dehydroascorbic acid and dehydrogenation.] *Arch. Sci. biol.*, Bologna, 1954, **38**, 607–613; 614–619. [Ist. Patol. Gen., Univ. Catania.]

Dehydroascorbic acid was prepared and injected into the tail vein of 30 rats weighing from 100 to 130 g. Sugar was estimated in the blood and urine before, and every day or two for 9 days after the injection, and again after 15 and 30 days. The pancreas of some rats was examined histologically. The first dose of 20 mg. dehydroascorbic acid often proved fatal, the rats dying in a state of extreme agitation and respiratory embarrassment. Three further doses of 80 mg. were given to those surviving, one after half an hour and 2 after intervals of 24 hr. Of the 30 rats injected, 9 died, 8 showed no rise in the blood sugar, and 13 showed a large rise; all those showing the rise had sugar in the urine. The hyperglycaemia was not permanent, and the values returned to normal after about 15 days. Histological examination of the pancreas showed no abnormality in the islets of Langerhans. Results of Patterson (Absts. 4888, Vol. 19; 1901, 3534, Vol. 20) were thus only partly confirmed.

The acute respiratory embarrassment of the rats given dehydroascorbic acid was further investigated. The dehydrogenating activity of the watery fraction from homogenates of rat liver was estimated with methylene blue in Thunberg tubes, with and without addition of dehydroascorbic acid, and buffered at pH 6. In the tubes without dehydroascorbic acid, methylene blue was reduced in from 48 to 50 min. In tubes with dehydroascorbic acid there was no reduction.

E. M. Hume.

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3609

DE SALEGUI, M., SCHWARTZ, M. A. and WILLIAMS, J. N. (Jr.) **Catabolism of ascorbic acid by animal tissues.** *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 530-533. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Homogenates of rat and guinea pig liver were separated by centrifuging into a soluble portion and an insoluble residue. Incubation experiments showed that ascorbic acid was oxidised to dehydroascorbic acid by a heat-stable, non-enzymic substance in the insoluble residue. The soluble portion enzymically oxidised dehydroascorbic acid to a stage beyond diketogulonic acid. A. Hepburn.

3610

ERICSSON, Y. **The effect of ascorbic acid oxidation on mucoids and bacteria in body secretions.** *Acta pathol. microbiol. scand.*, 1954, **35**, 573-583. [Dept. Operative Dent., State Dent. Coll., Stockholm.]

The oxidation of sodium ascorbate by hydrogen peroxide or sodium percarbonate with a trace of copper as catalyst caused depolymerisation with accompanying decrease in viscosity of mucoids from mandibular saliva, nasopharyngeal secretions, pathological lung sputum and gastric juice from patients with gastritis. When the mixture was used as a mouth wash, there was a beneficial effect on acute gingivitis and stomatitis and the coatings of mucus disappeared after a few rinses. *In vitro*, most of the bacteria in cultures from gastric juice were killed during oxidation by the mixture, leaving a small number of staphylococci; bacteria from the mouth were almost all killed. Depolymerisation of bacterial polysaccharide probably occurred. Neither ascorbic acid nor the oxidising agent separately caused depolymerisation or had any bactericidal effect. The same action was shown by ascorbic acid but only to a small extent by dihydroxymaleic acid.—A. Hepburn.

3611

STERN, H. and TIMONEN, S. **The position of the cell nucleus in pathways of hydrogen transfer: cytochrome C, flavoproteins, glutathione and ascorbic acid.** *J. Gen. Physiol.*, 1954, **38**, 41-52. [Rockefeller Inst. Med. Res.]

Studies of cell nuclei of calf thymus and liver tissue showed that cytochrome c reductase, cytochrome c and most other flavoprotein systems were absent. Ascorbic acid and glutathione were present but there was very little glutathione reductase, and no enzymic relation could be established between ascorbic acid and hydrogen transfer in nuclei. Examination of lily anthers at different stages of the mitotic cycle showed a close association between ascorbic acid concentration and the mitotic process. The possible relation

between the anaerobic nature of nuclear metabolism and chromosome function is discussed.

A. M. Copping.

3612

BARAC, G. **Recherches sur la brûlure. Influence de quelques facteurs sur l'effet diurétique de l'acide ascorbique chez le chien brûlé. [Studies of burning. Effect of some factors on the diuretic action of ascorbic acid in the dog after burns.]** *C.R. Soc. Biol.*, 1954, **148**, 1670-1673. [Inst. Clin. Méd., Univ. Liège.]

Adrenaline, arterenol, histamine and the magnesium salt of adenosinetriphosphate tend to appear in increased quantities in the blood from burned dogs, and inhibition of diuresis occurs. The substances were injected singly into intact dogs, at first alone and later mixed with ascorbic acid. Ascorbic acid prevented the inhibition of diuresis by Mg adenosinetriphosphate but not by adrenaline, arterenol or histamine. The diuretic effect of ascorbic acid was strongly inhibited during experimental hypotension and after bleeding.—A. Hepburn.

3613

MEREZHINSKY, M. F., CHERKASOVA, L. S. and KYTSENKO, Z. M. **Soderzhanie askorbinovoi kisloty v tkanyakh belykh kryis s eksperimental'nym perelomom kosti nakhodivshikh-sya v razlichnykh usloviyakh pitaniya. [Ascorbic acid content of the tissues of white rats with experimental fractures, in different nutritional conditions.]** *Vop. Pitan.*, 1955, **14**, 26-30.

Rats weighing about 200 g. were given 3 diets, normal, low-protein with high carbohydrate, and low-protein and carbohydrate with high fat. The diets all had the same calorie value. The animals were subjected to experimental fracture of the femur and, in sub-groups of from 10 to 12 animals, were killed at intervals of from 1 to 60 days after the fracture. The ascorbic acid content of several tissues was estimated and compared with the values for uninjured animals having the same 3 diets. The average values are tabulated.

In the guinea pig, which cannot synthesise vitamin C, such injury was followed by a fall in the vitamin C content of the tissues, but in rats on a normal diet injury was followed by a rise in the ascorbic acid content, in particular of the spleen, adrenal glands, lungs, small intestine, and muscle and bone of the injured limb. With the low-protein, high-carbohydrate diet, increased values for ascorbic acid were found only in the lungs, small intestine and tissues of the broken limb, the changes occurring earlier than in the animals on normal diet. In the group with low protein and carbohydrate and high fat, the ascorbic acid values fell in the liver, kidneys and adrenal

glands, rose in the spleen and lungs, showed a fall and then a rise in the small intestine, and in the injured limb rose even earlier than in the other 2 groups, although not so high.—D. W. Taylor.

3614

RUDAS, I. Veränderungen des Nukleoproteidgehaltes des Granulationsgewebes bei verschiedenen Verabreichungsmethoden von Vitamin C. [Changes in nucleoprotein content of granulation tissue in relation to different methods of administering vitamin C.] *Acta physiol. hung.*, 1954, 6, Suppl., 83–84. [Inst. Ernährungswissensch., Budapest.]

3615

HODGES, J. R. A modified adrenal ascorbic acid depletion technique for the bioassay of ACTH. *J. Endocrinol.*, 1955, 12, 152–158. [Dept. Pharmacol., Sch. Pharm., Univ. London.]

The methods of Sayers *et al.* (Abst. 1967, Vol. 18) and Munson *et al.* (quoted by Sayers), in which adrenocorticotrophic hormone (ACTH) was estimated from its depleting effect on adrenal ascorbic acid in hypophysectomised rats, were modified by injecting 20 mg. deoxycorticosterone acetate per 100 g. bodyweight before injection of ACTH in order to prevent mobilisation of endogenous ACTH, and so obviating the need for hypophysectomy. Results with both modified methods were about the same. A linear relationship existed between the logarithms of doses from 0.25 to 16 μ g. of the international standard for ACTH, and the values for the depletion of adrenal ascorbic acid. The method could be performed by comparatively unskilled workers, was as sensitive and as accurate as the Sayers method, and took less time.

A. Hepburn.

3616

MESTYÁN, G. and NAGY, L. Adrenal ascorbic acid content of normal, thyroidectomized and methylthiouracil treated rats exposed to high and low environmental temperatures. *Acta physiol. hung.*, 1954, 6, 403–407. [Inst. Pathophysiol., Med. Univ., Pécs.] Russian summary.

3617

CHEYMOL, J., DE LEEUW, J. and OGER, J. Poids et teneur en acide ascorbique des surrénales au cours de l'année chez le rat blanc δ hypophysectomisé. [Variations round the year in the weight and ascorbic acid content of the adrenal glands of the hypophysectomised male white rat.] *C.R. Soc. Biol.*, 1954, 148, 1555–1557.

For a total of 1394 male rats from which the pituitary gland had been removed 24 hr. pre-

viously, the mean ascorbic acid content of the left adrenal gland, in μ g. per 100 mg. gland, for groups of from 31 to 269 rats, killed in each month of the year except February and August, was 420 in January, from 424 to 430 in March to July, and from 434 to 444 in September to December.

E. M. Hume.

3618

RALLI, E. P., DUMM, M. E., KUHLE, W. J. (Jr.), GERSHBERG, H. and BECK, E. M. Effect of extensive denudation on electrolyte and nitrogen balances, ascorbic acid excretion and adrenal cholesterol in rats. *Amer. J. Physiol.*, 1954, 179, 319–324. [Dept. Med., Coll. Med., New York Univ.-Bellevue Med. Centre.]

Balance studies were made on 30 female rats from which a quantity of skin equal to 4 per cent. of the bodyweight had been removed surgically. The diet, given to appetite, contained, per cent., vitamin-free casein 22, sucrose 64, Primex 9, cod liver oil 2 and a salt mixture without Na, Cl or K 3, with vitamins E, K and those of the B complex added; in a drinking solution the animals received 0.05 M KCl and 0.10 M NaCl before and after operation. Of 90 other female rats given similar treatment 26 received 0.01 M KCl in a drinking solution before and after operation, 48 received 0.05 M KCl before and after operation, and 16 received 0.01 M KCl before and 0.05 M KCl after operation; the NaCl content of the drinking solution was 0.10 M, except where 0.01 M KCl was used, when it was sometimes increased to 0.14 M. During the first 2 days after operation, weight, fluid and food intake, and urine output were measured daily; after this time total urine was collected every 48 hr., and analysed for ascorbic acid, total N, Na, K and Cl. After 15 days all the surviving animals were killed, and the weight of the adrenal glands and the concentration in them of ascorbic acid and cholesterol were estimated.

In rats which survived 15 days, food intake was higher than for rats which died before 15 days. Fluid and electrolyte intake was very high in all animals after operation. Rats which survived 15 days retained more K than those which failed to survive. Ascorbic acid excretion increased during the first 2 days after operation and then decreased to below the values before operation. The weight and ascorbic acid and cholesterol concentration of the adrenal glands were higher 15 days after the removal of skin than in intact female rats having the same diet.—G. F. Garton.

3619

FUSI, G. and TILLI, R. Sul comportamento istochimico dei chetosteroidi e dell'acido ascorbico della corticosurrene in corso di irradiazione sperimentale. [Histochemical behaviour of the ketosteroids and of ascorbic acid in the

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adrenal cortex during experimental irradiation.] *Sperimentale*, 1954, 104, 34-41. [Ist. Radiol., Univ. Florence.] English summary.

Thirty-six male rabbits, 6 months old, maintained on a normal diet, were subjected in groups of 3 to exposure to X-rays of from 50 to 1500 r over the abdomen, lower limbs or whole body. They were killed 2 hr., or in one group 24 hr., later. In histological preparations of the adrenal cortex, ketosteroids were demonstrated by a staining technique and ascorbic acid with silver nitrate. In comparison with that of normal animals, the ascorbic acid content of the zona fasciculata of the adrenal cortex was hardly affected. The ketosteroid content in all animals irradiated and killed 2 hr. later was reduced in the zona fasciculata and zona reticularis, but not in the zona glomerulosa. In the animals killed 24 hr. after exposure, return to normal was always in progress.—E. M. Hume.

3620

FORBES, J. C. and DUNCAN, G. M. Effect of alcohol intoxication and ACTH on liver ascorbic acid in the guinea pig. *Endocrinology*, 1954, 55, 822-827. [Dept. Biochem., Med. Coll. Virginia, Richmond.]

Intraperitoneal injections for up to 3 consecutive days of an amount of alcohol intoxicating to guinea-pigs gave a significant increase in total liver ascorbic acid after 48 hr. The effect was not observed after 24 hr. but was still apparent after 72 hr. Large amounts of ascorbic acid given before and with the alcohol did not alter the effect, nor did moderate depletion of ascorbic acid, but depletion for 184 hr. before injection abolished the difference between animals given and not given alcohol. Ascorbic acid increased in the liver 24 hr. after the injection of adrenocorticotrophic hormone. The amount and time of decrease in adrenal ascorbic acid produced by the treatments suggested that the rise in the liver was not entirely at the expense of ascorbic acid in the adrenal glands.—A. Hepburn.

3621

MOURQUAND, G. and EDEL, V. Hypervitaminose C et gestation. [Vitamin C excess and gestation.] *C.R. Soc. Biol.*, 1954, 148, 1422-1423.

The injection of about 70 g. ascorbic acid during 372 days into 4 female guineapigs impaired reproduction in 2, one of which had stillborn young; the third was completely infertile and the fourth normal. For previous work with pregnant, non-pregnant and normal male guineapigs see Abst. 3145, Vol. 24.—A. Hepburn.

3622

SCATENA, A. R. La influencia estacional en el tenor de ácido ascórbico de los polvos lácteos.

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[Influence of season on the ascorbic acid content of milk powders.] *Prensa pediat.*, 1954, 5, 28-30.

Five analyses were made on each of 15 specimens of dried milk powder produced locally in Argentina, in summer. Ascorbic acid was estimated by the use of chloramine T. In the milk reconstituted to contain 15 per cent. solids, the ascorbic acid content varied from 20 to 40 mg. per litre, which is not considered to differ much from the values [none quoted] for milk produced in winter.

E. M. Hume.

3623

DERSE, P. H. and ELVEHJEM, C. A. Nutrient content of acerola, a rich source of vitamin C. *J. Amer. Med. Assoc.*, 1954, 156, 1501. [Dept. Biochem., Univ. Wisconsin, Madison.]

A complete analysis of acerola, the West Indian cherry, confirmed the high content of ascorbic acid previously found (Abst. 512, Vol. 16).

A. Hepburn.

3624

SCHRADER, O. L., DE SIQUEIRA, R. and PECHNIK, E. Variedades de goiaba (*Psidium guajava*, L.) genéticamente seleccionadas e vitamina C. [Genetically different varieties of the guava and vitamin C.] *Univ. Brasil Inst. Nutrição Trab. e Pesq.*, 1952, 5, 233-244. English summary.

The 20 varieties of guava compared were obtained from the botanical gardens of São Paulo or from California, and represented the principal types from all over the world. They were grown from seed under identical experimental conditions and fruit was collected from trees 6 or 7 years old.

In 88 samples the ascorbic acid content ranged from 7 to 325 mg. per cent. Several varieties especially selected for size, weight and resistance to pests and disease were also particularly rich in ascorbic acid. Fruit with red or salmon-pink pulp usually contained more than the white or yellow types. The ascorbic acid content rose as the fruit ripened.

In 2 varieties low in ascorbic acid the fruits from branches most exposed to the sun had somewhat higher values.

The results are shown in tables.—D. Duncan.

3625

ANDERSON, E. E., FAGERSON, I. S., HAYES, K. M. and FELLERS, C. R. Ascorbic acid and sodium chloride content of commercially canned tomato juice. *J. Amer. Dietetic Assoc.*, 1954, 30, 1250-1253. [Dept. Food Technol., Univ. Massachusetts, Amherst.]

In 6 samples of each of 40 brands of canned tomato juice, the reduced ascorbic acid value ranged from 1.8 to 29.3 mg. per 100 g., mean 15.6. NaCl values ranged from 0.66 to 1.10 mg. per 100

ml., mean 0.89. The mean NaCl content of 6 samples of canned, unsalted tomato juice prepared in the laboratory was 0.13 mg. per 100 ml.

F. C. Aitken.

3626

KYZLINK, V. Antioxydační opatření a ztráty vitamínu C při sterilisaci ovocných konserv. [Anti-oxidative mechanisms and loss of vitamin C during the sterilisation of canned fruit.] *Výživa lids.*, 1954, 9, 139-141. [Fac. Food Tech., Chem. Tech. Univ., Prague.]

Sterilisation of fruit should be accompanied by rapid inactivation of the enzymes. Loss of vitamin C during preservation is considerably reduced by dipping the fruit for several hours in a 30 per cent. solution of sugar saturated with CO_2 .—M. Jančařík (Czechoslovakia).

3627

RUBINO, F. Sul contenuto in acido ascorbico del succo di limone sottoposto alla "flash pasteurisation". [Ascorbic acid content of lemon juice subjected to flash pasteurisation.] *Bol. Soc. ital. Biol. sper.*, 1954, 30, 244. [Ist. Fisiol., Univ. Palermo.]

Flash pasteurisation, in which the juice is exposed for from 5 to 40 sec. to a temperature of 95° C., has recently been applied to the commercial preparation of lemon juice. In 16 samples of juice, the mean ascorbic acid content, in mg. per 100 ml., estimated by the method of Tillmans, was 55 before flash pasteurisation and 50 after it.—E. M. Hume.

3628

MALAKAR, M. C., BANERJEE, S. N. and GUHA, B. C. Studies on the effect of canning and storage on the nutritive value of some common vegetables. 1. Changes in ascorbic acid in cabbage. *Indian J. Med. Res.*, 1955, 43, 23-29. [Nutrit. Res. Unit, Indian Coun. Med. Res., Univ. Coll. Sci. Technol., Calcutta.]

Ascorbic acid was estimated by the 2:6-dichlorophenolindophenol method in samples of cabbage fresh, 5, 30 and 60 min. after blanching for 4 min. at 82-2° C., after canning in 1.5 per cent. salt solution at 10 lb. pressure for 30 min.,

and after storage in cans at Indian temperatures, about 30° to 40° C. for 7 days and 1, 2, 3 and 6 months.

The mean ascorbic acid content of the fresh cabbage was 4.10 mg. per g. on a dry basis. Mean loss on blanching and canning was 92 per cent.; about one-third of this was due to the blanching. Of the remaining ascorbic acid, about one-quarter was lost during the first week's storage; thereafter there was little change until after 2 months; after 6 months only traces were left. Up to 1 month the distribution between solid and liquid was in the ratio of 6:10; thereafter the ascorbic acid content fell more rapidly in the solid than in the liquid. When the cabbage was fortified at the rate of 100 mg. ascorbic acid per 100 g. in the can, about 36 per cent. of the total ascorbic acid was lost during canning, but nearly half remained after 6 months and the ratio of distribution between solid and liquid remained fairly steady, between 3:10 and 4:10.—W. M. Deans.

3629

ROINE, P., WICHMANN, K. and VIHAVAINEN, L. Askorbiinihapon määristä ja säilyvyydestä eri perunalajikkeissa. [Quantity and stability of ascorbic acid in potato varieties in Finland.] *Acta agral. fenn.*, 1955, 83, 71-87. [Dept. Nutrit. Chem., Univ. Helsinki.] English summary.

The vitamin C content of 58 varieties of potato grown in the same field varied widely, the range being from 120 to 49 mg. per 100 g. dry matter. Of 12 varieties grown at the University Experimental Farm at Viik in 3 successive years, Sikkle, Rheingold and Eigenheimer had the highest values each year and Franz and Aquila the lowest, showing that vitamin C content is characteristic of variety. During storage the greatest decrease in vitamin C occurred during the first 3 to 4 months and the loss was most rapid in varieties with the highest vitamin C content; after 6½ months there was no great further loss. About 50 per cent. of the original vitamin C was lost, part of it being converted to dehydroascorbic acid. (From summary.)—J. S. Thomson.

See also Absts. 3378, 3382, 3556.

OTHER VITAMINS

3630

LÖVI, M., ÁDOR, V. and GÁBOR, M. Wirkung von Rutin auf die Heilung experimenteller Korneageschwüre. [Effect of rutin on the healing of experimental ulcers of the cornea.] *Acta med. hung.*, 1954, 6, 391-396. [Augenklin., Med. Univ., Szeged.] Russian summary.

Records were made of the healing time, with and without application of rutin, of corneal ulcers produced in rabbits by mechanical injury. In 19 animals in which ulcers were produced simultaneously in both eyes, local treatment with a 5 per cent. rutin salve was without effect on the time of healing. In another series, after the time

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of spontaneous healing of the ulcer in one eye had been recorded, a similar ulcer was produced in the other eye, and daily intravenous injections were given of 100 mg. per kg. bodyweight of a 20 per cent. solution of rutin in propylene glycol. For 13 animals the average time of spontaneous healing was 33 days. With intravenous injection of rutin, the average time of healing was 9 days. It is suggested that rutin may act by reducing permeability, and so preventing the complications that arise from iritis in association with corneal ulceration.—M. B. Richards.

3631

KLOSTERMANN, G. F. Über den Einfluss von Rutin auf das Verhalten der Arsenwerte im Blutplasma nach Arsenzufuhr. Tier-experimentelle Untersuchungen mit radioaktivem As⁷⁶. [Influence of rutin on the behaviour of the arsenic values in blood after arsenic administration. Animal experiments with radio-active ⁷⁶As.] *Klin. Wochenschr.*, 1954, 32, 1054-1056. [Klin. Poliklin. Haut- Geschlechtskrankh., Univ. Erlangen.]

From human experiments (*Arch. Dermatol.*, in the press) it had been found that after intravenous administration of rutin, there was increased urinary excretion of arsenic, administered by intramuscular injection 8 hr. previously.

Six rabbits weighing about 2.9 kg. received by intramuscular injection 0.38 mC. ⁷⁶As, equivalent to 3.61 mg. elementary arsenic. One animal died. Blood samples were taken every 4 hr. for the ensuing 24 hr., and 50 mg. rutin was given by intramuscular injection to every animal 8 hr. after the arsenic injection. The supply of radio-active As was insufficient to establish controls. The mean As concentration, ascertained by means of the isotope, for the 6 successive samples of plasma, in µg. per cent., was 101.6, 73.9, 69.7, 70.4, 86.3 and 80.0, so that a definite rise occurred after rutin was given. The effect was shown by all the animals, by some earlier than by others.

It is concluded that the increased excretion of As observed in the human subjects resulted from an increased offer of As by the plasma to the kidneys.—E. M. Hume.

3632

BUKIN, V. N. and EROFEEVA, N. N. Sravnitel'naya P-vitaminnaya aktivnost' katechinov chaya, dubil'nykh veshchestv vinograda i rutina grechikh. [Comparative P vitamin activity of tea catechins, tanning substances from grapes and rutin from buckwheat.] *Dokl. Akad. Nauk. S.S.S.R.*, 1954, 98, 1011-1012. [A.N. Bakh Inst. Biochem., Acad. Sci., U.S.S.R.]

Groups of 20 young rats were given a basal diet

which included, per cent., CaHPO₄ 0.9, MnSO₄·H₂O 0.04, NaCl 0.44 and dried baker's yeast 0.9. Iodised casein, 25 mg. daily, and cod liver oil, 15 ml. per 100 g. diet twice weekly, were given also. The substances being tested were given at the rate of 2 mg. daily [presumably to each rat] and there were 4 groups, rutin being given in 2 forms, as powder or in ampoules. The time of appearance of petechiae under a negative pressure of 200 mm. Hg was measured at the beginning of the experiment and again after 30 days. Each preparation had some vitamin P activity, that of tea catechins being the greatest.—H. Scherbatoff.

3633

MAGIS, N. Nutrition comparée des Tribolium. 3. Action vitaminique de la DL-carnitine et de la DL-dicarnitine chez *Tribolium castaneum* Herbst (insecte, Coléoptère). [Comparative nutrition of *Tribolium*. 3. Vitamin effect of DL-carnitine and of DL-dicarnitine in *Tribolium castaneum* Herbst (insect, Coleoptera).] *Arch. internat. Physiol.*, 1954, 62, 505-511. [Inst. Léon Frédéricq, Univ. Liège.]

For previous parts see Abst. 1052, Vol. 25.

Larvae of *Tribolium castaneum* failed to develop on a purified medium without addition of a growth substance which was present in yeast and yeast extract. The yeast could be replaced by 0.8 µg. DL-carnitine per g. medium. DL-Dicarnitine, added to the medium at the same rate, was as effective as DL-carnitine. Carnitine appeared to be essential for normal metamorphosis and for survival of the nymphs.—A. M. Copping.

3634

BHATTACHARYYA, P. K., FRIEDMAN, S. and FRAENKEL, G. The effect of some derivatives and structural analogs of carnitine on the nutrition of *Tenebrio molitor*. *Arch. Biochem. Biophys.*, 1955, 54, 424-431. [Dept. Entomol., Univ. Illinois, Urbana.]

The effect of certain degradation products, derivatives and analogues of carnitine, on the growth and survival of the larvae of *Tenebrio molitor* was tested. Slight growth-promoting activity was demonstrated in the sulphonic acid and triethyl analogues of carnitine, and activity almost equal to that of carnitine in the O-acetyl derivative and the ethyl ester. Inhibition occurred with γ-butyrobetaine. None of the other compounds tested had any effect on *T. molitor*.—A. M. Copping.

3635

QUATRINI, U. Effetti della vitamina T di Goetsch sull'accrescimento del ratto albino. [Effect of vitamin T Goetsch on the growth of white rats.] *Arch. Fisiol.*, 1954, 54, 166-169. [Ist. Fisiol., Univ. Palermo.]

Seven groups of 5 rats, from 20 to 30 days old, fed on a diet of pasteurised milk, minced meat, bread and greenstuff were given daily for 40 days 0.4 ml. of a preparation of vitamin T received from Professor Goetsch, or 0.4 or 1.2 ml. of a commercial preparation of vitamin T, or 0.4 ml. of the same autoclaved, or 2 µg. folic acid or no treatment (2 groups). Only the preparation from Professor Goetsch had any beneficial effect on growth.—E. M. Hume.

3636

GOETSCH, W. Untersuchungen über Steigerung der Resistenz durch den T-Komplex. [*Increase of resistance by the T-complex.*] *Ztschr. Vitamin-, Hormon-Forsch.*, 1954, 6, 225-233. [Univ. Graz.] English and French summaries.

Of 200 *Drosophila melanogaster* larvae left for 2 hr. in from 30 to 40 per cent. ethanol, the mean percentage that subsequently recovered was 40 when no T-complex had previously been given and 66 when it had been given. Groups of 10 or 12 frog tadpoles, with or without legs, were immersed for 10 min. in 10 per cent. ethanol. When treatment for from 15 to 24 hr. with a solution of from 0.02 to 0.01 per cent. T-complex had previously been given none died, and movement began again in an average time of 38 min. When untreated, 2 died, and recovery of movement required on the average 50 min. Confirmatory experiments of the same type are described. Treatment with T-

complex immediately after treatment with ethanol also promoted recovery. In young frogs, with or without tails, treatment with T-complex accelerated recovery from ether anaesthesia.

E. M. Hume.

3637

HARTMANN, F. and GERTH, H. J. Der Wirkungsmechanismus des meso-Inositol als lipotrope Substanz bei der Bestehen Mangelkonstratte. [*Mode of action of meso-inositol as a lipotropic substance for rats on the Best deficient diet.*] *Arch. exp. Pathol. Pharmacol.*, 1955, 224, 322-326. [Med. Klin., Univ. Göttingen.]

In an experiment with 106 male albino rats weighing from 100 to 120 g., 40 had a normal diet, and 66 had the deficient diet described by Best and his colleagues (*cf. Abst.* 2392, Vol. 21), 36 of them with a supplement of 5 or 10 mg. inositol per 10 g. diet. With the deficient diet the total fat, neutral fat and cholesterol content of the liver were significantly increased and the phosphatide content was decreased. Addition of inositol to the diet reduced the total and neutral fat of the liver, but did not raise the phosphatide. Tests with radio-active ³²P showed a decrease of about 50 per cent. in the rate of phosphatide synthesis in the liver of rats on the deficient diet and only partial restoration in presence of inositol. The mode of action of inositol is discussed and it is considered to be concerned with the liberation of endogenous methionine through increased protein breakdown.

A. M. Copping.

4. PHYSIOLOGY OF NUTRITION

ENZYMES

3638

CARNEVALE, A., COCOZZA, G. and DE ANGELIS, P. Rilievi sulle attività enzimatiche del succo duodenale nel lattante. [*Enzyme activities in the duodenal secretion of infants.*] *Pediatrics*, 1954, 62, 344-362. [Ist. Clin. Pediat., Univ. Naples.] French, English, German and Spanish summaries.

From 2 to 4, usually 3, samples of duodenal juice were withdrawn in the morning after a fast from infants, 7 premature, 8 newborn, and 18 aged from 2 to 12 months. The capacity of enzymes in the juice to split starch, protein and fat was investigated.

All the results for each infant are tabulated and shown in graphs. The amount of starch-splitting enzyme was very small in the premature infants, and in some of the samples taken in the first week of life none was detected. The amount increased with age. It was absent also at first in 2 full-

term infants, but in others was greater than in the premature infants. Above the age of 2 months the values were higher still. Proteolytic activity was never absent and differences between the groups were not great; the values increased somewhat with age, but some high values were found even among premature infants. The fat-splitting enzyme activity was lowest in the premature infants, higher in the newborn infants born at term, and highest in the older babies. The values found are discussed in relation to the infant's natural diet of breast milk.—E. M. Hume.

3639

PRIGMORE, J. R., BOTHWELL, J. W. and WILLIAMS, J. N. (Jr.) Response of liver enzymes and other proteins to amino acid deficient diets. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 43-46. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

N.A. and R., July 1955

Weanling rats were depleted of protein for 9 days and divided into 4 groups of 8. One group then received the diet of Ramasarma *et al.* (Abst. 3676, Vol. 19), containing 16 per cent. of complete amino-acid mixture, and the other groups received similar diets but without lysine, histidine and methionine, respectively, for 8 days. The rats were then killed for study of liver N and enzymes. Other groups were killed before or after protein depletion for 9 days or after receiving the complete diet for 17 days.

Protein depletion for 9 days reduced bodyweight by 10 per cent. Weights declined slowly on the diets deficient in amino-acids, but on the complete diet the depleted rats gained 50 per cent. in bodyweight in 8 days. During depletion, liver xanthine, succinic and choline oxidases and N all fell. On the histidine-deficient diet xanthine and succinic oxidases and liver N were restored to normal, but choline oxidase was only partly restored. Lysine deficiency prevented restoration of normal levels of all these substances. Succinic oxidase became normal despite methionine deficiency, and N nearly so, but the complete diet was needed to restore choline oxidase to nearly normal. The complete and methionine-deficient diets usually gave results between those obtained with the histidine- and lysine-deficient diets.—D. Duncan.

3640

BRUNS, F. H. and NEUHAUS, J. Die Aktivität einiger Serum- und Leberenzyme beim experimentellen Tetrachlorkohlenstoffschaden der Maus. [Activity of some enzymes of serum and liver in the mouse experimentally poisoned with carbon tetrachloride.] *Biochem. Ztschr.*, 1955, **326**, 242–251. [Inst. Physiol. Chem., Med. Akad., Düsseldorf.]

3641

WILBERG, G. S. and TUBA, J. On rat serum amylase. 2. The influence of diet on levels of the enzyme. *Canad. J. Biochem. Physiol.*, 1955, **33**, 46–53. [Dept. Biochem., Univ. Alberta, Edmonton.]

3642

LASKOWSKI, M. and LASKOWSKI, M. (Jr.). Naturally occurring trypsin inhibitors. *Advances in Protein Chem.*, 1954, **9**, 203–242. [Dept. Biochem., Sch. Med., Marquette Univ., Milwaukee, Wis.]

3643

ALBRECHT, T. W. and JAYNES, H. O. Milk lipase. *J. Dairy Sci.*, 1955, **38**, 137–146. [Dept. Dairying, Tennessee Agric. Exp. Stat., Knoxville.]

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Raw skimmed milk contained 2 enzyme systems capable of hydrolysing both tributyrin and ethyl butyrate; each had optima at pH 5.4 and 6.3. Lactic acid was used to adjust pH, since acetic acid, HCl and H₂SO₄ almost completely inhibited lipase activity. The reduced activity with formaldehyde and the substrate specificity indicated that there were 2 enzymes in each system. At pH 5.7 to 6.0 ethyl butyrate was hydrolysed, but tributyrin was not. The esterase was inactivated by formaldehyde.—A. Hepburn.

3644

BERTRAND, J. Influence de l'alimentation et du jeûne sur la localisation intralobulaire des cholinestérases hépatiques. [Effect of feeding and fasting on the intralobular location of liver cholinesterase.] *C.R. Soc. Biol.*, 1955, **148**, 1912–1914. [Lab. Anat., Univ. Liège.]

3645

ILGNER, G. Das Verhalten der alkalischen Darmphosphatase bei den sog. Ernährungsstörungen im Säuglingsalter. [Behaviour of intestinal alkaline phosphatase in the so-called nutritional disorders of infancy.] *Beitr. pathol. Anat.*, 1954, **114**, 398–416. [Kinderklin., Univ. Erlangen.]

Alkaline phosphatase was studied in the intestines of 13 infants, in sections taken 15 to 20 min. after death. In 4 infants who died from perinatal disease, whose intestines were healthy, there was very strong phosphatase activity in the small intestine, but in those with acute or chronic intestinal disease enzyme activity was generally reduced. In 2 infants there was no reaction in the middle and lower part of the small intestine. The reduction of the phosphatase content of the intestinal mucosa is regarded as an indicator of diminished function, because dietary and rachitic influences could be excluded.—M. B. Richards.

3646

DICKIE, N., ROBINSON, M. I. and TUBA, J. The role of alkaline phosphatase in intestinal absorption. 3. The effects of various fatty acids on levels of the enzyme in intestinal mucosa.

TUBA, J. and DICKIE, N. 4. The effects of various proteins on levels of the enzyme in intestinal mucosa. *Canad. J. Biochem. Physiol.*, 1955, **33**, 83–88; 89–92. [Dept. Biochem., Univ. Alberta, Edmonton.]

For part 2 see Abst. 2078, Vol. 25.

3. Alkaline phosphatase was estimated in homogenates of intestine and occasionally in serum from fasted rats fed on fatty acids made palatable with casein. Casein was found to affect intestinal phosphatase and was replaced by wheat gluten,

The increase in intestinal alkaline phosphatase after feeding varied inversely with the chain length of butyric, lauric, palmitic and stearic acids. Oleic acid produced the greatest increase, but this was abolished when choline was included.

4. Alkaline phosphatase in intestinal homogenates from rats was significantly higher 6 hr. after consumption of casein or vitellin than in fasting rats. Lactalbumin, egg albumin, zein, gelatine and wheat gluten had no effect.

A. Hepburn.

3647

MARSH, C. A. A glucuronic-decomposing enzyme from rumen micro-organisms. 3. Mode of

action, specificity and inhibition by acidic sugar derivatives. *Biochem. J.*, 1955, **59**, 375-382. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

For parts 1 and 2 see Absts. 3097, Vol. 21 and 1659, Vol. 25.

The enzyme was found to be a true β -glucuronidase and was specific for β -D-glucosidopyranuronic acids. Ester glucosiduronic acids and oxycellulose inhibited the enzyme's action on phenolphthalein glucuronide and are considered to be probable substrates. The most powerful inhibitor was D-glucosaccharo-1 \rightarrow 4-lactone.—D. Duncan.

See also Absts. 3532, 3789, 3841, 3930, 4115, 4492.

DIGESTION AND ABSORPTION

3648

SHAY, H. and SUN, D. C. H. Stress and gastric secretion in man. 1. A study of the mechanisms involved in insulin hypoglycemia. *Amer. J. Med. Sci.*, 1954, **228**, 630-642. [Dept. Clin. Med., Fels Res. Inst., Philadelphia, Pa.]

The intravenous administration of insulin to a fasting patient with chronic duodenal ulcer produced an increase in secretion of total acid, with 2 or more peaks. When Regitine, an adrenolytic and sympathetic drug, was injected just before the insulin the early secretion was unaltered, but later secretion was prevented. The same results were obtained with a similar patient before and after subtotal removal of the stomach and bilateral vagotomy. It is suggested that adrenaline is liberated by the hypoglycaemic action of insulin and is involved in the stimulation of gastric secretion.—A. Hepburn.

3649

HUNT, J. N. and MACDONALD, I. The influence of volume on gastric emptying. *J. Physiol.*, 1954, **126**, 459-474. [Dept. Physiol., Guy's Hosp., London, S.E.1.]

The quantity in the stomach of a test meal of 2 per cent. pectin with 3.5 per cent. sucrose and phenol red was estimated by the recovery of phenol red. Meals of differing volume were given and withdrawn at different times after administration so that for one subject a composite curve of gastric emptying could be constructed. Reproducible patterns of gastric emptying were formed. The initial rate of emptying was more rapid with larger than with smaller meals. This was followed by exponential emptying in which the quantity leaving the stomach decreased with the size of the meal. If 2 successive meals were given the second passed from the stomach more rapidly than the first.—A. T. Phillipson.

3650

TOLCKMITT, W. Studien über die proteolytischen Verhältnisse des Magensaftes bei Ulcus duodeni unter Berücksichtigung neuerer Forschungsergebnisse. [Proteolytic activity of gastric juice in duodenal ulcer with special reference to results of recent research.] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselerkr.*, 1955, **15**, 1-12. [1. Med. Klm., Univ. Hamburg, Eppendorf.]

At pH 0.9 and 3.6 the mean proteolytic activity of gastric juice was higher in 15 patients with duodenal ulcer than in the same number of healthy subjects, but the curves of protein breakdown did not differ enough to have diagnostic significance.

D. Duncan.

3651

WALKER, L., OLSON, W. H. and NACHELES, H. Basal gastric secretion in the dog. *Amer. J. Physiol.*, 1954, **179**, 473-476. [Dept. Gastro-Intestinal Res., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

The preparation of gastro-duodenal and gastro-antral pouches was described earlier (Abst. 131, Vol. 21). The 10 dogs were fed on ground lean beef and milk with added vitamins and Fe. They were fasted for 18 hr. and basal stomach secretion was then collected every 15 min. for 6 or 6½ hr. in quiet conditions.

In 41 tests on the 10 dogs there was no free acid in 7 tests and no secretion at all in 2. Patterns of secretion varied widely, even though the known conditions were apparently constant. There was no relation between volume and acidity of secretion. It is suggested that the fasting dog has no true basal secretion.—D. Duncan.

3652

NASSET, E. S. and DAVENPORT, A. Canine and human gastric digestion of proteins *in vivo*. *J. Appl. Physiol.*, 1955, **7**, 447-450. [Dept.

N.A. and R., July 1955

Physiol., Sch. Med. Dent., Univ. Rochester, N.Y.]

Stomach contents from a dog were obtained free from duodenal contamination by insertion of cannulae, connected externally, at the pylorus and duodenum. Samples of stomach contents were obtained also by stomach tube from 2 human subjects.

At least 15 amino-acids were found in the gastric juice from the dog, whether egg albumin or zein had been eaten or whether secretion had been induced by the sight and smell of food. Lysine and tryptophan, which are almost absent from zein, were always present. Some amino-acids had evidently originated from enzymes and other proteins present in saliva and gastric juice.

After lactalbumin had been given the amino-acids in human gastric juice rose to a maximum in the first hour.—A. Hepburn.

3653

EWERBECK, H. and JAEGER, W. Über den fermentativen Abbau der Proteine und Fette moderner Säuglingsnahrungen in vitro. [Enzymic breakdown of proteins and fats of modern infant foods in vitro.] *Ztschr. Kinderheilk.*, 1954, **75**, 496-511. [Kinderklin., Univ. Cologne.]

Human milk and 7 infant foods including raw and cooked cow's milk were compared. After 1 hr. in pancreatin at pH 7.4 the greatest production of free fatty acid came from homogenised milk and the lowest from human milk, although the total fat contents were 2.5 and 3.7 per cent., respectively. The rate of fat digestion was also high in homogenised milk, but even higher in human milk. Fat digestion was slow in two-thirds cow's milk with Mondamin and in citric acid milk.

The rate and completeness of protein digestion with regard to the 4-hr. total protein level were greatest for human milk, homogenised milk and the mixtures called Correla and Humana. All the foods except citric acid milk had complete protein digestibility, but some of them took longer. Fresh cow's milk protein is as valuable as that of homogenised milk because it remains longer in the stomach.

Homogenisation is considered to be a valuable method of adapting cow's milk for infant feeding. D. Duncan.

3654

MARŠČEK, V. and HERRBYCHOVÁ, A. Průběh enzymatického štěpení bílkovin. [Enzymic splitting of proteins.] *Sborn. pathofysiol. tráv.*, 1954, **8**, 209-214. [Fats and Oils Res. Inst., Prague.]

The digestive activity of trypsin and pancreatin on casein, meat, dried egg white and soya bean

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protein was studied. From the beginning of hydrolysis the amino-acids are split off from animal proteins in the same ratio as they have in the protein. Aspartic acid, glutamic acid, serine, glycine and threonine are split off in smaller quantities from plant proteins.—M. Prokšová (Czechoslovakia).

3655

RAYNAUD, P. L'azote total dans les réservoirs gastriques des bovidés. [Total nitrogen in the gastric contents of cattle.] *Arch. Sci. physiol.*, 1955, **9**, 35-50. [Lab. Physiol. Gén., Fac. Sci., Toulouse.]

Total N and dry matter were estimated in samples of contents of rumen, omasum, abomasum and duodenum obtained from cattle at the slaughterhouse, after starvation for about 24 hr.

The mean values in mg. N per 100 g. dry matter were rumen 1705, omasum 2110, abomasum 2404, duodenum 3479. The rising proportion of N depends on absorption of dry matter constituents other than N and on addition of N from secretions or desquamated epithelium. When the abomasum was divided into 2 parts for sampling the trend was found to be reversed in this organ; the mean values in mg. N per 100 g. dry matter were 2575 in the anterior and 2214 in the posterior part. The increase in the anterior part is ascribed to secretion of gastric juice, the fall in the posterior part to absorption of nitrogenous compounds.

The N content in terms of fresh weight of digesta in the different organs was, in mg. per 100 g., rumen 154, omasum 445, anterior abomasum 229, posterior abomasum 240, duodenum 348. All the differences except that between the parts of the abomasum are highly significant. The causes of the changes are discussed.—D. Duncan.

3656

SPISNI, D. Il pH del contenuto del rumine di pecore alimentate con insilato A.I.V. di erba medica. [The pH of the rumen contents of sheep fed on A.I.V. alfalfa silage.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 662-663. [Ist. Zootec. Gen., Univ. Pisa.]

Four adult sheep of the Sopravissana breed, weighing from 33 to 35 kg., were fed for 6 days on alfalfa and then for 32 days on alfalfa from the same source made into A.I.V. silage of pH about 5. Rumen contents were withdrawn after a 16-hr. fast. The pH was from 7.2 to 8.2 before alfalfa silage was given. After 11 days of the silage, the pH was from 6.3 to 6.6, but it gradually rose, and the final value was from 7.1 to 7.6.—E. M. Hume.

3657

HILL, K. J. Continuous gastric secretion in the ruminant. *Quart. J. Exp. Physiol.*, 1955, **40**,

32-39. [Agric. Res. Coun., Inst. Animal Physiol., Babraham, Cambridge.]

Secretion of gastric juice by innervated pouches in sheep and goats continued during a 48-hr. fast with only small decreases in acidity and volume produced. Emptying the rumen, however, caused cessation of gastric secretion. This and other evidence suggests that the continuous flow of gastric juice into the abomasum is due to the continual entry of food into that organ. In fasting animals onward passage of food is in progress up to 48 hr.—A. T. Phillipson.

3658

KREMEN, A. J., LINNER, J. H. and NELSON, C. H.
An experimental evaluation of the nutritional importance of proximal and distal small intestine. *Ann. Surg.*, 1954, **140**, 439-447 (with discussion 447-448). [Dept. Surg., Univ. Minnesota, Minneapolis.]

Dogs had from 50 to 70 per cent. of the small intestine removed from continuity and established as a Thiry Vella fistula. The segment removed was either distal or proximal, and in some dogs the ileocaecal valve was by-passed. Metabolic studies were later made with different diets.

The dogs which had the proximal 50 or 70 per cent. of the intestine removed maintained their bodyweights after some initial loss, and absorption of protein and fat was not significantly altered. The dogs with the distal part of the intestine removed lost weight, but in those in which the ileocaecal valve was active the weight eventually became stable after falling by from 15 to 50 per cent., whereas in those with the valve by-passed there was no sign of compensation; one dog survived after the flow through the valve was restored, and regained some weight. In all the dogs with the distal part of the intestine removed there was consistent loss of from 80 to 90 per cent. of the food fat in the faeces, and some increased loss of N. The alterations in transit time of barium meals were not closely related to the changes in absorptive capacity.—D. Duncan.

3659

VARTIOVAARA, U., LAMPILA, M. and SAARENMAA, H.
Enrichment culture and animal inoculation experiments regarding the efficiency of the intestinal cellulose-decomposing bacteria of the horse. *Acta agra. fenn.*, 1955, **83**, 185-204. [Dept. Microbiol., Univ. Helsinki.] Finnish summary.

Cultures of cellulose-decomposing bacteria with accompanying organisms were prepared from the intestinal contents of slaughtered horses. Those cultures showing the highest rate of cellulose breakdown were given by mouth to horses, whose

capacity for digesting cellulose was thereby increased.—J. C. Appleby.

3660

SINGER, H., SPORN, J., BRIDGWATER, A. and NECHLES, H.
Effects of mixed foods on the blood levels of glucose, amino acids and chylomicrons. *J. Appl. Physiol.*, 1955, **7**, 443-446. [Dept. Gastro-Intestinal Res. Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

The blood glucose curves of dogs fed on glucose were depressed when gelatine or cream or both were given also. Glucose, cream or both depressed the blood amino-acid curve when dogs were given gelatine. Gelatine, glucose or both did not affect the plasma chylomicron curves produced by cream.—A. Hepburn.

3661

WISEMAN, G.
Preferential transference of amino-acids from amino-acid mixtures by sacs of everted small intestine of the golden hamster (*Mesocricetus auratus*). *J. Physiol.*, 1955, **127**, 414-422. [Dept. Biochem. Nutrit., Tufts Coll. Med. Sch., Boston, Mass.]

Sacs of everted small intestine were prepared by the method of Wilson and Wiseman (*J. Physiol.*, 1954, **123**, 116). The sac, filled with a known volume of amino-acid solution, was suspended in a flask with 20 ml. of the same solution under an atmosphere of oxygen with 5 per cent. CO₂ and was kept for 1 hr. at 37° C. with continuous agitation. The fluids from inside and outside the sac were then analysed.

With proline solutions the rate of transference of the amino-acid into the sac, in μ l. per mg. dry weight of sac per hour, was 7.31 when the initial concentration was 5 mM and 14.0 at 20 mM. The rates of transference and the concentration gradients developed for L-amino-acids separately and in combination, each at 20 mM initial concentration, are tabulated. Proline and glycine were transferred more rapidly than histidine and methionine, but lysine, ornithine and glutamic acid were not transferred against a concentration gradient. The rate of transference of methionine was not altered by the presence of other amino-acids, but methionine prevented the transference of proline, glycine and histidine. Histidine reduced the transference of proline and glycine, and proline reduced that of glycine. The changes in concentration gradient reflected the rates of transference. The affinity of methionine for the active mechanism was about 20 times that of proline.

It is concluded that only monoaminomono-carboxylic acids are actively transferred by the intestine, and that they compete with one another for the mechanism.—D. Duncan.

3662

FRENCH, J. M. Disorders of fat absorption. *Proc. Nutrition Soc.*, 1955, **14**, 33-41. [Dept. Pharmacol., Univ. Birmingham.]

3663

BLANKENHORN, D. H. and AHRENS, E. H. (Jr.) Extraction, isolation, and identification of hydrolytic products of triglyceride digestion in man. *J. Biol. Chem.*, 1955, **212**, 69-81. [Hosp. Rockefeller Inst. Med. Res., New York.]

An improved intubation technique for sampling the contents of the human alimentary tract is described. The technique was applied to 2 men aged 27 and 43 years. The samples of digesta from the jejunum were fractionated by counter-current distribution into bile acids, fatty acids and mono-, di- and triglycerides.

After the subjects had received 25 g. maize oil by mouth 1.3 g. mixed lipids were obtained from the upper jejunal contents, which on fractionation yielded 167 mg., 110 mg. and 45 mg., respectively, of mono-, di- and triglycerides, with 710 mg. mixed fatty acids and 34 mg. cholesterol. After 40 g. synthetic triolein, 1.3 g. of mixed non-acidic lipids was isolated from mid-jejunal contents. This mixture gave, on resolution, 532 mg. monoolein, 186 mg. diolein and 186 mg. triolein, with 47 mg. cholesterol and 33 mg. cholesteryl oleate; at least 1.9 g. oleic acid was also isolated from the intestinal sample.

It has been shown for the first time that diglycerides are formed during the normal digestion of triglycerides in man.—G. A. Garton.

3664

BLANKENHORN, D. H. and AHRENS, E. H. (Jr.) Demonstration of diglycerides in human intestinal contents during fat digestion. *J. Lab. Clin. Med.*, 1954, **44**, 770-771. *Proc. [Cincinnati, Ohio.]*
See above Abstr.

3665

CLÉMENT, G. and CLÉMENT, J. Sur le mécanisme chimique de l'hydrolyse enzymatique des huiles et graisses naturelles. 1. Influence du degré de désaturation du substrat sur la vitesse d'hydrolyse, *in vitro*, par le suc pancréatique; étude du degré de désaturation des acides gras libérés. [Chemical mechanism of the enzymic hydrolysis of oils and natural fats. 1. Effect of degree of unsaturation of the substrate on the speed of hydrolysis *in vitro* by pancreatic juice; study of the degree of unsaturation of the liberated fatty acids.] *Bull. Soc. Chim. biol.*, 1954, **36**,
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1319-1328. [Inst. Res. Cancer du C.N.R.S., Paris.]

The hydrolysis of triglycerides by rat pancreatic lipase was studied *in vitro* with human depot fat, rat depot fat, arachis oil, rape oil, soya bean oil and linseed oil, in all of which the mean molecular weight of the component acids is about 275.

The acids preferentially liberated by enzyme action were saturated, and the I value of the liberated acids increased progressively with time of incubation from 2 to 18 hr. Bile in the incubation mixture raised the rate of lipolysis.

G. A. Garton.

3666

BRUNAUD, M. and NAVARRO, J. Action sur la motricité des estomacs du mouton de quelques esters stables de la choline. [Action on the motility of the sheep's stomachs of certain stable esters of choline.] 1. Choline et carbaminoylcholine. [1. Choline and carbaminoylcholine.] 2. Dérivés méthylés de la choline. [2. Methylated derivatives of choline.] *Bull. Acad. vét. France*, 1954, **27**, 213-217; 219-225 (with discussion 225-226). [Lab. Physiol., Ecole Nat. Vét., Toulouse.]

The movements of the rumen, reticulum and abomasum and their neuromuscular reactions were measured by techniques previously described (Titles 4458, Vol. 23; 572, Vol. 24) in sheep anaesthetised with chloralose. The substances tested were injected intravenously. In mg. per kg. bodyweight, the doses given were choline 1 to 50, carbaminoylcholine 0.001 to 0.01, and acetyl- β -methylcholine and carbaminoyl- β -choline 0.001 to 0.1.

All 4 substances increased the tone of the rumen and abomasum, but had no effect on the reticulum; in small doses they sensitised the muscles of the stomachs to vagus impulses. In large doses all except acetyl- β -methylcholine blocked neuromuscular conduction. Only carbaminoylcholine could excite the motor centre of the stomachs.—E. M. Hume.

3667

BLOMSTRAND, R. The intestinal absorption of linoleic-1- 14 C acid. *Acta physiol. scand.*, 1954, **32**, 99-105. [Dept. Physiol. Chem., Univ. Lund.]

Groups of rats with thoracic duct cannulae were given by stomach tube methyl linoleate-1- 14 C, alone or dissolved in olive oil, or fatty acids obtained by saponification of a mixture of labelled linoleate and olive oil. Another group of rats received in the same way olive oil containing 0.2 per cent. palmitic acid-1- 14 C. Lymph was then collected for 24 hr. and the total fat was extracted. Neutral fat and phospholipins were separated on

columns of silicic acid and the radio-activity of each lipid fraction was then measured. Respiratory CO_2 was collected for estimation of its ^{14}C content.

Whatever the form in which it was given, the linoleic acid absorbed was almost all recovered from the neutral fat of the lymph, though some was metabolised, as was shown by detection of $^{14}\text{CO}_2$ in the respiratory CO_2 . Similarly palmitic acid was almost all found in the lymph neutral fat. All lipid mixtures given were absorbed to the extent of 80 to 90 per cent., and up to 95 per cent. was absorbed by some animals.—G. A. Garton.

3668

BLOMSTRAND, R. On the intestinal absorption of phospholipids in the rat. *Acta chem. scand.*, 1954, 8, 1945-1946. [Dept. Physiol. Chem., Univ. Lund, Sweden.]

Rats with thoracic duct cannulae were given labelled phospholipins, dissolved in olive oil, by stomach tube. The phospholipins, prepared biosynthetically, were labelled with ^{14}C in the fatty acids or the glycerol moiety, or with ^{32}P . Lymph was collected for 24 hr. The lymph fat was then chromatographed on silicic acid and the distribution of radio-activity was studied.

With phospholipins containing ^{14}C -labelled fatty acids, 52 to 98 per cent. of the activity was absorbed; and on the average 65 per cent. of the absorbed activity was recovered from the lymph lipids, mostly in the neutral fat and about 16 per cent. in the phospholipins.

When phospholipins labelled in the glycerol part of the molecule were given, more than 60 per cent. of the administered activity was found in the lymph lipids; from 57 to 72 per cent. of the activity appeared in the neutral fat and 28 to 43 per cent. in the phospholipins.

After ^{32}P -labelled phospholipins were given only about 7 per cent. of the activity was recovered from the lymph.—G. A. Garton.

3669

HERNANDEZ, H. H. and CHAIKOFF, I. L. Do soy sterols interfere with absorption of cholesterol? *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 541-544. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Rats with cannulae in the thoracic lymph duct were given 4- ^{14}C -labelled cholesterol dissolved in olive oil with or without added soya bean sterols. Lymph was collected for 24 hr. and analysed for digitonin-precipitable ^{14}C .

The soya bean sterols depressed the absorption of cholesterol whether as little as 4 mg. or as much as 100 mg. of the labelled sterol was given.

G. A. Garton.

3670

BLICKENSTAFF, D. D. Change in the ability of the intestine to absorb isosmotic NaCl solution following distilled water instillation. *Amer. J. Physiol.*, 1954, 179, 467-470. [Dept. Physiol., Med. Sch., Univ. Oregon, Portland.]

Eleven experiments were made on 2 unanaesthetised, trained dogs with upper jejunal ring fistulas (Blickenstaff, *Amer. J. Physiol.*, 1954, 178, 371).

Filling the jejunal loop with distilled water for about 30 min. significantly reduced the amount of water absorbed subsequently from isosmotic NaCl solution, but the rate of chloride absorption was reduced by an amount not reaching significance.

D. Duncan.

3671

BLICKENSTAFF, D. D. Increase in intestinal absorption of water from isosmotic saline following pitressin administration. *Amer. J. Physiol.*, 1954, 179, 471-472. [Dept. Physiol., Med. Sch., Univ. Oregon, Portland.]

Eleven experiments were made on 5 unanaesthetised, trained dogs with Oni fistulas of the upper jejunum (Blickenstaff and Lewis, *Amer. J. Physiol.*, 1952, 170, 17). Absorption from 0.9 per cent. NaCl solutions in 30-min. periods at 15 cm. water pressure was studied before and after injection of 0.005 and 0.01 units Pitressin per kg. bodyweight.

With the smaller dose of Pitressin there was no significant effect on water absorption, but the increase with the larger dose was significant.

D. Duncan.

3672

FIELD, H. (JR.), DAILEY, R. E., BOYD, R. S. and SWELL, L. Effect of restriction of dietary sodium on electrolyte composition of the contents of the terminal ileum. *Amer. J. Physiol.*, 1954, 179, 477-480. [Veterans Admin. Centre, Martinsburg, W. Va.]

After a period on control diet containing about 85 m. equiv. Na and 14 m. equiv. K daily, 3 dogs were fed on a diet containing only 1 m. equiv. Na. Samples were taken by fistula from the terminal ileum and analysed for Na and K.

Na varied greatly from hour to hour and the values reported were for pooled specimens of multiple samples for each day. Na decreased on the low-Na diet, but K increased. Conservation of Na in the upper digestive tract was indicated and possibly a mechanism for selective absorption or secretion, or both, of Na and K in the ileum, to maintain constant osmolarity. Na decreased in the faeces of 1 dog, K to a less extent. The other 2 dogs had unaltered faecal excretion of Na, but K increased. The colon was thought to be able to conserve Na efficiently during the control period, but not K when this was presented in increased amount in the low-Na diet.—A. Hepburn.

N.A. and R., July 1955

3673

MANGOLD, E. and BEHM, G. Der Einfluss des Rohfasergehaltes im Futter auf die Durchgangszeiten beim Schwein. [Effect of crude fibre of feed on time of transit in pigs.] *Arch. Tierernährung*, 1954, No. 5, Beihefte, 10-22. [Inst. Tierernähr., Humboldt Univ., Berlin.]

The 2 crossbred pigs received first a protein-free diet containing 8 per cent. sugar, 3 per cent. mineral mixture and different proportions of potato starch and pure cellulose in the form of ground filter paper. The marker was fuchsin.

The time for total evacuation of the residues of a meal containing 5 per cent. cellulose was 6 days, and when the cellulose content was raised to 10 and 20 per cent. the time fell to 4 and to 3 days.

In the second study the diet consisted of barley meal and fishmeal with different proportions of cooked potatoes and strawmeal. The transit time for such a feed with 5 per cent. strawmeal was 6 days, and as the strawmeal was increased to 10, 15 and 20 per cent. the time fell to 3 days, 48 hr. and 48 hr. The minimum time thus appeared to be 48 hr.—D. Duncan.

See also Absts. 3295, 3343, 3872.

COMPOSITION OF BODY FLUIDS AND TISSUES

BLOOD

3674

SCHULMAN, I., SMITH, C. H. and STERN, G. S. (with FORT, E., BENNEM, B. and PRESTWIDGE, J.) Studies on the anemia of prematurity. 1. Fetal and adult hemoglobin in premature infants.

SCHULMAN, I. and SMITH, C. H. 2. The blood volume in premature infants. 3. The mechanism of the anemia. *Amer. J. Dis. Child.*, 1954, 88, 567-568; 568-575; 575-582; 582-595. [Dept. Paediat., New York Hosp.-Cornell Med. Centre.]

1. The percentage of foetal Hb at birth was estimated in 96 term infants and 36 premature infants of birthweight 2100 g. or less. In all, 337 estimations of foetal Hb were made in premature infants during the first year of life.

The results showed that premature infants have a higher percentage of foetal Hb at birth than term infants. Both synthesise foetal Hb after birth, but premature infants tend to lose foetal Hb at an earlier age than term infants. In the premature infant the concentrations of foetal and adult Hb decrease at the same rate during the first 4 to 6 weeks. After this there occurs a sharp increase in the relative concentration of adult Hb and an abrupt decrease in the rate of fall of foetal Hb. These changes appear to be independent of weight gain.

2. Blood volume was estimated by the dye-haematocrit method in 38 premature infants aged 1 to 94 days.

Total blood volume in ml. per kg. bodyweight levelled off by the seventh week of life after a steady fall from relatively high initial levels. Both red cell volume and total blood volume per kg. bodyweight tended to vary directly with venous haematocrit.

3. Estimations of Hb, red cell count, reticulocyte count and percentage of foetal Hb were made on samples of blood taken from 32 premature

infants in the first 24 hr. of life, weekly during their hospital stay and at intervals of 1 to 2 months during the first year of life. Estimates of blood volume were obtained from the observations on a similar group of infants reported in part 2. Changes with age in weight, Hb, reticulocyte count and body Hb content are shown graphically for 4 infants to illustrate the general trend in the group.

In the premature infant there is, apparently, a depression of haemopoietic activity in the early neonatal period with spontaneous recovery beginning at 5 to 7 weeks of age. During the first 3 to 4 months there is more Fe in the body than is used for Hb synthesis. The need for Fe therapy comes after this, to maintain optimum rates of Hb production.—F. C. Aitken.

3675

HERRERA, A. Determinación del volumen plasmático y sanguíneo en niños distroóficos. [Estimation of plasma and blood volume in dystrophic infants.] *Rev. española Pediat.*, 1954, 10, 791-808.

In 20 dystrophic infants, weights were from 12 to 45 per cent. below a standard curve for normal infants, but heights were nearly normal, differing from the standard by from -13 to +9 per cent. Their surface area, Hb, haematocrit, blood volume and plasma volume are tabulated and the volumes are compared with those of normal infants of similar ages. The percentage of difference fell with advancing age up to 2 years, but in dystrophic infants the mean plasma volume was 18 to 41 per cent. and the blood volume 16 to 38 per cent. below normal. There were high positive correlations between blood and plasma volumes and also between bodyweight and blood volume, similar to those in normal infants. The red cell volume showed a lower correlation with physical measurements than in normal infants, so the plasma volume was the most important component. Regression equations are presented, showing a greater

increase of blood volume with weight in dystrophic infants.

Relative to bodyweight, blood volume per kg. was significantly greater in dystrophic infants, without relation to the degree of dystrophy. Red cell volume was low only in severe dystrophy, when it was compensated by higher plasma volume. Relative to height and surface area the blood volume was nearly normal.—D. Duncan.

3676

HERRERA ORTECHO, E. A. La determinación del volumen plasmático y sanguíneo. 2. En lactantes eutróficos y niños mayores. [Estimation of plasma and blood volume. 2. In eutrophic infants and older children.] *Rev. española Pediat.*, 1954, 10, 685-705. [Lima.] French, English and German summaries.

For part 1 see Abst. 1683, Vol. 25.

Height, weight, surface area, blood and plasma volumes, haematocrit and Hb values are tabulated for 20 healthy infants aged from 3 to 26 months and 16 children aged from 3 to 12 years. The relations between the values were examined statistically and the results are shown in tables and graphs. The increase in blood volume in the first year of life is more in haematocrit than in plasma. There is a high positive correlation between increase in blood volume and in body measurements, especially weight and surface area.—D. Duncan.

3677

WILCOX, E. B., MANGELSON, F. L., GALLOWAY, L. S. and WOOD, P. Children with and without rheumatic fever. 4. Hemoglobin, packed red cells, red and white cell count, sedimentation rate, blood glucose, serum iron and copper. *J. Amer. Dietetic Assoc.*, 1955, 31, 45-51. [Dept. Foods Nutrit., Utah State Agric. Coll., Logan.]

For parts 1 and 2 of this survey see Abst. 5090, Vol. 24 and for part 3 Abst. 4090, Vol. 25. Blood constituents were estimated in the same 131 control children and in 131 children with a history of rheumatic fever.

At all ages girls in the rheumatic fever group showed higher values for sedimentation rate than controls. Values for Hb, packed red cells and red cell counts were higher in the control girls and this is attributed to their better diet. Up to about 12 years of age girls in both groups showed higher values than boys for serum Fe, but the reverse was true after that age. Simple and multiple correlations between blood constituents and sex, rheumatic fever history, age and constituents of the diet showed that age had the greatest effect on Hb, volume of packed cells and red cell count. Rheumatic fever had the greatest effect on sedimentation rate.—J. S. Thomson.

3678

RAMAMURTI, K. A note on the haemoglobin levels of normal Indian students in Rajasthan. *Indian J. Med. Res.*, 1955, 43, 57-59. [Biochem. Lab., Birla Coll. Sci., Pilani, Rajasthan.]

Hb in samples of blood from 112 students was estimated by Sahli's method and by those of King and Gilchrist (Abst. 2929, Vol. 17), Collier (Abst. 914, Vol. 14) and Clegg and King (Title 1829, Vol. 12). Mean values were, respectively, 14.30, 17.00, 16.65 and 16.53 g. Hb per 100 ml. blood. The Sahli method is thought to give low values and the high values given by the other methods are taken as indicating the adequacy of Fe intake. D. Harvey.

3679

LIESEGANG, E. and VOGEL, G. Orientierende Versuche über Veränderungen des weissen Blutbildes verschiedener Tierarten in Abhängigkeit von Nahrungsaufnahme und Nahrungsentzug. [Changes in the white blood cells in different species as related to feeding and fasting.] *Arch. Tierernährung*, 1954, No. 5, Beihefte, 50-59. [Vet. Physiol. Inst., Humboldt Univ., Berlin.]

White cell counts were made in a man, a dog, 4 rats, a wether sheep, a goat, 4 rabbits and 3 hens fed in the ordinary way, fasting and re-fed. In all species there was usually a fall in the leucocyte count during 3 to 5 days of fasting, with overcompensation for the first day or two when feeding was resumed. The fall occurred in the ruminants although the digestive tract in these species does not empty as it does in the non-ruminants.

D. Duncan.

3680

FFAU, P. Die Serumproteine von Feten, Neugeborenen und übertragenen Säuglingen. [Serum proteins of foetuses, newborn infants and postmature infants.] *Arch. Gynäkol.*, 1954-55, 185, 208-220. [Frauenklin., Univ. Heidelberg.]

Paper electrophoresis by the method of Grassmann (see Abst. 3969 Vol. 25) of the cord blood of 16 foetuses and the blood, taken just after birth and in some again later, of 15 premature infants, 35 mature and 35 with signs of postmaturity showed a steady rise in total serum proteins from 2.5 g. per cent. for foetuses of length 20 to 22 cm. to a mean of 5.8 ± 0.10 for term infants and of 6.2 ± 0.12 for postmature infants; the last value is thought to be artificially raised by loss of water. Changes in the proportions of albumin and α -, β - and γ -globulins at different stages are shown in graphs and tables. Weltmann band and nephelogram studies are reported also.—W. M. Deans.

N.A. and B., July 1955

3681

CORBEEL, L. L'intérêt de l'électrophorèse des protéines sanguines en pédiatrie. [Significance of the electrophoresis of blood proteins in paediatrics.] *Acta paediat. belg.*, 1954, 8, 101-123. [Dept. Paediat., Child. Hosp., Univ. Cincinnati, Ohio.] English summary.

A general account is given of the principles and applications of protein electrophoresis. Results obtained by electrophoresis on paper and with the apparatus of Tiselius are tabulated for the serum of 10 children aged from 2 months to 2 years. The results of the methods were in agreement, and showed the expected increase with age in the concentration of γ -globulin. The effect of different diseases on the electrophoretic pattern is reviewed.—E. M. Hume.

3682

RUSS, E. M., EDER, H. A. and BARR, D. P. (with RAYMUNT, J.) Protein-lipid relationships in human plasma. 3. In pregnancy and the newborn. *J. Clin. Invest.*, 1954, 33, 1662-1669. [Dept. Med., New York Hosp.-Cornell Med. Centre.]

Blood samples were taken immediately after delivery from 27 women in a New York hospital; blood was withdrawn simultaneously from the placental end of the umbilical cord in 25. Plasma was fractionated and analysed for protein, cholesterol and phospholipins; sometimes moving boundary and paper electrophoresis methods were used to confirm the separation of protein components.

The results supported the findings of others. The concentration of albumin, compared with normal plasma, was low in maternal plasma and the concentrations of α - and β -globulins, phospholipins and cholesterol were high. In the plasma from the umbilical cord the concentrations of total protein, α - and β -globulins, cholesterol and phospholipins were lower than in adult plasma.

G. A. Garton.

3683

NYS, A. L'étude combinée des protéines et des lipoprotéines sériques par électrophorèse sur papier, en particulier dans les syndromes hépatiques, néphrotiques et dans l'athérosclérose. [Combined study of serum proteins and lipoproteins by paper electrophoresis, especially in hepatic and nephrotic syndromes and in atherosclerosis.] *Rev. belg. Pathol. Méd. exp.*, 1954, 23, 329-342. [Clin. Med. B, Univ. Louvain.] English summary.

The method of simultaneous electrophoretic estimation of serum proteins and lipoproteins in parallel chromatograms is described.

In 16 normal subjects of both sexes aged from 15 to 48 years the individual variation in lipopro-

teins was much greater than that in proteins. The total lipids were distributed to the extent of about 25 per cent. in α_1 -lipoproteins, 6 per cent. in α_2 -lipoproteins and 70 per cent. in β -lipoproteins.

In 14 subjects with aortic atheromatosis α_1 -lipoproteins were decreased and β -lipoproteins were increased, and there was always a slight reduction in serum albumin. In 17 patients with obstructive jaundice there was a typical disappearance of α_1 - and α_2 -lipoproteins and an increase of β -lipoproteins; in one patient α_1 -lipoproteins reappeared within a week after surgical correction of the biliary obstruction. In this group α_2 -, β -, and γ -globulins were increased.

In 16 patients with non-obstructive lesions of the liver parenchyma, such as hepatitis and cirrhosis, α_1 -lipoproteins were somewhat low and β -lipoproteins were increased. The serum protein showed increases in γ -globulin and, to some extent, in β -globulin.

The clinical value of such examinations is discussed.—D. Duncan.

3684

GOTTFRIED, S. P., POPE, R. H., FRIEDMAN, N. H., AKERSON, I. B. and DIMAURO, S. Lipoprotein studies in atherosclerotic and lipemic individuals by means of paper electrophoresis. *Amer. J. Med. Sci.*, 1955, 229, 34-40. [Dept. Biochem., Bridgeport Hosp., Bridgeport, Conn.]

Total serum lipids, cholesterol and α - and β -lipoproteins were estimated in 39 normal, 8 atherosclerotic and 17 lipaemic patients aged from 20 to 55 years. Age or sex did not affect the α -lipoproteins in the normal patients, but β -lipoproteins tended to be higher in men in their twenties than in women. β -Lipoproteins were elevated in 6 atherosclerotics compared with corresponding normal subjects but tended to drop as the time from the attack of myocardial infarction increased. In the other 2 they were normal, but in 1 they rose later. High β -lipoproteins were found in 5 of 12 men and 2 of 5 women with lipaemia. The atherosclerotics all showed at least one high total serum lipid value, estimations being made at the most twice in each patient. No apparent relation between lipids, cholesterol and β -lipoproteins was established.—A. Hepburn.

3685

JAHNKE, K. Klinische Ultrazentrifugen-Untersuchungen. 3. Die Lipoproteide im Serum, ihre Differenzierung und klinische Bedeutung. [Clinical studies with the ultracentrifuge. 3. Lipoproteins in serum, their differentiation and clinical significance.] *Ztschr. ges. exp. Med.*, 1954, 125, 59-79. [Med. Klin., Städt. Krankenanst. Wuppertal-Elberfeld.]

3686

BERNSOHN, J. and NAMAJUNKA, I. Phospholipid fractions in multiple sclerosis and normal serum. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 124-127. [Neuropsychiat. Res. Lab., Med. Res. Serv., Veterans Admin. Hosp., Hines, Ill.]

3687

MOORE, N. S., YOUNG, C. M. and MAYNARD, L. A. Blood lipid levels as influenced by weight reduction in women. *Amer. J. Med.*, 1954, 17, 348-354. [Sch. Nutr., Cornell Univ., Ithaca, N.Y.]

Each of 36 women kept a record for 1 week of all food eaten and, for 3 typical days, of all her activities. During the week total lipids, phospholipins and cholesterol were estimated in blood. A reducing diet with about 1400 Cal. daily was then taken and in 6 months 24 of the women, aged between 16 and 66 years, lost weight at from 0.6 to 2 lb. weekly. The 12 others, who did not maintain the diet, did not lose weight. Blood analyses were repeated at intervals of 2 or 3 weeks during the period.

There was no detectable linear relation between total lipids in serum and the change in bodyweight. For phospholipins and cholesterol there were small but significant increases of 0.64 and 0.58 mg., respectively, per 100 ml. serum for each pound of bodyweight lost.—D. Harvey.

3688

GEINITZ, W. Über Serumproteine von Tieren die häufig als Versuchstiere oder zur Gewinnung von Heilseren dienen. [Serum proteins of animals commonly used for research or for preparation of antisera.] *Klin. Wochenschr.*, 1954, 32, 1108-1111. [Inst. Physiol. Biochem., Med. Akad., Düsseldorf.]

Quantitative analysis was made by paper electrophoresis of the albumin and the globulin fractions in the serum of 12 mice, 12 rabbits, 10 horses, 12 cattle, 10 sheep and 12 dogs. All were healthy adults of both sexes, except the dogs, which were all male. The results are tabulated in comparison with those obtained by other workers. The considerable differences for the same species are discussed, and it is recognised that the values are affected by the method used, and by the breed and diet of the animals.—E. M. Hume.

3689

LAMM, GY. and SZALAY, E. Serumproteinsveränderungen bei experimentellen diätetischen Leberschädigungen. [Changes in serum protein in experimental dietary liver disease.] *Acta physiol. hung.*, 1954, 6, Suppl., 87. [Inst. Ernährungswissensch., Budapest.]

3690

RUSS, E. M. and RAYMUNT, J. Protein-lipid relationships in normal dog plasma: application of Cohen method 10. *Circulation Res.*, 1955, 3, 194-198. [Dept. Med., New York Hosp.-Cornell Med. Centre.]

Plasma from 6 normal dogs was separated into 3 protein fractions by the Cohn method. The plasma lipids, in contrast to those in man, were bound almost exclusively to α -globulins. The cholesterol: phospholipin ratios in whole plasma and in the β -lipoprotein fraction were 0.53 and 0.61 for the dog and 0.84 and 1.25 for man.

A. Hepburn.

3691

BARR, D. P., RUSS, E. M., EDER, H. A., KENDALL, F. E. and ABELL, L. L. Protein-lipid relationships in experimental canine atherosclerosis. *Circulation Res.*, 1955, 3, 199-202. [Dept. Med., New York Hosp.-Cornell Med. Centre.]

Three dogs of each sex were used in this study, which comprised 1 control and 4 experimental periods during which the basal ration was a commercial dog food. Blood samples were taken after 2 months on the basal ration alone; after 50 days, during which each animal was given 50 mg. thiouracil daily; after 21 days with thiouracil as before and 1.0 mg. Estinyl (17-ethinyl oestradiol) daily; after 34 days when the thiouracil and Estinyl treatment was continued, but during which the basal diet was supplemented with 5 per cent. cholesterol; and 3 weeks later when the animals had been fed on the cholesterol-rich diet plus thiouracil and Estinyl for a total of 55 days. Serum cholesterol and phospholipins were estimated, and plasma lipoproteins by microfractionation.

The administration of thiouracil, which caused high plasma cholesterol values, but not atherosclerosis, resulted in no marked alteration in the distribution of plasma lipoproteins. No reversal of the thiouracil effect was seen when the oestrogen was given also. The cholesterol-rich diet with thiouracil caused both atherosclerosis and a significant alteration in the distribution of serum lipoproteins. At every stage in the development of atherosclerosis the males developed higher serum cholesterol and phospholipin values and a higher cholesterol: phospholipin ratio than did the females.—G. A. Garton.

3692

BOSSAK, E. T., WANG, C. and ADLERSBERG, D. Comparative studies of lipoproteins in various species by paper electrophoresis. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 637-643. [Dept. Med., Mount Sinai Hosp., New York.]

The lipoproteins of monkeys, dogs, rabbits and man were separated by paper electrophoresis; the fractions were analysed by standard methods

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for total lipids, free and ester cholesterol and phospholipins. Experimentally induced elevation of total plasma lipid in dogs and rabbits was accompanied by a fall in the concentration of serum α -lipoprotein and some rise of the $\beta + O$ fraction.—G. A. Garton.

3693

STEIN, W. H. and MOORE, S. **The free amino acids of human blood plasma.** *J. Biol. Chem.*, 1954, **211**, 915-926. [Labs. Rockefeller Inst. Med. Res., New York 21.]

Deproteinised plasma contained 28 ninhydrin-positive compounds identifiable by ion-exchange chromatography. Asparagine, glutamine, α -aminobutyric acid, ornithine and citrulline were present in addition to the usual amino-acids. Hydroxyproline was absent. The amounts of aspartic acid and L- and 3-methylhistidine were extremely small. Glutamic acid was also low. Quantitative estimations were possible of all except glutamine. No peptide was found.

A. Hepburn.

3694

KAEDING, A. **Serumfettuntersuchungen bei Stoffwechselgesunden und Diabetikern. [Serum fat studies in healthy subjects and diabetics.]** *Deutsch. Ztschr. Verdauungs- u. Stoffwechselerkr.*, 1955, **15**, 18-26. [Med. Poliklin., Univ. Rostock.]

Total serum lipids were estimated in 46 non-diabetic patients, 11 patients with mild diabetes of whom 5 were obese, and 12 patients with moderate diabetes who required insulin, fasting and at 2-hr. intervals after a meal of 50 g. fat and 25 g. black bread, before and after treatment with a diet restricted in energy and low in fat but not low in carbohydrate (Abst. 2304, Vol. 23), or, for the obese patients, a reducing diet low in fat and carbohydrate and high in protein. The results are shown graphically.

All the diabetics had fasting serum lipid values nearly twice the normal; diet treatment brought them back to normal. High B.M.R. values in non-obese diabetics and low R.Q. values in all diabetics (see Abst. 1837, Vol. 23) were again found. After the diet treatments they approached normal, except that R.Q. remained desirably low in obese diabetics. The abnormal serum lipid curves of diabetics after the fat-rich meal also approached normal after treatment. It is important to maintain normal blood lipid values in diabetics in view of their tendency to vascular complications.—W. M. Deans.

3695

MOODIE, E. W., MARR, A. and ROBERTSON, A. **Serum calcium and magnesium and plasma phosphate levels in normal parturient cows.** *J. Vol. 25, No. 3*

Comp. Pathol., 1955, **65**, 20-36. [Royal (Dick) Sch. Vet. Studies, Univ. Edinburgh.]

Samples of blood were taken from the mammary or jugular veins of 32 cows, serum Ca and Mg and plasma phosphatase were estimated, and the changes at parturition were studied. Differences between 15 cows having their first or second calf and 17 having their third or a later calf were examined. Serum Ca began to fall 2 days before parturition and the lowest value was reached one day after parturition. In the older cows the fall was greater. Serum Mg rose to its highest value about one day after parturition, and in older cows it reached higher values than in younger.

Inorganic, total acid-soluble and total phosphates all fell during the 24 hr. before parturition and the lowest point was reached at calving, with lower values in the older cows. After parturition there was an immediate rise in these values, more rapid in the younger animals. There was little change in lipid phosphate values, and no difference between the 2 age groups.

These results were thought to confirm the opinion that milk fever is an exaggeration of a normal physiological process.—T. D. Bell.

3696

BOOGAERDT, J. **De toestand van het calcium in het bloed bij de grote huisdieren. [The state of calcium in the blood of the large domestic animals.]** *Thesis, Univ. Utrecht*, 1954, pp. 111. English, German, French and Spanish summaries.

3697

FUCHS, A. R. and FUCHS, F. **Investigations on the plasma phosphate. 2. Diffusibility of the inorganic phosphate of guinea pig serum. 3. Adsorption studies on guinea pig blood.** *Acta physiol. scand.*, 1954, **32**, 363-368; 369-373. [Carnegie Inst. Washington, Baltimore, Md.]

2. Guinea pig serum was shown by dialysis against Ringer or Tyrode solution to contain a non-diffusible P compound. The average amount, estimated as inorganic phosphate, was 8 per cent. of the total inorganic plasma phosphate.

3. Radio-active phosphate added to guinea pig serum was adsorbed more quickly when shaken with BaSO_4 than the original serum phosphate. Control experiments with Ringer or Tyrode solution did not show this effect, nor did foetal plasma. Plasma may contain a labile non-diffusible phosphate, chemically estimated as inorganic phosphate but less readily adsorbed on BaSO_4 .—A. Hepburn.

3698

RECHENBERGER, J. and HEVELKE, G. **Tagesrhythmik des Serumeisens und Leberfunktion. [Liver function and diurnal rhythm in serum**

iron.] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselerk.*, 1953, 15, 12-18. [Med. Klin., Univ. Leipzig.]

The diurnal variations in serum Fe are considered to be merely a manifestation of diurnal variations in liver processes, the maximum serum Fe values corresponding to the peak of activity in the liver cell. Evidence for this is provided by a study of serum Fe in 124 patients with hepatitis; in the acute stage of severe cases the diurnal variations were absent, but in convalescence they reappeared.—W. M. Deans.

See also Absts. 3198, 3531, 3717, 3732, 3782, 3826, 3967-69, 3972, 4120, 4350.

LYMPH, CEREBROSPINAL FLUID, ETC.

3699

KRÁL, J. and ŽENÍŠEK, A. Ztráty aminokyselin potem u těžce pracujících a u sportovců. [Loss of amino-acids in sweat by heavy workers and athletes.] *Čas. Lék. čes.*, 1954, 93, 1155-1163. [Fac. Med., Karl's Univ.] French and Russian summaries.

Sweat was examined from 7 students, not in training, after heavy work on the bicycle ergometer, from 22 metal workers, and from 5 men whose work was in a hot moist atmosphere, preparing the mud baths at Piešťany. The total loss of sweat during the job and per hr., respectively, was, in ml., for the students 700 ± 427 and 700 ± 427 , for the metal workers 3764 ± 1780 and 470.5 ± 222 , and for the mud-bath workers 580 ± 444 and 72.5 ± 56 . The average loss of amino-N in the sweat in mg per hr. and the average concentration in mg. per cent., respectively, for the 3 groups in the same order was 254.9 and 31.4, 64.9 and 10.8, and 7.4 and 10.3; the loss was greatest at the beginning of the work. Estimations were made chromatographically of lysine, arginine with citrulline, threonine and histidine. Though the losses were considerable, no special measure for replacement was considered necessary, and it was not thought that losses of amino-acids could account for the feeling of fatigue which follows heavy sweating. (From summary.)

E. M. Hume.

3700

ISAKSSON, B. Bile lipids in calves under different nutritional conditions. *Acta physiol. scand.*, 1954, 32, 281-290. [Dept. Med. Chem., Univ. Gothenburg.]

Bile was collected immediately after death from 5 newborn calves less than 1 week old, 6 weanling calves of average age 7 weeks and 6 calves less than 7 months old. Total bile acids, lecithin, cholesterol and cholic acid were estimated on the bile samples; the lipids in the serum and liver of each animal were examined for comparison.

The weanling calves had a higher percentage of cholesterol and lecithin in the bile than the older calves, possibly because of the forage diet of the older animals. The amount of total solids was low in the bile of the newborn calves, probably because the concentrating power of the gallbladder was undeveloped.—G. A. Garton.

TISSUES

3701

REYNOLDS, E. L. The distribution of subcutaneous fat in childhood and adolescence. *Monogr. Soc. Res. Child Development*, 1950, 15, No. 2, pp. xviii + 189.

This monograph from the Fels Research Institute for the Study of Human Development begins with a review of the literature covering 230 references. In the second part group results are presented and analysed. These data are obtained from over 9000 soft tissue X-ray photographs, taken during 12 years from 176 children from age $6\frac{1}{2}$ to $17\frac{1}{2}$ years, 80 infants and 256 adults. In the third part data relating to 19 children have been selected for special study of individual differences. The X-ray material is supplemented by some body measurements, nude photographs, medical and other reports and records of growth.

F. C. Aitken.

3702

ŠKERLJ, B. Further evidence of age changes in body form based on material of D.A.W. Edwards. *Human Biol.*, 1954, 26, 330-336. [Inst. Anthropol., Univ. Ljubljana, Yugoslavia.]

The analysis relates to the distribution of body fat, measured by skinfold thickness, as recorded in particular by Edwards (Abst. 730, Vol. 22) and by Škerlj *et al.* (Abst. 3214, Vol. 24). [The reference date given for this paper is 1953. It should be 1954.] The 2 series are in general agreement except in respect of the comparison of parous with non-parous women, for whom Edwards found no difference.—I. Leitch.

3703

JOHNSTON, L. C. and BERNSTEIN, L. M. Body composition and oxygen consumption of overweight, normal, and underweight women. *J. Lab. Clin. Med.*, 1955, 45, 109-118. [Dept. Med., Univ. Illinois, Chicago.]

In 17 healthy women aged from 21 to 59 years and of constant bodyweight the bodyweight ranged from 39.8 to 186.4 kg. or from 60 to 284 per cent. of the standard for height and age. The volume of extracellular water ranged from 7.2 to 25.9 litres and total body water from 24.2 to 71.7 litres. Body fat, calculated from the difference between total bodyweight and lean body mass,

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ranged from 6.7 to 88.4 kg., lean body mass from 33.0 to 98.1 kg. and cell mass from 19.7 to 68.4 kg. Basal oxygen consumption ranged from 140 to 357 ml. per min. or from 85 to 136 ml. per sq. m. per min.

Surface area was equally well correlated with cell mass and lean body mass; oxygen consumption was equally well correlated with surface area, lean body mass and cell mass. "Obesity tissue" was calculated to contain 24 per cent. cell mass, 6 per cent. extracellular fluid and over 67 per cent. fat.—G. F. Garton.

3704

JOHNSTON, L. C. **Body composition and oxygen composition of underweight, normal and overweight women.** *J. Lab. Clin. Med.*, 1954, **44**, 815. *Proc.* [Chicago Ill.]

See above Abst.

3705

SIRI, W. E., REYNATFARJE, C., BERLIN, N. I. and LAWRENCE, J. H. **Body water at sea level and at altitude.** *J. Appl. Physiol.*, 1954, **7**, 333-334. [Donner Lab., Univ. California, Berkeley.]

The data referred to 15 medical students at sea level and to 13 men acclimatised to 16,400 ft. or more above sea level. Mean values for body water as estimated and for body fat as calculated were 55.6 and 23.8, 60.6 and 17.0 for the respective groups. The findings are to provide a basis for further studies of changes during and after acclimatisation.—D. Harvey.

3706

ANNIGERS, J. **Total body water in rats and in mice.** *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 454-456. [Naval Med. Res. Inst., Bethesda, Md.]

Total body water was almost a constant fraction of the fat-free weight in grown normal mice and rats. Body fat had no independent effect on total body water. Total body water was reduced during severe dehydration. It was significantly higher in the weanling rat than in the adult when expressed as a percentage of the fat-free body weight.

A. Hepburn.

3707

KITS VAN HELMINGEN, A. J. M. and KEMP, A. **Free and fixed glycogen in rat muscle.** *Biochem. J.*, 1955, **59**, 487-491. [Pharmacotherap. Lab., Univ. Amsterdam.]

3708

TALLAN, H. H., MOORE, S. and STEIN, W. H. **Studies on the free amino acids and related compounds in the tissues of the cat.** *J. Biol.*

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Chem., 1954, **211**, 927-939. [Labs. Rockefeller Inst. Med. Res., New York 21.]

Analyses of protein-free extracts of liver, brain, pancreas, muscle, kidney, bladder, plasma and urine from the cat by ion-exchange chromatography revealed 40 components. These included, besides the common amino-acids, ethanolamine, phosphoethanolamine, glycerophosphoethanolamine, 3-methyl-histidine, taurine, asparagine, sarcosine, α - and γ -amino-*n*-butyric acid, β -aminoisobutyric acid, β -alanine, α -aminoadipic acid, ornithine and glutathione. Felinine, a sulphur amino-acid, occurred in large quantity in the urine. Anserine, carnosine and 1-methylhistidine occurred together, mostly in muscle. Bound forms of aspartic acid, other than asparagine, were shown by hydrolysis, and so were conjugates of serine, threonine, proline and lysine.—A. Hepburn.

3709

SMITH, L. C. and ROSSI, F. M. **Quantitative determination of ethanolamine phosphate and free amino acids of normal and neoplastic tissue.** *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 643-646. [Res. Div., Veterans Admin. Hosp., Hines, Ill.]

The free amino-acids from normal rat and rabbit thymus and rat testes and from neoplastic tissue were estimated quantitatively by ion exchange chromatography.

The amino-acid pattern of a given tissue was fairly constant, but varied with species. Rabbit lymphocytes had considerably more ethanolamine phosphate, glutamic acid and glycine than rat lymphocytes, which were richer in taurine and aspartic acid. Ehrlich carcinoma cells and sarcoma cells growing as free suspensions in the ascitic fluid of mice had similar amino-acid patterns, with large amounts of taurine, glutamic acid, glycine and alanine. Of solid tumours in rats the Bagg reticulum sarcoma contained 1.6 times the total amount of amino-acids in Walker carcinoma cells. Sarcoma cells contained most alanine and glycine, with smaller amounts of proline and ethanolamine phosphate and little taurine. Of the tumour cells only Walker carcinoma cells contained little alanine. Taurine was the most abundant, except in the lymphosarcoma, being much higher than in the normal tissues. Proline, aspartic acid, serine and threonine occurred in small quantity in all the tissues examined.

A. Hepburn.

3710

CORFIELD, M. C. and ROBSON, A. **The amino acid composition of wool.** *Biochem. J.*, 1955, **59**, 62-68. [Wool Indust. Res. Assoc., Torridon, Headingley, Leeds 6.]

The complete amino-acid analysis of a wool sample, mainly by the methods of Moore and

Stein (Abst. 3939, Vol. 18) and the authors (*Biochem. J.*, 1953, **55**, 517) gave values different from those of Simmonds (Abst. 4666, Vol. 24) for a similar wool sample. In particular, the work showed considerably more alanine, histidine, leucine, lysine, phenylalanine, serine and threonine.—A. Hepburn.

3711

LÁSZLÓ, J. and SCHULER, D. The role of lipids in the elastolysis of atherosclerotic vessels. *Acta physiol. hung.*, 1954, **6**, 463-469. [Inst. Pathol. Anat., Med. Sch., Univ. Budapest.] Russian summary.

Twenty-four human aortas showing different degrees of atherosclerosis were examined histologically and analysed for phospholipins and total cholesterol.

In accordance with previously published work, the increased amounts of cholesterol found in the pathological tissue were accompanied by only slightly increased amounts of phospholipins. During the progression of atherosclerosis the elastic fibres became more susceptible to elastolysis; this effect is discussed in relation to the lipid content of the vascular wall.—G. A. Garton.

3712

BUCK, R. C. Distribution of acid mucopolysaccharides and lipids in tissues of cholesterol-fed rabbits. *Arch. Pathol.*, 1954, **58**, 576-587. [Dept. Microscopic Anat., Fac. Med., Univ. W. Ontario, London.]

Eight male rabbits were fed on a stock pellet diet to which was added 1 per cent. of cholesterol. After from 3 to 6 months on the diet animals were killed and sections of tissues were stained for lipids and acid mucopolysaccharides. A group of 8 control animals received stock diet only.

After cholesterol feeding foam cell deposits were observed in many tissues, especially in the intima of the blood vessels, kidney, liver, dermis, spleen, stomach, ciliary body, brain and lung. No relation was found between sites of high concentration of acid mucopolysaccharide in the normal animals and sites of foam cell deposits in those given cholesterol. The cytoplasm of foam cells in all tissues contained acid mucopolysaccharide. In early lesions in arteries and other tissues the acid mucopolysaccharide appeared to be derived from foam cells. In older lesions an atheromatous mass was formed by breakdown of foam cells and liberation of cholesterol and acid mucopolysaccharide.

G. A. Garton.

3713

SCHMIDT, G., GREENBAUM, L. M., FALLOT, P., WALKER, A. C. and THANNHAUSER, S. J. The amounts of glycerophosphoryl esters in some

tissues. *J. Biol. Chem.*, 1955, **212**, 887-895. [Res. Labs., Boston Dispensary, Tufts Coll. Med. Sch., Boston, Mass.]

Details are given of a method based on P estimation for quantitative estimation of glycerophosphoryl esters in tissues.

The glycerophosphoryl ester content of lamb, beef, rabbit and dog liver was high; that of livers of rats and laying hens was negligible. When lamb liver homogenates were allowed to autolyse there was no significant change in the glycerophosphoryl ester content; autolysis of beef pancreas or of the mucosa of rat small intestine resulted in large increases in the amounts of glycerophosphoryl esters in the digests.

G. A. Garton.

3714

SOBEL, H., MARMORSTON, J. and MOORE, F. J. Collagen and hexosamine content of femurs of rats. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 346-349. [Dept. Biochem., Inst. Med. Res., Cedars of Lebanon Hosp., Los Angeles, Calif.]

Femurs from 57 male and 28 female rats, 1 to 3 months old, were analysed for collagen and hexosamine. Regression equations showed that the logarithms of these constituents were linearly related to the logarithms of bodyweight and femur length. The rate of deposition of collagen in the femur fell slightly with growth, that of hexosamine sharply. The female femur initially contained more collagen and hexosamine, but with growth the difference disappeared.—A. Hepburn.

3715

UNDERWOOD, A. L., TORIBARA, T. Y. and NEUMAN, W. F. An infrared study of the nature of bone carbonate. *J. Amer. Chem. Soc.*, 1955, **77**, 317-319. [Dept. Radiation Biol., Sch. Med. Dent., Univ. Rochester, N.Y.]

The method of infra-red identification (Anderson and Woodall, *Anal. Chem.*, 1953, **25**, 1906) was used for the study of pure carbonates, bicarbonates and apatites and of a number of samples of bone, dentine and enamel. The spectra showed that the carbon dioxide of bone and related materials was present entirely as carbonate.—D. Harvey.

3716

JACKSON, S. H. (with TRAIN, D.) The stabilization of the fluorine concentration of the total ash of rats. *Canad. J. Biochem. Physiol.*, 1955, **33**, 93-98. [Dept. Paediat., Univ. Toronto, Ont.]

3717

BRENNER, H. and WILKINSON, J. F. The nucleic acid content of bone-marrow cells in pernicious

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anaemia. *Brit. Med. J.*, 1955, i, 379-382.
[Manchester Royal Infirmary.]

Estimations of nucleic acids were made on suspensions of blood or bone marrow containing a known number of nucleated cells per c.mm., so that mean amounts of nucleic acid per cell could be calculated. Sternal marrow samples were taken from 18 patients with classical pernicious anaemia and these were compared with 9 samples from marrows showing normoblastic hyperplasia, which were thought to afford a better comparison than marrow from normal subjects with a high proportion of mature leucocytes. Seven samples of normal blood were examined.

The mean amounts of deoxyribose nucleic acid phosphorus per cell were similar in normoblastic and megaloblastic marrows and less in normal blood. The mean amount of ribose nucleic acid phosphorus per cell was 18.53×10^{-7} μ g. in pernicious anaemia and 10.69×10^{-7} μ g. in active blood regeneration. Accumulation of RNA is therefore a specific feature of the megaloblastic marrow cell, but accumulation of DNA in the marrow may be due simply to the prevalence of cells preparing to divide.—D. Duncan.

3718

LANDBOE-CHRISTENSEN, E. Occurrence of argent-affin cells in the stomach and duodenum in cases of pernicious anemia. *Acta med. scand.*, 1954, 150, 369-375. [Dept. Anat., Univ. Copenhagen.]

Sections were made of stomach and duodenum from 8 patients who died with typical pernicious anaemia, and were stained by the Masson Hamperl silver technique.

In all the subjects silver-staining cells were found; in 7 they were in the stomach and in 6 in the duodenum. The specimens in which they were few or absent were those showing the greatest post-mortem changes. The silver-staining cells in the stomach occurred in ectopic islands among cells of intestinal type, most commonly in the fundus, and not in the pyloric area. In the duodenum they were distributed normally.

It is concluded that earlier reports of the absence of such silver-staining cells in patients with pernicious anaemia arose from delay in fixing the material, since post-mortem changes affect these cells very rapidly.—D. Duncan.

See also Absts. 3231, 3742, 8836, 3923.

DUCTLESS GLANDS AND HORMONES

3719

CRAFTS, R. C. Relationships of hormones to the utilization of essential nutrients in erythropoiesis. *Amer. J. Clin. Nutrit.*, 1955, 3, 52-55. [Dept. Anat., Coll. Med., Univ. Cincinnati, Ohio.]

A review.

See also Abst. 3405.

3720

FARQUHAR, J. W. Control of the blood sugar level in the neonatal period.

STEIN, L. Summary of statistical method. *Arch. Dis. Childhood*, 1954, 29, 519-529; 529-530. [Dept. Child Life and Health, Univ. Edinburgh.]

Serial studies of blood sugar and eosinophil counts during the first 10 days of life of 32 normal infants showed no consistent relation between them in the individual infant. The results, though they gave no confirmation of the hypothesis relating neonatal hypoglycaemia and adrenocortical hypofunction, do not invalidate such a hypothesis. F. C. Aitken.

3721

PESCHEL, E. and RACE, G. J. Studies on the adrenal zona glomerulosa of hypertensive patients and rats, with special reference to the effect of dietary salt restriction. *Amer. J.* Vol. 25, No. 3

Med., 1954, 17, 355-364. [Dept. Med., Sch. Med., Duke Univ., Durham, N.C.]

The width of the zona glomerulosa of adrenal glands was measured in 54 patients after death from diseases causing high blood pressure; all had been on salt-free rice diet and in 10 death was relatively sudden. For comparison measurements of glands were made in 20 cases of accidental death, in 15 with cancer of the intestines causing malnutrition and in 13 patients with high blood pressure, whose salt intake had not been reduced. Five groups of rats, normal or hypertensive on normal or salt-free diets or hypertensive and on the salt-free diet with added salt, were studied also. Histochemical estimations were made of the lipids present in the zone. In general the findings for rats agreed with those on the human subjects.

On normal diets the mean widths of zones did not differ in normal and hypertensive subjects, being 136 ± 39 and 130 ± 21 μ , respectively; for the undernourished subjects the mean was 104 ± 25 μ . For all hypertensive patients it was 181 ± 79 μ , and for the 10 selected ones 168 ± 56 μ . The indications in human subjects on the rice diet were that as the width of the zona glomerulosa increased its fat content decreased.

The findings may be interpreted as evidence of increased hormone production without storage.

D. Harvey.

See also Absts. 3524-47, 3616-19.

3722

TALMAGE, R. V. and KRAINTZ, F. W. **Progressive changes in renal phosphate and calcium excretion in rats following parathyroidectomy or parathyroid administration.** *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 263-267. [Dept. Biol., Rice Inst., Houston, Tex.]

Of 150 male rats of 180 to 225 g. bodyweight some had their parathyroids removed and others had subcutaneous injections of parathyroid extract. The rats were given 7 to 10 μ C. of ^{45}Ca or ^{32}P in water and urine was collected 2, 4, 12 and 27 hr. thereafter. The rats were then killed and the blood was collected for estimation of Ca and P.

After parathyroid removal there was an immediate fall in urine P and a rise in urine Ca. Within 27 hr. the excretory rates of both ions had returned to normal, although P continued to be high and Ca low in the serum. When 100 I.U. parathyroid extract was given to intact rats there was an immediate drop in urine Ca and a rise in urine P, although serum Ca had risen and serum P had fallen. Within 27 hr. the excretory rate for Ca had returned to normal or was even higher, while urine P continued to be high. It is suggested that the kidney is directly involved in the action of the parathyroids on Ca and P metabolism.

B. W. Simpson.

3723

BROWN-GRANT, K. and GIBSON, J. G. **The metabolism of exogenous and endogenous thyroid hormone in the rabbit.** *J. Physiol.*, 1955, 127, 341-351. [Dept. Neuroendocrinol., Inst. Psychiat., Maudsley Hosp., London, S.E.5.]

3724

ANDIK, I. and BANK, J. **Wirkung der Umgebungstemperatur auf die Nahrungsaufnahme der normalen und der mit Thyroxin behandelten Ratte.** [Effect of environmental temperature on food consumption of normal and thyroxine-treated rats.] *Acta physiol. hung.*, 1954, 6, Suppl., 37. [Pathophysiol. Inst., Med. Univ., Pécs.]

3725

MOOKERJEE, S. and SADHU, D. P. **The role of thyroid on the mechanism of cholesterol synthesis in the body.** *Indian J. Physiol. Allied Sci.*, 1954, 8, 121-124. [Dept. Physiol., Univ. Coll. Sci., Calcutta.]

Hypothyroidism was induced in rats with methyl thiouracil. The treatment resulted in production of increased amounts of total cholesterol, volatile fatty acids, including acetic acid, and acetone bodies in blood, kidneys, liver, intestine and adrenals. Dehydrogenase activity in the tissues was depressed.

It is concluded that the thyroid regulates oxidation of acetate and acetoacetate through the cyclophorase system and that in hypothyroidism oxidation of these compounds is diminished and they are converted to cholesterol.—G. A. Garton.

3726

VAN DER VEEN, H. E. and HART, P. C. **Onderzoek naar het voorkomen van strumogene stoffen in melk.** [Occurrence of goitrogens in milk.] *Voeding*, 1955, 16, 12-22. [Inst. Vee- teeltk. Onderzoek, T.N.O., Utrecht.] English summary.

Two experiments are described with North Holland Blue cocks as test animals. In the first experiment with 50 cocks, 12 weeks old, in 5 equal groups there were 3 experimental groups given a meal ration with 15.5 per cent. protein and 2.2 times the weight of pooled milk, or of milk from one of a pair of identical twins, one fed on turnips (*Brassica rapa*, var. *rapa*) known to contain goitrogens, and the other fed on fodder beet known not to contain goitrogens. Full details are given of the rations. One control group had the same meal mixture and water only; the other a mixture with 18 per cent. protein and water. Histological examination of the thyroids after 3 weeks showed no evidence of goitrogenic action from about 300 ml. milk daily.

In the second test the cocks were 6 weeks old at the start, there were 3 milk groups as before and 3 control groups, of which 2 were given 50 or 10 mg. methylthiouracil daily for 10 days before slaughter. After 6 weeks there was no evidence of goitrogenic effect. The turnips contained about 10 mg. 1:5-vinyl-2-thioxazolidone per kg., the fodder beet none. The milk groups had about 50 μ g. I daily; the water groups about 36 μ g. If the requirement of young cocks is 100 μ g. I daily the amount supplied could have had no part in preventing goitre.—I. Leitch.

3727

SILBERBERG, R. and SILBERBERG, M. **Skeletal effects of radio-iodine induced thyroid deficiency in mice as influenced by sex, age and strain.** *Amer. J. Anat.*, 1954, 95, 263-289. [Sodgrass Lab., Hosp. Div., St. Louis, Mo.]

Mice of 2 strains, DBA and C57BL, were injected intraperitoneally with 200 μ C. of ^{131}I at one month or with 400 μ C. at 6 months of age. Untreated mice of the same strains acted as controls. Mice were killed at selected dates and the tibiae were examined histologically.

The destruction of the thyroids by the ^{131}I delayed growth and development of the skeleton. There was a decline in susceptibility to loss of the thyroid with advancing age in both strains. Mice of strain C57BL were less susceptible than mice of

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DBA strain. The thyroids of the untreated DBA mice were hyperactive, those of the untreated C57 BL mice relatively inactive. The loss of thyroid in the latter strain had not, therefore, such a great effect as in the DBA strain. Since thyroid and oestrogenic hormones have antagonistic effects on bone resorption, the removal of the active thyroids of the females of the DBA strain eliminated a more powerful inhibitor of the oestrogenic hormones than the removal of the comparatively inactive thyroids of the females of the C57 BL strain. Experiments on ovariectomised mice are in progress.

The study is illustrated with photomicrographs showing the delayed growth and ossification of the epiphyseal cartilage of the tibiae and the inhibition of resorption of both cartilage and bone in thyroid deficiency.—B. W. Simpson.

3728

RYAN, E. J. and KIRKWOOD, S. Explanation of the effect of feeding desiccated thyroid on the incidence of dental caries in the rat. *Science*, 1955, 121, 175-176. [Evanston, Ill.]

Reference is made to the work of Muhler and Shafer (Absts. 1047, 1048, Vol. 25), in which reduction of salivary flow by desalination increased the incidence of caries and consumption of dried thyroid reduced it. Evidence is also quoted showing that hyperthyroidism is associated with increased function of the salivary glands and hypothyroidism with low function. It is suggested that the preventive action of dried thyroid may result from an increased flow of saliva or an increase in the concentration of I in saliva, a concept which may both explain the predisposition of some individuals to caries and provide a new method for its control.—D. Harvey.

3729

WILKINSON, J. H. and FEETHAM, A. J. The biological action of substances related to thyroxine. 10. The de-iodination of thyroxine in thyroidectomized rats. *Biochem. J.*, 1955, 59, 21-24. [Dept. Chem. Pathol., Westminster Med. Sch., Univ. London.]

3730

STARR, P., SNIPES, G. and LIEBHOLD-SCHUECK, R. Biologic effects of triiodothyronine in human subjects. *J. Clin. Endocrinol.*, 1955, 15, 98-106. [County Hosp., Los Angeles, Calif.]

3731

MORIMOTO, H. and HAYASHI, Y. [On the influence of thyroprotein and thiouracil upon the nitrogen metabolism of the rabbit.] *Bull. Nat. Inst. Agric. Sci., Japan* [G], 1954, No. 9, 119-124. In Japanese: English summary.

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The addition of 0.1 g. thyroprotein to the diet of rabbits caused loss of bodyweight, but slightly increased N retention. Addition of a similar amount of thiouracil to the ration of another group increased bodyweight slightly and also increased N retention. Neither had an effect on digestibility. (From summary.)—J. S. Thomson.

See also Absts. 3414, 3528, 3745, 3865, 3930, 3943.

3732

CONTOPOULOS, A. N., VAN DYKE, D. C., ELLIS, S., SIMPSON, M. E., LAWRENCE, J. H. and EVANS, H. M. Prevention of neonatal anaemia in the rat by the pituitary erythropoietic factor. *Blood, J. Hematol.*, 1955, 10, 115-119. [Inst. Exp. Biol., Univ. California, Berkeley.] Interlingua summary.

Several substances were tested for their capacity to prevent the development of anaemia in newborn rats. The test substance was injected daily from the fourth to the eighteenth day of life. For each experimental group there was a control group, uninjected or injected with sterile saline. Only the anterior pituitary erythropoietic substance prevented neonatal anaemia. Testosterone propionate, thyroxine, bovine plasma albumin, or a combination of these, adrenocortical extract, iron gluconate and whole adrenocortical extract were ineffective.—F. C. Aitken.

3733

PÉREZ ALAMÁ, J., GÓMEZ PORTUGAL, I., HENRÍQUEZ INCLÁN, E., BUENO GARCÍA, A. and USHIYAMA, E. La hormona del crecimiento a dosis mínimas y desconocidas es capaz de producir la diabetes sacarina experimentalmente. [Growth hormone in small and unknown doses can produce experimental diabetes mellitus.] *Rev. clín. española*, 1954, 55, 284-288. [Hosp. Gen., Mexico.] English, German and French summaries.

Growth hormone given intravenously at 1 mg. per kg. bodyweight to dogs produced diabetes, but 1 µg. was equally effective when it was given directly into the aorta near the coeliac trunk or when it was given with 1 µg. adrenaline and 1 µg. thiosemicarbazide.

The significance of this sensitisation to the hormone is discussed.—D. Duncan.

See also Absts. 3528, 3535, 3795.

3734

THOMPSON, J. S. An effect of estrogens on water intake. *Canad. J. Biochem. Physiol.*, 1955, 33, 10-13. [Dept. Anat., Univ. Alberta, Edmonton.]

Pellets of oestradiol implanted subcutaneously in male mice of C57 BL and A strains caused an increase in water intake and bladder distention;

in mice of the C3H strain no such effect was produced. In the susceptible strains limiting the intake of water reduced the effect and retarded its appearance.—D. Harvey.

3735

CLEGG, R. E., ROSENTHAL, A. S. and SANFORD, P. E. The influence of certain synthetic

estrogens on the serum calcium of the chicken.

Poultry Sci., 1954, **33**, 1197-1198. [Dept. Chem., Kansas State Coll., Manhattan.]

Oestradiolcyclopentylpropionate in daily intramuscular doses of 2 mg. raised the serum Ca of chickens to 30 mg. per 100 ml., but several other synthetic oestrogens did not.—K. J. Carpenter.

See also Absts. 3797, 3937.

ENERGY EXCHANGE AND SPECIFIC DYNAMIC ACTION

3736

VARGA, F. Welche Faktoren beeinflussen den Energieumsatz atrophischer Säuglinge. [Some factors influencing the energy exchange of atrophic infants.] *Acta med. hung.*, 1954, **6**, Suppl. 1, 133-135. [Kinderklin., Med. Univ., Pécs.]

3737

GARN, S. M. and CLARK, L. C. (Jr.) (with HARPER, R. V.) The sex difference in the basal metabolic rate. *Child Development*, 1953, **24**, 215-224. [Fels Res. Inst., Yellow Springs, Ohio.]

Height, weight, leg muscle diameter (from lateral X-ray photographs) and B.M.R. were recorded for 76 boys and 69 girls aged from 6 to 17 years.

Basal oxygen consumption by age was higher in boys than in girls at all ages, though in the youngest groups the difference was not large. When computed as Cal. per kg. bodyweight the difference was less, but at 13 to 15 years old the boys consumed about 3 Cal. per kg. or 10 per cent. more than the girls. In 27 pairs of boys and girls matched in terms of diameter of calf muscle [not corrected for fat], two-thirds of the figures for boys still exceeded those for the girls. After puberty all the boys consumed more oxygen on each basis than the girls paired with them by age and muscle size.

It is suggested that ketosteroids may produce the higher B.M.R. in boys, which is most marked after puberty.—D. Duncan.

3738

EICHORN, D. H. A comparison of laboratory determinations and Wetzel Grid estimates of basal metabolism among adolescents. *J. Pediat.*, 1955, **46**, 146-154. [Inst. Child Welfare, Univ. California, Berkeley.]

Metabolic and anthropometric measurements were made at intervals of about 6 months from 11.5 to 17.5 years of age in 52 boys and 52 girls. Cross-sectional measurements were made also on the control group for basal metabolism studies, 80 boys and 77 girls from 9.0 to 17.5 years old, of whom more than half were between 15 and 16 years old. The estimated basal metabolic rate

from the Wetzel grid was compared with the average of 6 measurements by the Tissot open-circuit technique, made on 2 consecutive days on each subject.

Of 522 measurements on boys and 475 on girls, 33 and 28 per cent. deviated from the grid estimate by at least 10 per cent. In the longitudinal study 22 of the 52 boys and 12 of the girls showed deviations of this order consistently, for one-third or more of their tests. The average difference from the grid estimate was 130 Cal. for boys and 100 Cal. for girls. In the control group the values were 125 and 107. In boys the grid estimates were consistently below the measured values and the difference increased with age, becoming significant at 12 years. In girls the grid underestimated B.M.R. at ages below 14 years and overestimated it thereafter, and the differences were significant except at 14.5 years, where the curves crossed.

Precautions to be taken in the use of grid estimates of B.M.R. are discussed.—D. Duncan.

3739

EICHORN, D. H. and MCKEE, J. P. Oral temperature and subcutaneous fat during adolescence. *Child Development*, 1953, **24**, 235-247. [Univ. California, Berkeley.]

Mouth temperature was recorded when B.M.R. measurements were being made and subcutaneous fat was measured on the anterior surface of the arm, on the abdomen and over the iliac crest. Fifty-three boys and 52 girls were examined at 6-month intervals from about 11 years of age. In boys the temperature declined steadily from 12½ to 17½ years of age, the relation being linear. In girls a rise occurred after 12½ and continued until 15 years; beyond that age there was a steady fall. At all ages above 13 years the girls' temperatures were higher than the boys'.

An attempt was made by correlation techniques to relate temperature to the amount of subcutaneous fat, to B.M.R. and to menarche in girls, but none of the relationships was clear and no single variable studied would account for the trends and sex differences in mouth temperature.

D. Harvey.

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3740

McKee, J. P. and Eichorn, D. H. **Seasonal variations in physiological functions during adolescence.** *Child Development*, 1953, **24**, 225-234. [Univ. California, Berkeley.]

The subjects were those described in the preceding Abst. Records were made on 2 successive days of B.M.R., respiratory and pulse rates, blood pressure and mouth temperature. The data were grouped according to months, regardless of the year, and corrections were applied for age and for individual differences. Mouth temperature in boys tended to rise in spring and decline in autumn. B.M.R. and pulse rate in both sexes declined in spring and rose in autumn. No seasonal variation was seen in respiratory rate or systolic pressure.

D. Duncan.

3741

Passmore, R., Meiklejohn, A. P., Dewar, A. D. and Thow, R. K. **Energy utilization in overfed thin young men.** *Brit. J. Nutrition*, 1955, **9**, 20-27. [Dept. Physiol., Univ. Edinburgh.]

Three healthy but constitutionally thin young men resident in the metabolic ward of a hospital were given diets containing from 1300 to 1600 Cal. in excess of their requirements for 10 to 14 days. During this time a standard routine of physical activity was followed; oxygen consumption was measured at intervals of 4 hr. day and night and food samples, urine and faeces were collected for analysis.

During excess energy intake, daily energy expenditure rose by 85, 150 and 225 Cal. for the 3 subjects; protein intake rose from 79 to 131 g. daily for one subject and from 77 to 124 g. daily for the other 2. Metabolism reached basal levels by late evening and there was no evidence to suggest that the thinness of the men was due to any inherent ability to oxidise surplus food, apart from a small rise in metabolism attributable to the specific dynamic action of the extra protein ingested. From faecal analyses 90 per cent. of the excess food was shown to have been digested.

G. F. Garton.

3742

Passmore, R., Meiklejohn, A. P., Dewar, A. D. and Thow, R. K. **An analysis of the gain in weight of overfed thin young men.** *Brit. J. Nutrition*, 1955, **9**, 27-37. [Dept. Physiol., Univ. Edinburgh.]

In the experiment described in the previous Abst. the balances of energy, N, water, Na and K were measured to investigate the nature of the material responsible for the weight gain which occurred. This gain was only about 70 per cent. of that expected for deposition of "obese tissue" of the composition 62 per cent. fat, 24 per cent. cell mass and 14 per cent. extracellular fluid as

described by Keys and Brožek (Title 624, Vol. 24). In the 3 subjects the weight gain was found to be entirely due to deposition of fat and protein; there was no evidence of gain of body water.

G. F. Garton.

3743

Terzioğlu, M. and Aykut, R. **Variations in basal metabolic rate at 1.85 km altitude.** *J. Appl. Physiol.*, 1954, **7**, 329-332. [Inst. Physiol., Univ. Istanbul.]

Estimations of B.M.R. were made on 12 subjects at sea level before their ascent to altitude 1.85 km. (6069 ft.), after residence there for 1 to 2, 5 to 6 and 10 to 11 days, and again at intervals after their descent. The average values in Cal. per 24 hr. per sq. m. per hr., respectively, were 7.4 and 7.6, 12.1 and 14.4, 13.6 and 16.0 per cent. above sea-level values at the end of the periods. After return to sea level the time taken for B.M.R. to return to pre-ascent value was 4 to 5 days for 5 subjects, 10 days for 2, 16 to 18 days for 4 and 33 days for 1 subject.

The findings contradict those of earlier workers, e.g., Liljestrand and Magnus, *Pflügers Arch.*, 1922, **193**, 527 and Loewy, *ibid.*, 1925, **207**, 632.

D. Harvey.

3744

Fraser, R. and Nordin, B. E. C. **The basal metabolic rate during sleep.** *Lancet*, 1955, **268**, 532-533. [Dept. Med., Post-grad. Med. Sch., London.]

The B.M.R. was estimated in 73 patients without sedation and then during sleep induced with intravenous pentobarbitone sodium, and in 53 patients during sleep induced with amylbarbitone sodium given by mouth.

In euthyroid patients the B.M.R. during sleep was in the normal range, or between 85 and 115 per cent. on the standard of Robertson and Reid (Abst. 2278, Vol. 22). In "nervous" patients the B.M.R. was above the normal range when they were awake, but fell to normal during sleep. The B.M.R. during sleep was high in thyrotoxic patients and low in myxoedema.

It is suggested that heavy sedation helps to reduce error associated with B.M.R. estimations for assessment of thyroid function.—D. Duncan.

3745

Vivanco, F. and Ramos, F. **Correlation between B.M.R. and protein-bound iodine in serum in normal subjects and in patients with thyroid disease.** *Bull. Inst. Med. Res., Univ. Madrid*, 1954, **7**, 63-68.

3746

De Langen, C. D. **Basal metabolism and sodium chloride.** *Acta med. scand.*, 1954, **150**, 257-261. [Utrecht.]

Basal metabolism estimated in 8 patients with Addison's disease ranged from -9 to -32 per cent. The administration of NaCl either by infusion or by mouth to 5 of the patients raised B.M.R. to normal, with a range of -2 to $+14$ per cent. The further addition of deoxycorticosterone acetate (DOCA) or cortisone had no appreciable effect. The B.M.R. of the other 3 patients rose to normal after administration of NaCl plus DOCA and remained normal after the withdrawal of DOCA except in one subject. A fall in B.M.R. followed the withdrawal of NaCl from 3 patients in balance with it.

Three normal subjects given a salt-free diet for 10 days had no change in B.M.R., but after Turkish baths for several days B.M.R. fell considerably. NaCl restored it to normal. NaCl is considered to affect oxygen consumption by its influence on capillary activity.—A. Hepburn.

3747

PATRICK, R. M., RICHARDSON, P. S. and MOSCHETTE, D. S. Metabolic studies with pre-adolescent girls. 2. Energy absorption. *J. Amer. Dietetic Assoc.*, 1955, 31, 138-143. [Dept. Home Econ., Louisiana Agric. Exp. Stat., Baton Rouge.]

For part 1 see Abst. 4094, Vol. 25.

The subjects were 5 girls aged 8 and 9 and a girl aged 11 years whose diets were controlled for 56 days. Energy values of food and faeces were measured in the Emerson fuel calorimeter and for each subject data obtained in 8 periods are reported. Mean daily intake and mean daily absorption, in Cal. per kg. bodyweight, were 77.7 and 75.4, respectively. There was a direct relation between these values which was statistically highly significant. The percentage of energy absorbed by the 6 subjects was fairly constant, 96.6 to 97.8, mean 97.1.—F. C. Aitken.

3748

BEST, W. R. The caloric equivalent of weight loss. *J. Lab. Clin. Med.*, 1954, 44, 768-769. *Proc.* [Chicago, Ill.]

3749

FOURNIER, P. Alimentation et travail. [Nutrition and work.] *Bull. Soc. sci. Hyg. aliment.*, 1954, 42, 279-295. [Ecole Hautes Etudes, Paris.]

A review.

3750

DILL, D. B., SEED, J. C. and MARZULLI, F. N. Energy expenditure in bicycle riding. *J. Appl. Physiol.*, 1954, 7, 320-324. [Chem. Corps Med. Labs., Army Chem. Centre, Md.]

A comparison is made between bicycles with balloon tyres of American type of diameter $2\frac{1}{2}$ to $2\frac{3}{4}$ in., 22 to 28 lb. per sq. in. pressure, and those with narrow tyres of standard European type, of diameter $1\frac{1}{2}$ in., 50 to 60 lb. per sq. in. pressure. Experiments to measure the force required to hold the bicycle stationary on a treadmill at 15 m.p.h. showed that on level ground with the wind blowing from behind at the same rate as the bicycle it should be more than twice as easy to pedal the bicycle with narrow tyres as the one with balloon tyres. Road tests were made to compare the oxygen consumption required on each bicycle under the same conditions, and this was also found to be appreciably less for the narrow-tyred bicycle. It is concluded that for transport with minimum energy expenditure tyres of narrow diameter are preferable to balloon tyres.—I. McDonald.

3751

FORD, A. B., LITTMAN, W. K., HELLERSTEIN, H. K. and GOUSTOS, A. Energy cost of the Master two-step test. *J. Lab. Clin. Med.*, 1954, 44, 796. *Proc.* [Cleveland, Ohio.]

3752

SERAPHIN, R. Zur Frage der Wärmeregulation der Säuglinge und Frühgeborenen. [Heat regulation of infants and premature infants.] *Ztschr. Kinderheilk.*, 1955, 75, 664-670. [Kinderklin., Univ. Heidelberg.]

The temperature regulation of the inner surface of the hand was studied by means of a circulation calorimeter. The infants 6 to 10 weeks old were in a room temperature of 22° to 24° C., the pre-matures, 6 to 14 days old and weighing 1000 to 2000 g., at 27° to 29° C. A warm stimulus was obtained by an electric pad over the abdomen and legs, a cool one by directing a draught from a fan on to the head.

Vasomotor temperature regulation in these infants was quite as prompt and extensive as in adults. The so-called thermolability of infants is not due to lack of vasomotor regulation, but mainly to their unfavourable surface: volume ratio and other causes such as thin skin and fat insulation and lack of mobility.—D. Duncan.

3753

ZÖLLNER, G., THAUER, R. and KAUFMANN, W. Der insensible Gewichtsverlust als Funktion der Umweltbedingungen. Die Abhängigkeit der Hautwasserabgabe von der Hauttemperatur bei verschiedenen Temperaturen und Wasserdampfdrücken der umgebenden Luft. [Insensible weight loss as a function of environment. Relation of water loss through the skin to skin temperature at different temperatures and vapour pressures of the surrounding

N.A. and R., July 1955

air.] *Pflügers Arch.*, 1955, **260**, 261-273. [William G. Kerkhoff-Just., Max-Planck-Gesellschaft., Bad Nauheim.]

Insensible weight loss and water loss through the skin were studied in 3 unclothed adults, 2 men and a woman, in 169 three-hour periods at different environmental temperatures and humidities. In the indifferent temperature zone and at constant relative humidity the insensible water loss and loss from the skin increased very gradually with rising body and skin temperatures, but after a critical body or skin temperature was reached the increase in water loss became steep, introducing a temperature-regulation mechanism.

Water loss through the skin fell with increasing relative humidity at constant skin temperature, and was a function of the saturation pressure at the skin temperature and the vapour pressure of the air.—D. Duncan.

3754

DOBOS, F., HAMAR, N., PREDMERSZKY, T. and TARJÁN, S. Zahlenmäßige Kennzeichnung der Hitze-arbeitsverhältnisse in den Betrieben der Eisen- und Stahlindustrie mit einem "Hitze-arbeitsindex". Zusammenhang zwischen Hitze-arbeitsindex und dem Schwitzen des Hitzearbeiters. [Numerical characterisation of conditions of hot work in the workshops of the iron and steel industry with a "hot work index". Relation between the hot work index and sweating of workers in heat.] *Acta med. hung.*, 1954, **6**, 453-461. [Staatliches Inst. Arbeitshyg., Budapest.] Russian summary.

A "hot work index", which makes it possible to characterise by a single figure the conditions of working in heat, is computed from the amount of bodily work done at different periods of the day and from components of the surrounding atmospheric conditions, i.e., radiation, air temperature and humidity, air currents and the length of time the worker is exposed to these. The relation between the hot work index and loss of fluid by the worker in heat was estimated empirically and is represented graphically. The limits of its application are discussed. The hot work index appears to be suitable for characterising the working conditions in the iron and steel industries. From it numerous conclusions can be drawn about the average loss of fluid of workers engaged on different jobs.—M. B. Richards.

3755

BEAKLEY, W. R. and FINDLAY, J. D. The effect of environmental temperature and humidity on the rectal temperature of calves. The effect of environmental temperature and humidity on the skin temperature of Ayrshire calves. The effect of environmental temperature and

humidity on the temperature of the skin of the scrotum in Ayrshire calves. The effect of environmental temperature and humidity on the ear temperatures of Ayrshire calves. *J. Agric. Sci.*, 1955, **45**, 339-352; 353-364; 365-372; 373-379. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Rectal temperature of calves rose with increasing environmental temperatures from 15° to 40° C. and increasing humidity, the change from low to high humidity being equivalent to 4° C. at 30° C. environmental temperature and 9° C. at 35° C.

The skin temperatures of the calves at 8 sites on the trunk rose with increasing temperature, humidity and time of exposure. There was no difference between the sites in any one animal.

Skin temperatures of the scrotum behaved in general as those of the trunk. The difference between scrotal and rectal temperatures became less as environmental temperature increased.

Skin temperatures of the ears also behaved as those of the trunk, but were lower, and there was a critical environmental temperature between 15° and 20° C. at which a sudden increase in ear temperature took place.—T. D. Bell.

3756

HAFEZ, E. S. E. and SHAFEEI, M. M. Sweating mechanism in the domestic buffalo. *Nature*, 1954, **174**, 1181-1182. [Fac. Agric., Univ. Cairo.]

3757

IRVING, L. and KROG, J. Temperature of skin in the Arctic as a regulator of heat. *J. Appl. Physiol.*, 1955, **7**, 355-364. [Arctic Health Res. Centre, Anchorage, Alaska.]

The skin beneath the fur or feathers of well adapted Arctic mammals or birds was not more than 10° C. colder than the body temperature, which varied little. Bare extremities such as the feet or nose were often near 0° C., but blood circulation was active. Cooling of the extremities serves for the dissipation of body heat. The sharp temperature gradients in the insulated parts of the extremities supported the view that heat is conserved by transfer from arterial to venous blood.

A. Hepburn.

3758

KROG, H., MONSON, M. and IRVING, L. Influence of cold upon the metabolism and body temperature of wild rats, albino rats and albino rats conditioned to cold. *J. Appl. Physiol.*, 1955, **7**, 349-354. [Arctic Health Res. Centre, Anchorage, Alaska.]

The first group, of 6 white rats, was kept in the warm room at 30° C. \pm 2 before the experiment, which began when the rats were 11 weeks old.

The second group consisted of 5 rats transferred at 4 weeks of age to a cold room at 20° C., and the temperature was reduced gradually to 5° C., at which level it remained for 6 weeks before the experiment. The third group was made up of 4 wild rats (*Rattus norvegicus*) captured in Alaska when the mean temperature was -23° C. and kept outside at the research station in a mean temperature of -14° C.

The respiratory quotient, measured at environmental temperatures between -40° and 30° C., showed no significant modification with temperature. The metabolic rate was higher in all groups at 20° than at 30°, and the critical temperature was calculated to be about 23°. The basal metabolic rate (B.M.R.) in white rats conditioned to cold was 60 per cent. above the empirical standard, but that of the other 2 groups did not differ significantly from the standard. The conditioned rats responded to cold by maintaining a metabolic rate consistently above that of white rats from the warm room. The former could withstand -30° for 2½ hr. before their metabolic rate declined, the latter only -10° for 2½ hr. The metabolic rate of wild rats rose in cold along the straight line which in conformity with Newton's law defines the metabolic maintenance of body temperature in animals adjusted to cold. At -40° the metabolic rate in some of this group was 6 times the B.M.R. The body temperatures of conditioned white rats did not fall appreciably after 2½ hr. at -10° C., but rats from the warm room could not maintain their body temperature in environments below 10°. No measurement was made on wild rats.

It is concluded that in domesticated white rats the metabolic response to cold is not as efficient as that in animals living naturally in a cold climate.
D. Duncan.

3759

BARGETON, D., EON, M., KRUMM-HELLER, C., LIBERMANN, C. and MASSON, J. Influence de l'adaptation sur les réactions thermorégulatrices au froid chez le rat. [Effect of adaptation on heat-regulating reaction to cold in the rat.] *J. Physiol., Paris*, 1954, 46, 845-860. [Serv. Recherches, Soc. Theraplix, Paris.]

Rats kept out of doors from 4 days of age in the region of Paris in a mean winter temperature of 8.5° C. were compared with rats bred and main-

tained at 29.5 ± 0.5°. Their thermoregulation was studied under fasting conditions; after 20 hr. at thermal neutrality, 29.5 ± 0.5° C., they were exposed to cold at 20°, 15° and 10° for 35 min. and then returned to thermal neutrality.

The rats accustomed to cold showed some elevation of colon temperature at 10° C., produced less heat with a negligible decline, and controlled their heat loss more efficiently.—D. Duncan.

3760

CUMMING, M. C. and MORRISON, S. D. Total energy expenditure during fasting and re-feeding of rats. *J. Physiol.*, 1955, 127, 10P-11P. [Inst. Physiol., Univ. Glasgow.]

3761

GARREN, H. W. and SHAFFNER, C. S. Factors concerned in the response of young New Hampshires to muscular fatigue. *Poultry Sci.*, 1954, 33, 1095-1104. [Poultry Dept., Univ. Maryland, College Park.]

Chicks about a month old were forced to exercise in a treadmill cage 3 ft. in circumference, turning at from 4 to 22 revolutions per min. Birds showed great variability in the time they would continue to exercise, and there was some evidence that those which continued longest had the heaviest adrenals. After 10 days of severe exercise chicks were killed; the mean weights of their hearts, pituitaries and adrenals were greater than those of non-exercised controls. In general males resisted exhaustion better than did females.

Supplementation of the diet of the chicks with 0.2 per cent. thiouracil for 2 weeks resulted in their becoming exhausted more rapidly. The use of 0.03 per cent. iodinated casein increased the resistance to fatigue of birds which had previously shown a poor performance in the cages.

A group that received an implant in the neck of 4 mg. testosterone showed a tendency to increased resistance after several periods of severe exercising. This effect was very variable, so that the range of performance in this group was even greater than in the controls.

Daily injections of either 2.5 or 5.0 mg. cortisone per kg. bodyweight had no significant effect on the resistance of the birds. The higher dose slightly depressed growth.—K. J. Carpenter.

See also Absta. 3583, 3703, 4330.

CARBOHYDRATES

3762

GROSS, R. T. Limitations of aerobic metabolism in the newborn. *Amer. J. Med.*, 1954, 17, 103-104. *Proc.* [Dept. Paediat., Stanford Univ. Sch. Med., San Francisco, Calif.]

3763

WICK, A. N. and DRURY, D. R. Metabolism of hexoses in the body. *Amer. J. Med.*, 1954, 17, 103. *Proc.* [Scripps Metabol. Clin., La Jolla, Calif.]

3764

BAKER, N., SHREEVE, W. W., SHIPLEY, R. A., INCEPY, G. E. and MILLER, M. **C¹⁴ studies in carbohydrate metabolism. 1. The oxidation of glucose in normal human subjects.** *J. Biol. Chem.*, 1954, **211**, 575-592. [Radioisotope Unit, Veterans Admin. Hosp., Cleveland, Ohio.]

From the specific activities of blood glucose and respiratory CO₂ in 4 normal subjects after a single injection of glucose uniformly labelled with ¹⁴C, the mean size of the glucose pool was calculated to be 0.15 g. per kg. bodyweight, distributed in a volume equivalent to 17 percent. of the bodyweight. The average turnover of the pool was 0.60 per cent. per min. The mean relative contribution of glucose to CO₂ was 21 per cent. and the amount of glucose oxidised accounted for about 60 per cent. of that removed from the pool in a given time. The change in specific activity of CO₂ after injection of labelled fructose, acetate and bicarbonate was compatible with the transfer of ¹⁴C from glucose to CO₂ through pools with rapid turnover.

A. Hepburn.

3765

HENNEMAN, D. H., ALTSCHULE, M. D., GONCZ, R. M. and ALEXANDER, L. **Carbohydrate metabolism in brain disease. 1. Glucose metabolism in multiple sclerosis.**

HENNEMAN, D. H., ALTSCHULE, M. D. and GONCZ, R. M. **3. Fructose metabolism in schizophrenic, manic-depressive, and involutional psychoses.** *Arch. Neurol. Psychiat.*, Chicago, 1954, **72**, 688-695; 696-704.

HENNEMAN, D. H., ALTSCHULE, M. D. and GONCZ, R. M. **4. Effect of hydrocortisone and corticotropin (ACTH) on the metabolic effects of administered glucose in patients with chronic schizophrenic and manic-depressive psychoses.** *Arch. Int. Med.*, 1955, **95**, 241-246. [Lab. Clin. Physiol., McLean Hosp., Waverley, Mass.]

1. The 6 subjects with active multiple sclerosis were 38 to 56 years old and free of intercurrent disease; 4 were men. There were 20 normal controls of comparable age.

Fasting blood glucose, pyruvic acid and citric acid were normal, but lactic acid and α -ketoglutaric acid were high. After 100 g. glucose was taken by mouth there was a prolonged rise in blood glucose, excessive accumulation of lactic acid, and a rise, instead of the normal fall, in citric acid and α -ketoglutaric acid. The rise in citric acid was especially striking.

For part 2 see Abst. 2202, Vol. 25.

3. The methods and subjects were those described in part 2, but fructose was given by mouth or intravenously instead of glucose.

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When fructose was given by mouth there was no significant difference in response between the psychotic patients and the normal controls, except a rise instead of a fall in blood glucose in the former. When the fructose was injected the chief difference was a rise in plasma citric acid in the patients, but not in the controls.

4. The subjects were 2 men and 2 women with chronic psychoses and a normal man. All had high-carbohydrate diets for 3 to 5 days before tests. In all subjects the glucose tolerance before and after administration of hydrocortisone or ACTH was within the normal range. The hormones produced in all 5 an increased rise in blood lactic acid after glucose administration; blood pyruvic acid behaved similarly in 2 of the patients. The normal subject showed after glucose alone or with hydrocortisone no change in blood citric acid; all 4 patients showed increases in blood citric acid after glucose in the control period, which changed to falls after hormones. In 2 of 3 patients blood α -ketoglutaric acid rose abnormally after glucose alone, but not after hormones. The third patient and the control showed high α -ketoglutaric acid levels only after hormones.

The changes observed in these 4 patients were typical of chronic psychoses in the control period, but after hormones the changes resembled those seen in psychoses of recent onset.—D. Duncan.

3766

BAKER, N., SHREEVE, W. W., MILLER, M., SHIPLEY, R. A. and CRAIG, J. W. **A study of carbohydrate oxidation in diabetic subjects by means of C¹⁴-labeled glucose.** *J. Lab. Clin. Med.*, 1954, **44**, 763-764. *Proc.* [Cleveland, Ohio.]

3767

SMITH, M. J. H. and TAYLOR, K. W. **Blood concentrations of pyruvic and α -ketoglutaric acids in normal people and diabetic patients.** *Lancet*, 1955, **268**, 27. [Dept. Chem. Pathol., King's Coll. Hosp. Med. Sch., London, S.E.5.]

The α -keto-acids in blood from 8 ambulant diabetic outpatients, 2 with moderate ketosis, were not significantly different from those of 7 normal people, nor were they related to the blood sugar, which ranged from 72 to 350 mg. per 100 ml.

A. Hepburn.

3768

PENNINGTON, A. W. **Pyruvic acid metabolism in obesity.** *Amer. J. Digest. Dis.*, 1955, **22**, 33-37. [Med. Div., E.I. du Pont de Nemours and Co., Wilmington, Del.]

Evidence that high-fat diets are more efficient than high-carbohydrate diets in weight reduction and that a defect in the oxidation of pyruvic acid is a cause of obesity is reviewed.—F. C. Aitken.

3769

ALEXANDER, F. Factors affecting the blood sugar concentration in horses. *Quart. J. Exp. Physiol.*, 1955, **40**, 24-31. [Dept. Vet. Pharmacol., Univ. Edinburgh.]

The blood sugar of 8 ponies was between 66 and 100 mg. per 100 ml. as measured by Somogyi's copper reduction method. Oral administration of glucose caused a rise in blood sugar and a large rise in glucose in the contents of the ileum. Fasting did not depress the blood sugar below normal. Consumption of hay was followed by the appearance of a yeast-fermentable reducing substance in the ileum. A comparison is made between the horse and the ruminant regarding the availability of glucose.—A. T. Phillipson.

3770

CHRISTOPHE, J. Détermination d'un coefficient d'assimilation glucidique chez le rat normal. Étude de l'influence de la dose de glucose sur l'assimilation. [Estimation of a glucose assimilation coefficient in the normal rat. Effect of the test dose of glucose on assimilation.] *C.R. Soc. Biol.*, 1955, **148**, 1886-1889. [Clin. Méd., Hôp. Brugmann, Univ. Brussels.]

Adult rats of the same strain and receiving a stock diet received after an 18-hr. fast a single intravenous injection of glucose. The dose per kg. bodyweight was 0.25 g. for 17 rats, 0.5 g. for 42 and 1.0 g. for 18, and the experiment was made under light nembutal narcosis.

The rate of assimilation of glucose was independent of the dose; it was quicker than in man and similar to that in the dog. A coefficient of assimilation is given.—D. Duncan.

3771

SCOW, R. O. and CORNFIELD, J. Quantitative relations between the oral and intravenous glucose tolerance curves. *Amer. J. Physiol.*, 1954, **179**, 435-438. [Lab. Biochem. Nutrit., Nat. Inst. Arthritis and Metabol. Dis., Bethesda, Md.]

Rats about 10 weeks old had oral and intravenous glucose tolerance tests, receiving 300 mg. glucose per 100 g. bodyweight by mouth or 125 mg. per 100 g. by vein. The rate of absorption of the same dose of glucose given by mouth was studied in other rats killed at different times after the meal.

The normal oral glucose tolerance curve could not be deduced only from knowledge of the rate of removal of glucose given by vein and the rate of intestinal absorption of glucose. The blood sugar values calculated from those rates exceed the actual values by a factor of 3, so glucose given by mouth must be removed considerably more quickly than glucose given by vein. If it is as-

sumed that only 37 per cent. of the glucose leaving the intestines enters the general circulation and 63 per cent. is removed by the liver, the calculated curve closely agrees with the actual curve. Glycogen formation in the liver, however, could not alone account for such an uptake of glucose.

D. Duncan.

3772

GARNER, R. J. and ROBERTS, R. The influence of previous diet on the fasting blood-sugar level and on glucose utilization in the rat and hamster. *Biochem. J.*, 1955, **59**, 224-228. [Vet. Lab., Univ. Bristol.]

After fasting for 17 hr., rats fed on a high-fat diet from weaning had lower blood glucose values at 7 and 10 weeks than similar animals on a control high-carbohydrate diet. By reversing the diets at 7 weeks the blood sugar of the fat-fed animals was restored to the control level at 10 weeks. Hamsters showed a fall in blood sugar with age, but, as with rats, the values at 7 and 10 weeks were lower on the high-fat than on the high-carbohydrate diet. Rats on the high-fat diet showed the reduced tolerance to intravenously injected glucose that has been recorded by others. Glucose uptake and glycogen synthesis by isolated rat diaphragm were both depressed when the carbohydrate intake was restricted by diets with excess fat or protein. The hexokinase activity of kidney homogenates from rats and hamsters was reduced by high-fat diets.—M. B. Richards.

3773

DE VENANZI, F., MASIN, M. and MASIN, F. Action de l' inanition sur la chute des phosphates du sérum produite par le glucose. [Effect of inanition on the fall in serum phosphate produced by glucose.] *C.R. Soc. Biol.*, 1954, **148**, 1636-1637. [Inst. Res. Sci., Caracas, Venezuela.]

Blood sugar tolerance tests were made on dogs before and after they were starved for 4 or 10 days, and phosphates were estimated also during the blood sugar tests. The fall in blood phosphates produced by glucose was less after fasting than before, but not significantly so.—D. Duncan.

3774

ROY, S. N. and SADHU, D. P. On the mechanism of glycosuria in skim milk fed rats. *Indian J. Physiol. Allied Sci.*, 1954, **8**, 117-120. [Dept. Physiol. Animal Nutrit., Bengal Vet. Coll., Calcutta.]

One group of rats was given mineralised skimmed milk and pair-fed with another group given isocaloric whole milk. Galactose appeared in the urine of the skimmed milk group from the second day of experiment; when milk intake and

galactosuria were constant injections were given of enterogastrone, atropine sulphate, glucose, acid histamine phosphate or prostigmine. Liver and muscle glycogen, liver fat and blood and urine sugar were estimated.

Galactosuria was less after enterogastrone, atropine and glucose, and more after acid histamine phosphate and prostigmine. In the skimmed milk group there was a higher blood sugar, lower liver and muscle glycogen and liver neutral fat and higher liver phospholipin levels than in the group given whole milk. The mechanism of the galactosuria which occurs in rats on a skimmed milk diet is discussed.—G. F. Garton.

3775

PATTERSON, J. W. Effect of partial starvation on development of diabetic cataracts. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 395-396. [Dept. Anat., Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

Diabetic rats starved for 40 hr. each week were protected against cataracts to a degree corresponding to the reduction of the blood sugar; when the mean non-fasting blood sugar was 450 mg. per 100 ml. or less there was no cataract.—A. Hepburn.

3776

WICK, A. N., MORITA, T. N. and BARNET, H. N. Sorbitol metabolism in alloxan-diabetic animals as compared with fructose and glucose. *Food*

Res., 1955, 20, 66-70. [Scripps Metabol. Clin., La Jolla, Calif.]

About half the amount of radio-activity given as sorbitol or fructose uniformly labelled with ^{14}C was recovered as $^{14}\text{CO}_2$ from diabetic rats on a diet containing 68 per cent. sucrose; only 26 per cent. was recovered from glucose. With a diet containing 68 per cent. fructose, the oxidation of sorbitol was unaffected, but fructose was not oxidised better than glucose after 7 days. Rats given sorbitol excreted glucose in the urine. Rats given fructose excreted less than 5 per cent. of the carbohydrate as fructose. It is suggested that there are 2 oxidative pathways for sorbitol or fructose.—A. Hepburn.

3777

DAUGHADAY, W. H., LARNER, J. and HARTNETT, C. The synthesis of inositol in the immature rat and chick embryo. *J. Biol. Chem.*, 1955, 212, 869-875. [Dept. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

Radio-active inositol was isolated from the liver and carcass of immature rats after intraperitoneal injection of radio-active glucose. Activity was higher in rats with a low intake of inositol. Radio-active inositol was found in chick embryos after application of labelled glucose to the chorio-allantoic membrane.—A. Hepburn.

See also Absts. 3455, 3456, 3498, 3542, 3720, 3781, 3821, 3838, 3845, 4197.

PROTEINS AND PROTEIN DERIVATIVES

3778

MITCHELL, H. H. The validity of Folin's concept of dichotomy in protein metabolism. *J. Nutrition*, 1955, 55, 193-207. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Data are quoted from N balance experiments with rats, pigs, dogs and man to support the view that endogenous protein metabolism proceeds independently of protein intake except when the dietary protein is deficient and stored protein is mobilised to supply a missing amino-acid, such as cystine for growth of wool. Work with isotopes has clarified the distinction.—I. Leitch.

3779

FEKETE, L. and KORPÁČY, I. Physiologische Untersuchung der kompletierenden Eigenschaften und der (wertvermindernden) Degradationseffekte von Diätbeiwissenschaften. [Physiological study of the complementing properties and the (value-lowering) degradation effects of mixtures of dietary proteins.] *Acta physiol. hung.*, 1954, 6, Suppl., 84. [Inst. Ernährungswissenschaft., Budapest.]

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3780

PEREIRA, M. D., HICKS, W. P., RILEY, J. D. and ELMAN, R. The effect on nitrogen balance of varying the proportion of infused protein hydrolysate and glucose. *Ann. Surg.*, 1954, 140, 349-353. [Surg. Metabol. Div., Homer G. Phillips Hosp., St. Louis, Mo.]

The subjects were 29 adults in hospital, 11 with advanced cancer and the others without acute disorders. Each received 2 litres of solution daily by intravenous injection for 7 days as sole source of food, with water as desired by mouth. The first and last 2 days were control periods when the solution was 10 per cent. glucose or fructose, and in the 3 experimental days a proportion of the sugar was replaced by amino-acids (Amigen) to provide the same energy intake, 800 Cal.

The highest positive N balance, 60 to 85 per cent. of that injected, was obtained when amino-acids provided 75 per cent. of the energy intake. In 7 subjects who received only amino-acids, without sugar, the N balance was from -3.7 to +3.1 g. daily, with a mean of -0.6 g.; in control periods on sugar alone the mean loss was 8.0 g. in

the first period and 7.3 g. in the second. Differences between subjects receiving glucose and fructose were not significant.

It is concluded that in malnourished patients with a low energy intake N retention increases as the proportion of protein given intravenously is increased from 25 to 75 per cent.—D. Duncan.

3781

CHRISTENSEN, H. N., WILBER, P. B., COYNE, B. A. and FISHER, J. H. Effects of simultaneous or prior infusion of sugars on the fate of infused protein hydrolysates. *J. Clin. Invest.*, 1955, **34**, 86-94. [Dept. Biochem. Nutrit., Med. Sch., Tufts Coll., Boston, Mass.]

Evidence is presented that there is wastage in the urine of free and bound amino-acids when commercial protein hydrolysates, autoclaved with 10 per cent. fructose or 5 or 10 per cent. glucose, are infused intravenously. Addition of the sugar to the hydrolysate immediately before infusion prevents peptide wastage, but not wastage of free amino-acids. Separate infusion of the sugar, which prevents amino-acid and peptide wastage, substantially reduces the immediate N catabolism.

F. C. Aitken.

3782

NIKLAS, A. and POLIWODA, H. Zur Frage der biologischen Halbwertszeit menschlicher Albumine und Globuline. [Biological half-life of human albumin and globulin.] *Biochem. Ztschr.*, 1954, **326**, 97-106. [Med. Klin., Univ. Cologne.]

The curves of radio-activity in total serum and in its protein fractions were followed in 10 subjects, 9 normal and 1 with chronic nephritis, who each received a single injection of 20 or 30 μ g. methionine containing 200 μ C. of 35 S.

Total serum protein gave curves suggesting a half-life of 22 to 40 days. Albumin gave straight lines with half-life values of 55 to 65 days. Globulin did not give a straight line. From the curves it is calculated that new serum protein formation in the 9 normal subjects was about 9.2 ± 0.3 g. daily.—D. Duncan.

3783

RAMAMURTI, K. Studies on the nitrogen partition in the urine of Rajasthanis. *Indian J. Med. Res.*, 1955, **43**, 61-69. [Biochem. Lab., Birla Coll. Sci., Pilani, Rajasthan.]

The nitrogenous constituents were estimated in 24-hr. samples of urine from 24 Rajasthanis, 12 manual workers and 12 sedentary workers, living on typical low-N diets supplying 42.6 and 50.4 g. total protein daily. The average values for the 2 groups in g. were total N 5.2 and 10.9, urea 6.1 and 17.1, ammonia 0.37 and 0.48, uric acid 0.41 and 0.26, creatinine 0.81 and 1.23 and undeter-

mined N 1.30 and 1.81. Total N and urea were much lower than figures quoted for western standards, NH_3 , uric acid and creatinine were slightly less and undetermined N was appreciably higher.—A. Hepburn.

3784

KOJECKÝ, Z., DOBERSKÝ, P., MAŠEK, J. and PELIKÁN, V. Metabolismus dusíku v různých stadiích vředové choroby. [Nitrogen metabolism in different stages of peptic ulcer.] *Sborn. pathofysiol. tráv.*, 1954, **8**, 200-208. [Human Nutrit. Res. Inst., Prague.] English and Russian summaries.

In 7 patients with moderate bleeding into the intestine no negative N balance was found. In 14 patients with painful peptic ulcer there were labile or so-called true negative balances. The 27 patients in the quiescent stage were permanently in positive N balance.—M. Prokšová (Czechoslovakia).

3785

TRÉMOLIÈRES, J. and JACQUOT, R. Protéinogénèse et bilan azoté. [Protein formation and nitrogen balance.] *C.R. Acad. Sci.*, 1955, **240**, 235-236.

The increased excretion of N by the rat after treatment with cortisone is accompanied by a considerable increase in liver weight, of which about two-thirds is due to protein. The pregnant rat retains N, but in a quantity insufficient for growth of the foetus, whose demands are met from maternal tissue. These examples are taken to show that N balance is not a state of total catabolism or anabolism, but a summation of both.

A. Hepburn.

3786

LINAZASORO, J. M., JIMÉNEZ DÍAZ, C. and CASTRO MENDOZA, H. Renal function and protein metabolism. *Bull. Inst. Med. Res., Univ. Madrid*, 1954, **7**, 9-16. [Dept. Biochem.]

Removal of the kidneys caused increases in plasma amino-N, urea N and residual N in rats. Ligation of the ureters, or removal of the kidneys together with injection of a kidney extract, caused similar increases in urea N and residual N, but only slight increases in amino-N.—C. Warner.

3787

CRAMPTON, E. W. and RUTHERFORD, B. E. Apparent digestibility of dietary protein as a function of protein level. *J. Nutrition*, 1954, **54**, 445-451. [Dept. Nutrit., Macdonald Coll., McGill Univ., Que.]

Rats were fed on diets consisting partly or entirely of whole egg powder or dry cheese with mineral and vitamin supplements, the balance being shredded wheat mixed with methyl cellulose. The apparent digestibility of the dietary protein

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rose from about 65 per cent. when it was 6 per cent. of the diet to 95 per cent. when it was half the diet. Faecal protein per unit dry matter intake increased with increasing dietary protein; since a protein of low apparent digestibility was being replaced by a protein of high apparent digestibility the increase was not thought to be due to an increase in dietary protein residue, but rather to increased growth of alimentary microflora. It is postulated that the true digestibility of the proteins of egg, cheese and wheat is 100 per cent. and that differences in the apparent digestibility of protein foods are due to differences in the concentration of protein in them.—C. Warner.

3788

WEISZ, P., SÓs, J., HARMOS, GY., GÁTI, T. and FÜSTI-MOLNÁR, Zs. Die Wirkung von quantitativer und qualitativer Eiweissmangel-diät auf die bedingte Reflex-tätigkeit weisser Ratten. [Effect of quantitative and qualitative protein deficiency on the conditioned reflex activity of the white rat.] *Acta physiol. hung.*, 1954, 6, Suppl., 87-88. [Pathophysiol. Inst., Med. Univ., Budapest.]

3789

SRINIVASAN, P. R. and PATWARDHAN, V. N. The effect of protein deficiency on (a) some liver constituents, and (b) enzymes in liver, pancreas and blood plasma in albino rats. *Indian J. Med. Res.*, 1955, 43, 1-13. [Nutrit. Res. Labs. Indian Counc. Med. Res., Coonoor.]

Groups of 30 rats, 15 of each sex, received from 3 months of age 3 different diets. The control diet contained 20 per cent. casein and the experimental diets contained 2 per cent. casein and 2 per cent. protein provided by 26 per cent. rice, respectively. Each diet contained 10 per cent. lard, 4 per cent. salt mixture and starch to 100 parts. Intake was restricted to 10 g. daily. Rats from each group were killed each month for 3 months, then the remaining protein-depleted rats were divided into 2 groups and continued on the low-protein diet or were given the control diet for another month. In a second experiment young rats, initially 21 to 28 days old, received the control or 2 per cent. casein diet for 1 month, then 12 deficient rats were killed and 6 were given the control diet for another month.

In adult rats liver fat showed a temporary increase after the second month of depletion, but there was no histological fatty infiltration. Glutathione fell in the first month and remained low. Succinic acid and butyric acid dehydrogenases were low from the first month onwards. Alkaline phosphatase activity rose progressively until the third month in adult rats. Acid phosphatase increased only after 3 months. Transaminase

activity fell in the first month, D-amino-acid oxidase and esterase in the second month. Oxygen consumption by liver slices fell in the first month and remained low. Re-alimentation restored all the liver constituents to normal.

Pancreatic lipase was reduced in the third month, especially on the rice diet. Plasma lipase was reduced only in the fourth month, when plasma esterase was also low.

In the young rats all the enzyme changes seen in adults in 3 months were already established after one month.—D. Duncan.

3790

LUCAS, C. C. and RIDOUT, J. H. The lipotropic activity of protein. *Canad. J. Biochem. Physiol.*, 1955, 33, 25-30. [Banting and Best Dept. Med. Res., Univ. Toronto, Ont.]

Groups of 6 individually housed rats were fed to appetite on one of 4 diets for 3 weeks. The diets contained 3, 6, 9 and 18 per cent. vitamin-free casein; the total methionine content was kept uniform at 0.54 per cent. by addition of appropriate amounts of DL-methionine. The rest of the diet was made up with sucrose, salts, cellulose flour, maize oil and adequate amounts of vitamins; thus all diets contained equal amounts of choline and its known precursors. At the end of the experiment liver lipids were estimated.

More fat was found in the livers of the animals given the diets low in protein than in those on more adequate rations. It appears that protein exerts a lipotropic effect which does not directly involve choline or its known precursors. Histologically the fatty livers which were produced were different from those in choline deficiency.

G. A. Garton.

3791

KUZOVLEVA, O. B. Ob izmeneniyakh soderzhaniya aminokislot v pecheni belykh kry, nakhodyashchikhsya na diete, nedostatochnoi v otnoshenii belka. [Changes in free amino-acid content of the liver of white rats on a protein-deficient diet.] *Vop. Pitan.*, 1955, 14, No. 1, 30-34.

White rats of 120 to 160 g. were divided into 2 groups and given a normal mixed diet or an artificial diet containing 3 per cent. protein. The animals were killed after different periods and the amino-N of liver homogenates was estimated.

In normal rats, the average amino-N was 78.9 mg. per cent., but in deficient animals killed after 3 to 7, 9 to 15 and 24 to 52 days the values were 67.1, 73.2 and 85.9 mg. It is argued that, since on a protein-deficient diet liver protein falls and is accompanied at first by a fall and not a rise in amino-N, and since the protein content of other organs does not fall and may even rise, either amino-acids from breakdown of liver protein must

be at once utilised in the synthesis of protein for other tissues, or large quantities of amino-acid are not formed in the liver, re-synthesis of protein for other tissues taking place without preliminary complete splitting-up of liver protein.

D. W. Taylor.

3792

HARADA, M. and HORIGUCHI, G. **Bone and nutrition (primary report). Experimental studies on changes of bone and bone-marrow in hypoproteinemia.** *Wakayama Med. Rep.*, 1954, 2, No. 1, 7-14. [Dept. Orthopaedic Surg., Wakayama Med. Sch.]

Rabbits received fresh vegetables, bean curd residues, and a basal or low-protein diet, the latter containing, per cent., starch 85.5, agar 5, sugar 5, butter 2, McCollum's salt mixture 2 and vitamin B complex components 0.5.

Five rabbits on the basal diet were subjected to plasmapheresis; 20 to 50 ml. blood was taken daily or every other day for 8 to 30 days. Body-weight and serum protein fell in proportion to the severity of plasmapheresis. All the rabbits showed thinning of epiphyseal cartilage and reduction of bone trabeculae, and 4 showed lacunar resorption of bone. There was reduction and hyaline degeneration of cartilage at the costochondral junctions.

Twelve rabbits received the low-protein diet, 30 or 40 g. daily for from 10 to 57 days. The bodyweight and serum protein fell for 2 weeks, but then remained fairly constant or fell slightly. The bone changes were similar to those seen in the first group but more pronounced.

The last 3 rabbits served as controls and received the basal diet for 14 to 28 days. Active bone formation was found at the end of the experiment.

It is suggested that bone formation is dependent on protein metabolism.—D. Duncan.

3793

KASAMATSU, S. **Histologische Untersuchungen des Kaninchen-Wurmfortsatzes unter einschiger Fütterung. [Histological experiments on the vermiform appendix of the rabbit during unbalanced feeding.]** *Wakayama Med. Rep.*, 1954, 2, No. 1, 35-42. [Anat. Inst., Med. Univ., Wakayama.]

In rabbits fed for 4 months on bean curd residues (*okara*) the wall of the appendix became thin, with great reduction in the amount of lymphoid tissue and changes in the epithelial cells, which are illustrated. The changes were not greater after 8 months than after 4. The changes were not prevented by supplements of carbohydrate, "vitamin powder" or injection of vitamins A and D. A supplement of coarse particles of filter paper, one part to 10 of diet, prevented the changes, but when half the diet was powdered filter paper the

appendix became thin. Once the wall had been affected by 4 months of *okara*, addition of coarse filter paper for another 4 months did not reverse the changes.

The results are considered to indicate a local effect of fibre on the structure of the appendix.

D. Duncan.

3794

CAMPBELL, R. M., SHARP, G., BOYNE, A. W. and CUTHBERTSON, D. P. **Cortisone and the metabolic response to injury.** *Brit. J. Exp. Pathol.*, 1954, 35, 566-576. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The excess urinary N excretion of rats after fracture of the femur was of magnitude similar to that after the implantation of a tablet containing 25 mg. cortisone acetate. Adrenalectomy with maintenance of the animals on 0.9 per cent. saline abolished the response to injury; adrenalectomy with maintenance on cortisone had little effect. Animals with low basal urinary N excretion responded more to trauma than those with high, especially when food intake was also low.

C. Warner.

3795

RUFF, J. J., PASCHKIS, K. E. and CANTAROW, A. **Role of potassium in the protein-catabolic effect of cortisone and ACTH.** *Endocrinology*, 1955, 56, 21-23. [Div. Endocrine Cancer Res., Jefferson Med. Coll., Philadelphia, Pa.]

The increased excretion of urinary N and the loss of weight caused by cortisone or adrenocorticotrophic hormone in rats was not altered by large doses of KCl.—A. Hepburn.

3796

KELEMEN, E., TANOS, B., HAJDU, L. and FORGÁCS, P. **Long-term suppression of a permeability response of the rat's hind-paw by cortisone, by hypophysectomy and by protein-deficient diet.** *Nature*, 1955, 175, 122-123. [I. Belgyógyászati Clin., Szeged, Hungary.]

Local injections of crude testicular extract containing hyaluronidase greatly increase the permeability of the rat's hind paw (Kelemen *et al.*, *Acta med. hung.*, 1951, 2, 201). Large doses of cortisone given subcutaneously suppressed the oedema thus produced; so did removal of the pituitary. In young rats maintained on a diet containing less than 2 per cent. protein the response disappeared, to return within 24 to 72 hr. after they were given a protein-rich diet.

It is suggested that one of the effects of a protein-deficient diet may be a shift of water into the extracellular compartment, with dehydration of connective tissues, and that cortisone and hypophysectomy also exert their influence on this phenomenon through changes in protein metabolism.—D. Duncan.

3797

GLASSER, S. R. Influence of an adequate dietary protein on the immediate and latent effects of stilbestrol. *Amer. J. Physiol.*, 1954, **179**, 421-428. [Bur. Biol. Res., Rutgers Univ., New Brunswick, N.J.]

Adult rats were given for 21 days a synthetic basal diet containing 18 per cent. casein with vitamin supplements; 0.1 mg. stilbestrol was injected daily into some and others were kept as pair-fed controls. At the end of the period both groups were divided equally; half of each group continued on the basal diet and half were given a similar diet without protein. Nitrogen balances were measured.

In both groups there was loss of weight, greater in the treated than in the untreated rats, and after injections were stopped the difference persisted on both the basal and the protein-free diet. Rats on the basal diet did gain weight, but those on the protein-free diet did not. The hormone caused an immediate increase in N excretion over that of the untreated rats but, by the twentieth day, both groups had recovered and were nearly in equilibrium. Continuation on the basal diet led to positive balances in both treated and untreated animals, greater in the former than in the latter; on the protein-free diet balances were negative.

In similar experiments the effect of vitamin B₁₂ on the influence of the hormone was studied, but none was found. Loss of liver weight occurred in groups with and without the hormone. Total protein in liver was greater in injected than in control animals, the difference resulting from differences in liver weight, not from differences in protein concentration. In recovery on the basal diet the groups did not differ and there was immediate restoration of N in liver; rats on the protein-free diet had less protein in their livers than had those on the basal diet.

The hormone had no immediate effect on liver fat. During recovery on the basal diet treated and untreated rats did not differ; those on the protein-free diet had more liver fat than did those recovering on the basal diet and the level in the treated was higher than in the untreated rats.

D. Harvey.

3798

BEHM, G. Über den Einfluss der Rohfaser im Futter auf die Menge des Darmverlust-Stickstoffs, nach Versuchen an Ratten, Kaninchen und Schweinen. [Effect of crude fibre in feed on the faecal loss of nitrogen in experiments on rats, rabbits and pigs.] *Arch. Tierernährung*, 1954, **4**, 197-218. [Inst. Tierernähr., Humboldt Univ., Berlin.]

Rats, rabbits and pigs were fed on an N-free diet with different amounts of crude fibre in the

form of pure cellulose (shredded filter paper) or sawdust. In rats sawdust, but not cellulose, increased the faecal loss of N. With 5 per cent. or less of cellulose in the food, the faecal loss of N remained almost constant at 0.29 g. per 100 g. dry food. When the cellulose content rose to 20 per cent. the faecal loss of N fell to 0.22 g., with a change in the consistency of the faeces. With percentages of 10, 15 and 20 of sawdust in the feed, the faecal losses of N were respectively 0.27, 0.29 and 0.35 g. In rabbits, with a mixture of cellulose and sawdust no conclusion could be drawn about the faecal loss of N, but with sawdust alone, as in rats, the loss was increased. Experiments on pigs confirmed the reported value of 0.095 g. per 100 g. dry feed for faecal loss of N, provided the cellulose content of the feed did not exceed 5 per cent. With increase of cellulose the loss increased considerably, the values obtained for 5, 10 and 20 per cent. cellulose being 0.099, 0.129 and 0.199 g. Increasing amounts of sawdust acted in the same way, but the values reached for faecal loss of N were not so high as for the same amounts of cellulose.—M. B. Richards.

3799

ENGEL, R. W., LINKOUS, W. N. and BELL, W. B. Effect of protein on the toxicity of hexachloronaphthalene. *J. Nutrition*, 1955, **55**, 119-128. [Virginia Agric. Exp. Stat., Blacksburg.]

A total of 3 to 4 mg. hexachloronaphthalene given over 1 or 2 weeks produced liver enlargement with accumulation of fat in rats on a diet containing 9 per cent. casein. Significant protection against fat accumulation was achieved with 18 or 27 per cent. casein; liver fat increased much more gradually than in the rats on the 9 per cent. casein diet.—A. Hepburn.

3800

SCHROEDER, L. J., IACOBELLIS, M. and SMITH, A. H. In vitro digestibility studies on model peptides heated with glucose. *J. Nutrition*, 1955, **55**, 97-104. [Dept. Physiol. Chem., Sch. Med., Wayne Univ., Detroit.]

Glycyl-L-leucine and glycyl-DL-valine were autoclaved with glucose, dry, in water and in aqueous alkaline buffer, and the products were digested with pancreatin. The total available amino-N was reduced after autoclaving dry or in the alkaline buffer.—A. Hepburn.

3801

SCHREIER, K. Some peculiarities of amino acid metabolism in infancy and early childhood. *J. Pediat.*, 1955, **46**, 86-106. [Kinderklin., Univ. Heidelberg.]

A review.

3802

DUSTIN, J. P., MOORE, S. and BIGWOOD, E. J. **Chromatographic studies on the excretion of amino acids in early infancy.** *Metabolism*, 1955, 4, 75-79. [Lab. Biochem., Fac. Med., Univ. Brussels.]

Urine from a premature infant at 38 days and 18 weeks old, a 25-day-old normal infant and an adult were analysed for amino-acids by ion exchange chromatography. Expressed as a percentage of total urinary N, the total values were 4.3 and 3.6, 2.9 and 1.1. Threonine, glycine, serine plus asparagine plus glutamine (not separated), alanine, cystine, glutamic acid and proline were very much higher in infant than in adult urine. The first 3 and tyrosine were much higher in the premature than in the normal infant. Basic amino-acids were excreted at about the same rate in the two infants and the adult.

A. Hepburn.

3803

ROSE, W. C., LAMBERT, G. F. and COON, M. J. **The amino acid requirements of man. 7. General procedures; the tryptophan requirement.**

ROSE, W. C., COON, M. J., LAMBERT, G. F. and HOWE, E. E. **8. The metabolic availability of the optical isomers of acetyltryptophan.** *J. Biol. Chem.*, 1954, 211, 815-827; 1955, 212, 201-205. [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

For part 6 see Abst. 2224, Vol. 25.

7. With purified diets containing the known essential amino-acids, glycine and sometimes urea, and in which just over 1 per cent. of the N was of unknown origin, the amount of L-tryptophan needed to maintain N balance in young men was studied.

In 3 experiments, accurately measured, it was 0.15, 0.15 and 0.25 g. daily; in 15 it was less than 0.20 g. daily. No correlation was found between the tryptophan requirements of the subjects and their bodyweights, surface areas or creatinine outputs. Little, if any, of the D-isomer was utilised. It is suggested that 0.50 g. tryptophan daily is a safe intake.—C. Warner.

8. N balance experiments with young men showed that acetyl-D-tryptophan, like free D-tryptophan, was not utilised significantly. Acetylation did not reduce the availability of L-tryptophan or increase that of DL-tryptophan.

A. Hepburn.

3804

HARRIS, H., MITTWOCH, U., ROBSON, E. B. and WARREN, F. L. **The pattern of amino-acid excretion in cystinuria.** *Ann. Human Genetics*, 1955, 19, 196-208. [Dept. Biochem., London Hosp. Med. Coll.]

In urine from 28 cystinuric patients and 121 of their relatives a high positive correlation existed between the concentrations of cystine and lysine, which ranged from 20 to 8000 and from 25 to 1800 mg. per g. creatinine. When these values were above about 250 and 550, the amount of arginine, normally less than 25 mg., increased considerably, and in one patient reached 1800 mg. per g. creatinine.—A. Hepburn.

3805

SUMIYOSHI, T. [Experimental studies on the skeletal growth, especially on the changes of the epiphyseal cartilage of albino rats receiving amino-acid deficient diet. 2. Influence of corn diet on the skeletal growth, especially on the epiphyseal cartilage. 3. Influence of lysine deficient diet on the skeletal growth, especially on the epiphyseal cartilage.] *Shikoku Acta Med.*, 1954, 5, No. 4, 60-71; 72-81. [Dept. Int. Med., Sch. Med., Tokushima Univ.] In Japanese: English summary.

2. Sixteen rats were given 3 diets in which maize flour was the sole source of protein; for 14 others there were 3 similar diets with wheat flour, casein and dried milk, wheat flour and casein, or casein and starch replacing the maize flour. All diets contained salt and vitamin mixtures. The experiments lasted for from 21 to 191 days.

Among those receiving the maize flour diets growth was slower and long bones were shorter than in corresponding control rats. These changes were greater in male than in female rats. In the epiphyseal cartilages in which closure normally occurs by the age of 6 months ossification was later in the experimental than in the control group. In the cartilages which normally ossify later in life ossification did not occur but [presumably in the experimental group] there was impaired osteogenic activity or a retardation of normal ageing. In further experiments with rats on restricted feeding with the control diet these changes were not reproduced.

3. A diet without lysine consisted of, per cent., starch 58, lard 5, simsim oil 10, vitamin mixture 2, salt mixture 5, the remaining 20 per cent. being a mixture of 9 essential amino-acids; a control diet had the same proportions of lard, simsim oil and vitamin and salt mixtures, 25 per cent. casein and 53 per cent. starch. These diets were given to comparable rats, and a third set were restricted to an amount of the control diet maintaining the same rate of growth as in the lysine-deficient rats.

In the experimental animals there was atrophy of the epiphyseal cartilage and epiphyseal growth ceased; the changes were more severe in lysine-deficient than in restricted rats. They confirmed that, of the amino-acids, lysine is essential for skeletal growth.—D. Harvey.

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3806

SHILS, M. E. and STEWART, W. B. **Preventive influence of certain amino acids on experimental fatty liver of portal type.** *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 629-631. [Sch. Pub. Health, Coll. Phys. Surg., Columbia Univ., New York.]

Rats given a diet with 74 per cent. vegetable protein, either maize meal, white rice or cassava flour, developed a portal type of fatty liver which was partly or completely prevented by lysine or tryptophan. Methionine and threonine had little or no additional effect, but threonine produced a gain in weight in the rats fed on rice.

A. Hepburn.

3807

CAVALLINI, D. and TENTORI, L. **Aminoaciduria da arginina. [Amino-aciduria produced by arginine.]** *Rend. Ist. Super. Sanità, Rome*, 1954, **17**, 85-87. [Ist. Clin. Biol., Univ. Rome.] French, English and German summaries.

The method was the same as that described in Abst. 3331, Vol. 24.

In rats on normal diet the urine gave 3 ninhydrin-positive spots, identified as glutamic acid, glycine and alanine. Administration of arginine increased the number of such spots to 11, the extra amino-acids being aspartic acid, glutamine, arginine, lysine, γ -aminobutyric acid, valine, leucine and tyrosine. Not all these amino-acids can be considered as metabolites of arginine. Fewer amino-acids appeared after ornithine or glutamic acid was given.—D. Duncan.

3808

ARNSTEIN, H. R. V. **The metabolism of glycine.** *Advances in Protein Chem.*, 1954, **9**, 1-91. [Nat. Inst. Med. Res., London.]

3809

CAVALLINI, D. and TENTORI, L. **Osservazioni sul metabolismo del triptofano nel ratto. 2. [Observations on tryptophan metabolism in the rat. 2.]** *Rend. Ist. Super. Sanità, Rome*, 1954, **17**, 88-90. [Ist. Chim. Biol., Univ. Rome.] French, English and German summaries.

Under the same conditions as before (Abst. 3331, Vol. 24), rats were given 0.01 M DL-kynurenine on 2 consecutive days and the urine was examined by paper chromatography. Five fluorescent compounds were detected: 3 were identified as free and conjugated kynurenine and kynurenic acid and the other 2 were thought to be derivatives of anthranilic acid.—W. M. Deans.

3810

ROTHSTEIN, M. and MILLER, L. L. **The conversion of lysine to pipecolic acid in the rat.** *J. Biol.*

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Chem., 1954, **211**, 851-858. [Dept. Radiat. Biol., Sch. Med. Dent., Univ. Rochester, N.Y.]

When rats were injected with L-lysine-6- 14 C and L-pipecolic acid, the pipecolic acid isolated from the urine was strongly radio-active. When 15 N-labelled lysine was used, the pipecolic acid in the urine acquired the label of the ϵ - but not of the α -N. With L- α -aminoadipic acid the label of the α -N of lysine was taken up, the α -N giving a slight enrichment thought to be due to transamination. It is suggested that lysine is deaminated to ϵ -amino- α -ketocaproic acid, followed by cyclisation and reduction to form pipecolic acid, which is then converted to α -aminoadipic acid.

When 14 C-labelled aminoadipic acid was injected with pipecolic acid, no radio-activity was found in the pipecolic acid isolated, and it is suggested that the conversion of pipecolic acid to aminoadipic acid was irreversible.—C. Warner.

3811

BOTHWELL, J. W., PRIGMORE, J. R. and WILLIAMS, J. N. (Jr.) **A study of the nitrogen metabolism of lysine-deficient rats.** *J. Nutrition*, 1954, **54**, 469-478. [Dept. Biochem., Univ. Wisconsin, Madison.]

Weanling rats forcibly fed on a lysine-deficient diet remained in positive N balance until death (see Abst. 609, Vol. 23). In a similar experiment urinary N was found to be increased, mainly owing to increased urea concentration, but blood N remained normal despite a slight increase in blood urea. The continued positive N balance was therefore not due to kidney damage and retention of N in the blood.—C. Warner.

3812

HABERLAND, G. L., BRUNS, F. and ALTMAN, K. I. **Ein neuer Stoffwechselweg von Phenylalanin und verwandten Substanzen im Organismus der Ratte. Ein Beitrag zur endogenen Entstehung der Benzoesäure. [New metabolic pathway of phenylalanine and related substances in the rat organism. Endogenous origin of benzoic acid.]** *Biochem. Ztschr.*, 1954, **326**, 107-109. [Biochem. Lab., Div. Exp. Radiol., Dept. Radiol., Univ. Rochester, N.Y.]

The excretion of hippuric acid and the relative isotope concentration in rats was studied after intraperitoneal injection of 3-6 mg. carboxyl- 14 C-benzoic acid and 500 mg. phenylalanine or a related substance. Injection of phenylserine caused a significant increase in hippuric acid excretion and a fall in the relative isotope concentration. Phenylalanine and phenylpyruvic acid caused no increase in hippuric acid excretion, but a distinct fall of the relative isotope concentration, showing that these substances also must be regarded as forerunners of benzoic acid formed endogenously.

It is conceivable that these compounds are broken down to benzaldehyde and then oxidised to benzoic acid by an aldehyde oxidase. Tyrosine and tryptophan were without effect. When 3-¹⁴C-DL-phenylalanine was injected intraperitoneally into rats, a relatively large part of the ¹⁴C activity, after separation by paper chromatography, was found in the hippuric acid spot.—M. B. Richards.

3813

VENNART, G. P. and MCKEE, F. W. **The role of homocystine in protecting protein-depleted dogs exposed to fatal doses of chloroform.** *J. Exp. Med.*, 1955, **101**, 197-204. [Dept. Pathol., Sch. Med. Dent., Univ. Rochester, N.Y.]

Adult dogs which had had their protein reserves depleted by diet and bleeding in several weeks to 4.0 to 5.0 g. per cent. were protected from the lethal action of chloroform by 2 g. homocystine given by mouth either 2 hr. before or 2 hr. after anaesthesia. Without the protection of homocystine there was a constant post-anaesthesia fall in fibrinogen and rise in the icteric index, and death occurred in 30 to 48 hr., with severe central liver necrosis. In the protected animals changes in fibrinogen and icteric indices were not constant. No evidence was obtained that methyl groups are necessary for the protection of the liver by homocystine.

M. B. Richards.

3814

SCHWEIGERT, B. S. and GUTHNECK, B. T. **Utilization of amino acids from foods by the rat. 3. Methionine.** *J. Nutrition*, 1954, **54**, 333-343. [Div. Biochem. Nutrit., Amer. Meat Inst. Found., Chicago, Ill.]

Weanling or protein-depleted adult rats were fed on a basal ration deficient in methionine, in which most of the N came from casein treated with H₂O₂ and formic acid. Supplements of 13 methionine-containing foods were compared with L-methionine for their capacity to support weight gain. In most tests the results with weanling and adult rats were similar, but the methionine of soya bean products, sesame meal and pork ham was better utilised by the weanling rats, and that of beef rib was better utilised by the adult depleted rats. The methionine of unheated soya bean flakes was only 44 per cent. as efficient as pure L-methionine for supporting weight gain; other figures were lactalbumin 52 per cent., skimmed milk, wheat germ, rolled oats, split peas, sesame meal, pork luncheon meat and beef rib between 60 and 70, soya bean meal, soya bean grits, pork ham, canned pork and beef and beef rib between 70 and 80, and casein 83 per cent. Only part of the inefficiency of these foodstuffs was due to increased excretion of methionine in the faeces; the sum of the percentage

of ingested methionine excreted and the percentage utilised for weight gain varied from 55 per cent. for lactalbumin to 89 per cent. for rolled oats. There was no difference between DL- and L-methionine in capacity to support weight gain.

C. Warner.

3815

BALCH, H. E., MICHAELS, G. D. and SMYRL, S. **Plasma methionine and methionine utilization in relation to hepatic damage.** *Amer. J. Med.*, 1954, **17**, 117. *Proc. [Inst. Metabol. Res., Highland Alameda County Hosp., Oakland, Calif.]*

3816

LEVIN, W. C., PERRY, J. E., BLOCKER, T. G. and LEWIS, S. R. **The influence of severe burns on protein metabolism as measured by uptake and excretion of L-methionin labeled with radiosulfur.** *J. Lab. Clin. Med.*, 1954, **44**, 830. *Proc. [Galveston, Tex.]*

3817

WILLIAMSON, M. B. and FROMM, H. J. **Excretion of sulfur during healing of experimental wounds.** *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 366-368. [Dept. Biochem., Sch. Med., Loyola Univ., Chicago, Ill.]

Female rats weighing 200 ± 20 g. were given for 5 days a protein-free diet containing, per cent., sucrose 83, lard 10, maize oil 2 and salt mixture 5, with a vitamin supplement. They received 8 g. daily. Wounds were then made in the backs of experimental rats but not of controls. Faeces and urine were collected thereafter.

In 30 wounded rats kept on the basal diet N excretion for 2 weeks was greater than that of unwounded controls. Total S excretion was about the same in both groups, but wounded rats excreted about 40 per cent. more sulphate S, which may mean that their metabolism of sulphur amino-acids was increased.

When wounded and unwounded rats after 4 days on the basal diet received ³⁵S-cystine by intraperitoneal injection they excreted more ³⁵S than rats which similarly received ³⁵S-methionine. After both labelled amino-acids the wounded rats excreted more ³⁵S as sulphate than did controls.

D. Duncan.

3818

WILLIAMSON, M. B. and FROMM, H. J. **The incorporation of sulfur amino acids into the proteins of regenerating wound tissue.** *J. Biol. Chem.*, 1955, **212**, 705-712. [Dept. Biochem., Stritch Sch. Med., Loyola Univ., Chicago, Ill.]

The protein hydrolysates of regenerating wound tissue in rats contained more sulphur amino-acids than normal tissue. The methionine content was

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greater than that of cysteine plus cystine at first, but this was soon reversed. Two proteins were therefore considered to be synthesised. Injection of ^{35}S -cysteine after wounding resulted in rapid uptake and loss of activity in wound tissue, skin, muscle and liver. As the amount of cysteine plus cystine in the tissues remained constant the decrease of activity was attributed to protein turnover and label dilution. Liver methionine decreased considerably.

Methionine and cysteine plus cystine were separated and their activities were estimated in the tissues after the injection of labelled methionine. The activity of methionine decreased in the wound tissue, but the activity of cysteine plus cystine remained almost constant, owing presumably to transfer of label from methionine. The uptake and loss of labelled methionine and cystine by the livers of wounded rats were significantly greater than in normal rats. An increased rate of S metabolism during wound regeneration is evident, and liver methionine supplies a large part of the cystine required.—A. Hepburn.

3819

REGISTER, U. D. and BARTLETT, R. G. (Jr.) **Effect of cold and restraint on tissue non-protein sulphydryl compounds in methionine-deficient rats.** *J. Biol. Chem.*, 1955, **212**, 741-745. [Dept. Biochem., Sch. Med., Coll. Med. Evangelists, Loma Linda, Calif.]

Rats deficient in methionine and exposed to cold in cages which restricted movement had increased amounts of non-protein sulphydryl compounds in the liver, but in non-deficient rats similarly exposed these compounds decreased. Both groups of rats had decreased amounts in the kidneys. Deficiency of methionine increased amounts of sulphydryl compounds in the blood, but cold and restraint did not affect them. Adrenaline produced changes in the liver and kidney similar to those caused by exposure to cold and restraint.—A. Hepburn.

3820

LEVY, H. M., MONTAÑEZ, G. and DUNN, M. S. **Effect of ethionine and fasting on the free amino acids of rat liver.** *J. Biol. Chem.*, 1955, **212**, 985-990. [Chem. Lab., Univ. California, Los Angeles.]

The concentrations of methionine, glycine, lysine, aspartic acid and glutamic acid in the livers of fasted rats increased after injection of 200 mg. DL-ethionine. Serine decreased. Similar trends were obtained in fed rats given 100 mg. ethionine, but the increases in lysine, aspartic acid and glutamic acid were larger and occurred sooner; lysine and methionine fell and serine increased after 16 hr.—A. Hepburn.

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3821

ORD, M. G. and STOCKEN, L. A. **Creatine and carbohydrate metabolism.** *Biochem. J.*, 1955, **59**, 272-279. [Dept. Biochem., Univ. Oxford.]

In guineapigs the creatine content of the liver, which was less than 12 mg. per 100 g. liver in the fed animal, rose to 2 or 3 times as much within 24 hr. after withdrawal of food, with a proportional rise in phosphocreatine. In rats also there was a rise, though a smaller one, in liver creatine, but urinary creatine was much increased, while blood glucose fell to 60 or 70 mg. per 100 ml. Tissue analyses did not reveal the origin of the creatine, but perfusion experiments showed a reversible dependence of muscle creatine on the blood glucose level. The relation between creatine distribution, carbohydrate metabolism and electrolyte balance is discussed.—M. B. Richards.

3822

BENEDICT, J. D., KALINSKY, H. J., SCARRONE, L. A., WERTHEIM, A. R. and STETTEN, DEW. (Jr.) **The origin of urinary creatine in progressive muscular dystrophy.** *J. Clin. Invest.*, 1955, **34**, 141-145. [Div. Nutrit. Physiol., Pub. Health Res. Inst. City of New York, Inc.]

The study described in Abst. 2348, Vol. 22 was extended to 2 more subjects with progressive muscular dystrophy. They were maintained on a creatine-free diet low in purines and each received by mouth 100 mg. glycine labelled with ^{15}N per kg. bodyweight. They later received several intravenous injections of sodium benzoate. Urine was collected for 14 days.

Initially urinary creatine contained much more ^{15}N than did creatinine, but by the eighth or tenth day the isotope level in the creatine had fallen to about that in the creatinine. The results are taken as confirmation that the urinary creatine did not leak out of muscle, but was newly formed in the liver and not taken up by the muscle. The isotope concentrations in creatinine were higher than those found earlier in normal subjects, though creatinine output was less.

At all times there was 2 or 3 times as much ^{15}N in the sarcosine moiety of creatine as in the hippurate. The significance of this is discussed.

D. Duncan.

3823

BUZARD, J. A., BISHOP, C. and TALBOTT, J. H. **The conversion of uric acid to allantoin in the normal and gouty human.** *J. Biol. Chem.*, 1954, **211**, 559-564. [Dept. Biochem., Sch. Med., Univ. Buffalo, N.Y.]

3824

PAL, R. K. and MITRA, B. N. **Studies in uric acid metabolism.** *Indian J. Physiol. Allied Sci.*,

1954, 8, 89-97. [Dept. Physiol., R.G. Kar Med. Coll., Calcutta.]

The average uric acid content of blood from dogs was 0.45 and 0.65 mg. per 100 ml., on low- and high-purine diets, respectively. Tea or coffee produced an initial increase in uric acid, but the level then fell despite further doses. Tea or coffee given with a fish and chapati diet which alone had no effect gave a persistent increase in blood uric acid.

When the diet contained the large fish rohu (*Labeo rohita*) there was normal blood uric acid, but with the small fish puti (*Barbus ticto*), tenger (*Mystus carasius*) and khalse (*Colisa fasciatus*), uric acid was doubled after 3 days.

When the blood uric acid was raised by injection of uric acid the concentration of allantoin in the urine gradually fell. Blood was seen in some stools and 2 deaths occurred. Post-mortem examination showed haemorrhage in the digestive tract. These effects could be reversed and more normal levels of uric acid and allantoin restored by administration of colchicum, salicylates or cinchophen.

A. Hepburn.

See also Absts. 3287, 3517, 3528, 3639, 3654, 3731, 3841, 3847, 3918, 3919, 3927, 3929, 3934, 3938, 3940, 3941, 3945, 3946, 4033, 4105, 4112, 4127, 4226.

FATS AND OTHER LIPIDS

3825

DEUBL, H. J. (Jr.) Newer concepts of the role of fats and of the essential fatty acids in the diet. *Food Res.*, 1955, 20, 81-91. [Med. Sch., Univ. S. California, Los Angeles.]

A review.

3826

MANNING, P. R. and WALFORD, R. L. Lack of effect of fat ingestion on blood coagulation. *Amer. J. Med. Sci.*, 1954, 228, 652-655. [Med. Serv., U.S. Air Force Hosp., Chanute Air Force Base, Ill.]

Lipæmia was induced in 3 groups each of 4 patients, by administration of 240 ml. of 12, 20 and 40 per cent. cream, respectively, corresponding to 29, 48 and 96 g. fat. A meal of butter, bacon and egg containing 85 g. fat was given to 18 patients. After 1, 2, 3 and 4 hr. blood samples were taken for study of clot retraction, coagulation time and prothrombin consumption.

No statistically significant difference was found in any of the blood properties under examination.

G. A. Garton.

3827

KARSTEN, G. and BECKER, M. Versuche mit langfristiger fettfreier Ernährung an Wiederkäuern. [Experiments in prolonged feeding of ruminants on a fat-free diet.] *Arch. Tierernährung*, 1954, No. 5, Beihefte, 95-102. [Inst. Tierernährung, Völknerode, Brunswick.]

The aim of the experiments was to estimate the amount of endogenous fat excreted in the faeces. Three nearly fullgrown wethers were kept for 5 to 6 months on a diet almost without fat. The feeds used, hay, potato flakes and soya bean meal, were extracted in a specially constructed giant Soxhlet apparatus, first with methanol and then with trichloroethylene, and freed from solvent in a vacuum drying cupboard at 100° C. The extracted

mixed feed contained less than 0.1 per cent. ether extract. Vitamins A, D, E, K and choline in pure form were added.

The feed was not palatable and molasses did not improve palatability, but salt (NaCl) solution did. It was continued for 162 days without sign of deficiency and, at the end, weight, structure and quality of wool were normal. Three metabolism studies were made at intervals. With a daily intake of 0.697 g. crude fat, of which 0.174 g. was unsaponifiable matter and 0.328 g. fatty acids, saturated and lower unsaturated, average excretion was usually 2 to 3 g. crude fat, occasionally only 1 to 2 g. Of this 20 to 45 per cent. was unsaponifiable matter, the rest mostly saturated fatty acids with a little oleic acid.

At the end of the experiment, the sheep were slaughtered and fat was estimated in stomach and intestinal contents, and in samples of body fat, with special reference to highly unsaturated fatty acids. The rumen contents had a fat content 10 times that of the feed and of similar composition; higher unsaturated acids were not found. The high content is attributed to "mechanical accumulation". Synthesis of linoleic acid is not probable, and the linoleic acid content of depot fat had fallen almost to zero. The lipids of organs and especially hair, on the other hand, still had considerable amounts of highly unsaturated fatty acids.—I. Leitch.

3828

PANOS, T. C. and FINERTY, J. C. Effects of fat-free diet on growing male rats with special reference to the endocrine system. *J. Nutrition*, 1954, 54, 315-331. [Dept. Paediat., Univ. Texas Med. Branch, Galveston.]

Twenty male rats were given from weaning a diet of Purina chow; 35 similar rats were given a fat-free diet of vitamin-free casein 18, sucrose 76, salts 4 and cellulose 2 per cent. with added vitamins

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A, D₂, E and those of the B group. After 20 weeks during which weight gains and oxygen consumption were measured at intervals, the animals were killed and organs were removed for macroscopic and microscopic examination. Two other groups of rats were given identical treatment in a study of organ : bodyweight ratios after 2 and 5 weeks, respectively, on the fat-free diet.

In all rats given the fat-free diet growth was impaired, bodyweight being only 66 per cent. of that of controls. Typical skin lesions on tail, feet and back began to appear after 9 weeks on the deficient diet and oxygen consumption increased as early as 2 weeks. On a bodyweight basis the brain, adrenals, liver, heart and kidneys were significantly heavier than in the controls, but the thyroid was smaller. Microscopic studies showed intertubular accumulations of blood in the kidneys and thickening of the epidermis as found previously (Abst. 4834, Vol. 23) in female rats, and accumulation of fatty droplets round hepatic veins. There was increased vascularity of the myocardium. Non-relative weight changes of the testes, prostate and seminal vesicles were not significant, but the seminiferous tubules of all fat-deficient rats showed signs of degeneration, intercellular and intracellular vacuolation and reduction of spermatids and mature spermatozoa. The rats given the fat-free diet for 2 or 5 weeks showed similar differences from controls in bodyweight and weight of brain, liver, heart, kidney and thyroid.—G. F. Garton.

3829

NARAYANA RAO, M. **The relationship of glyceride structure to fat digestibility.** *Indian J. Med. Res.*, 1955, **43**, 51–56. [Food Technol. Lab., Indian Inst. Sci., Bangalore 3.]

Groups of 6 individually-caged adult rats were fed to appetite for 10 to 12 days on diets which contained 10 per cent. coconut oil, groundnut oil or butterfat or glyceride fractions of these oils prepared by low-temperature crystallisation from acetone. The rest of the diet consisted of casein 12, maize starch 60, sucrose 10, "vitaminised" starch 4 and salts 4 per cent. During the last 6 days food consumption was recorded and the faeces were collected for analysis.

All the oils and their glyceride fractions, which varied in I value from 2.7 to 122.0, were almost completely digested. All the fats had melting-points above 50° C. The I value and saponification value of the faecal lipids of the rats were almost the same and had similar fatty acid composition. G. A. Garton.

3830

NORCIA, L. N. and LUNDBERG, W. O. **Fat excretion. The influence of dietary fat on fecal fat**

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excretion. *J. Nutrition*, 1954, **54**, 491–508. [Dept. Physiol. Chem., Univ. Minnesota, Minneapolis.]

Two groups of rats were fed on diets containing 15 per cent. olive oil or tripalmitin for 30 days. The 2 groups of animals were then divided into sub-groups, each of which was given one of 4 test diets for 10 days; during the last 7 days faeces were collected. The test diets contained tripalmitin, triolein, a mixture of tripalmitin and trilinolenin, or no fat.

Faecal fat was unaffected in quantity or composition by any of the dietary fats used. Although the depot fats varied considerably in composition (see next Abst.) they did not influence the composition of the endogenous faecal fat. The results therefore support the view that endogenous faecal fat is of bacterial origin.—G. A. Garton.

3831

NORCIA, L. N. and LUNDBERG, W. O. **Body fat deposition. The influence of lard, olive oil and some simple triglycerides on rat body fats.** *J. Nutrition*, 1954, **54**, 509–522. [Dept. Physiol. Chem., Univ. Minnesota, Minneapolis.]

Groups of rats were fed on the diets described (see preceding Abst.); when they were killed total fatty acids, unsaponifiable matter, neutralisation equivalent, I value, peroxide value and fatty acid composition were estimated in body fat.

The diet containing tripalmitin as the only source of fat caused depletion of body fat reserves and reduced the I value of body fat, which was attributable to decrease of di- and tetra-ethenoid fatty acids and increase of monoethenoid unsaturation. All the body fats of animals fed on the olive oil diet and then on that containing tripalmitin and trilinolenin showed an increase in diethenoid fatty acid. Similar increases in diethenoid fatty acid were found in the perirenal and mesenteric depot fats of the animals which received the diet containing tripalmitin and trilinolenin after the conditioning diet containing tripalmitin. The liver fat of these animals showed a substantial increase in tetraethenoid fatty acids when trilinolenin was included in the diet.—G. A. Garton.

3832

AAES-JØRGENSEN, E., ENGEL, P. F., FUNCH, J. P. and DAM, H. **The role of fat in the diet of rats. 7. The influence on growth of diets supplemented with raw skim milk, linoleic acid or both; and of raw casein compared with alcohol-extracted casein.** *Brit. J. Nutrition*, 1955, **9**, 42–49. [Dept. Biochem. Nutrit., Polytech. Inst. Copenhagen.]

For previous work in this series see Abst. 806, Vol. 25 and Aaes-Jørgensen, "The role of fat in the diet of rats. 6. Influence of various fats in

ordinary refined state and after hydrogenation or polymerisation" (Copenhagen, Store Nordiske Videnskabsboghhandel, 1954).

Twenty groups, each of 6 weanling female rats, were given food and drinking fluid to appetite for 26 weeks. Growth, energy and fluid intake and urine output were measured and histological studies were made of the kidneys. The basic diet contained lard 28, sucrose 46, casein (crude or alcohol-extracted) 20, McCollum's salt mixture 5 and vitamin mixture 1 per cent. For different groups hydrogenated groundnut oil was substituted for lard or fat was omitted, raw skimmed milk was given as drinking fluid and the diets were supplemented with 20 or 100 mg. linoleic acid per rat daily.

With diets containing 28 per cent. hydrogenated groundnut oil growth was improved by substitution of crude for alcohol-extracted casein, or of skimmed milk for water, or by supplementation with linoleic acid, which gave the greatest effect. The effects of linoleic acid and of skimmed milk appeared to be additive. With diets containing 28 per cent. lard, growth was again increased by crude casein or skimmed milk.

Growth of the rats receiving 28 per cent. hydrogenated groundnut oil and water to drink was significantly slower than that of rats given a fat-free diet and water; when skimmed milk was given instead of water, growth on both diets improved, though the fat-free diet was still better.

Calculi in the cortico-medullary border of the kidneys were more numerous in rats which had been fed on diets containing 28 per cent. lard than in those which had received 28 per cent. hydrogenated groundnut oil.—G. A. Garton.

3833

DEUEL, H. J. (Jr.), ALFON-SLATER, R. B., WELLS, A. F., KRYDER, G. D. and ARTERGOOD, L. The effect of fat level of the diet on general nutrition. 14. Further studies of the effect of hydrogenated coconut oil on essential fatty acid deficiency in the rat. *J. Nutrition*, 1955, 55, 337-346. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California, Los Angeles.]

For previous parts see Absts. 2277, 2278, Vol. 25.

Weanling rats were fed on otherwise fat-free diets containing 5, 15 or 30 per cent. of hydrogenated coconut oil or none, until signs of essential fatty acid deficiency were apparent, i.e., failure of weight increase and lesions of the tail skin. Animals which had received 30 per cent. hydrogenated coconut oil were then given a daily supplement of 20, 40 or 80 mg. linoleate or none for 8 weeks and the effects on growth rate and recovery from the fatty acid deficiency were studied. At the end of the experiment free and total cholesterol were estimated in extracts of plasma and livers. Three

groups of weanling rats were fed on a fat-free diet, a diet containing 15 per cent. cottonseed oil and one containing 15 per cent. hydrogenated coconut oil. Animals in all groups were killed at intervals of up to 13 weeks for estimation of free and total cholesterol in plasma and liver.

The addition of hydrogenated coconut oil to an otherwise fat-free diet resulted in more rapid depletion of essential fatty acids than in animals on the fat-free diet alone. The subsequent response to linoleate was not impaired by the continued intake of hydrogenated oil. The diets without linoleate produced also an increase in liver cholesterol and a fall in plasma cholesterol. When diets containing hydrogenated coconut oil were continued with added linoleate, there was a return to normal of liver and plasma cholesterol, possibly owing to the availability of short-chain fatty acids contained in the hydrogenated oil for esterification of cholesterol.—G. A. Garton.

3834

ERSHOFF, B. H. and GREENBERG, S. M. Comparative effects of dietary fat and dextrin on mineral oil toxicity in the mouse. *Amer. J. Digest. Dis.*, 1954, 21, 363-365. [Dept. Biochem. Nutrit., Univ. S. California, Los Angeles.]

Groups of young mice were fed to appetite on a low-fat diet supplemented with mineral oil at 5, 7.5 and 10 per cent. The 2 higher proportions resulted in retardation of growth and development of alopecia. When the diet containing 7.5 per cent. mineral oil was supplemented with 10 per cent. cottonseed oil or hydrogenated coconut oil, the rate of growth was improved, but alopecia was not completely prevented. When white dextrin, containing 0.6 per cent. bound fat, was substituted for glucose in the low-fat ration, both the growth-retarding effect of mineral oil and the attendant alopecia were prevented. It is therefore suggested that the effects of mineral oil cannot be wholly due to deficiency of essential fatty acids.

G. A. Garton.

3835

REISER, R. and DIECKERT, J. W. The influence of dietary fat on the glyceride structure of animal fat. *J. Amer. Oil Chem. Soc.*, 1954, 31, 625-628. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., Texas Agric. and Mech. Coll. System, College Station.]

Groups of rats and chickens were reared on an almost fat-free basal diet. Body fat was then isolated from these animals and given at the 20 per cent. level with the same basal diet to other groups of rats and chickens; still other groups were given similar diets containing 20 per cent. cottonseed oil, and a fourth lot of chickens was given the same basal diet with 10 per cent. cottonseed oil. After several weeks on these diets the

animals were killed and their carcase fats were extracted and analysed for oleic, linoleic and linolenic acids and for saturated triglycerides.

Fat produced endogenously by the rat is formed with a random distribution of fatty acids, and in this species ingested fat appears to be digested and re-synthesised in a manner which tends to distribute the fatty acids selectively; thus, after ingestion of rat fat or cottonseed oil the percentage of saturated triglycerides in body fat was only 75 to 80 per cent. of that which would be expected from a random distribution of the component fatty acids of the dietary fat.

The results with chickens differed from those obtained with rats. After the diets containing 20 per cent. chicken fat or 10 per cent. cottonseed oil, the amounts of saturated triglycerides in the carcase fats were 150 per cent. greater than would have been expected from a random redistribution of ingested fatty acids; 235 per cent. more saturated triglycerides were found after the diet containing 20 per cent. cottonseed oil.

Possible mechanisms to explain these different observations in the 2 species are discussed, among others the higher body temperature of the chicken.
G. A. Garton.

3836

THOMAS, K., WEITZEL, G., SCHÖN, H. and GEY, F.
Beziehungen zwischen Fettsäuren mittlerer Kettenlänge und Hautfett. [Relation between fatty acids of medium chain length and skin fat.] *Arch. Tierernährung*, 1954, No. 5, Beihefte, 103-109. [Med. Forschungsanst., Max Planck Gesellsch., Göttingen.]

For 21 days 10 young rats of 60 to 80 g. body-weight received a normal diet, 5 rats a diet containing 37 per cent. lard and 10 rats a similar diet with 37 per cent. mixed glycerides of C_8 , C_{10} and C_{12} fatty acids. The last diet increased the saponification number and decreased the iodine number of cutaneous and subcutaneous fat. The steam-volatile fatty acid content of 10 g. skin fat was 100 mg. on the normal diet, 150 mg. after lard and 450 mg. after glyceride diet.

In a second similar experiment 5 rats received a normal diet and 3 groups of 10 received the same with 10 per cent., respectively, of C_8 or C_{10} triglycerides or C_{16} ethyl ester. In all 3 experimental groups the amounts of skin fat and subcutaneous fat after 21 days considerably exceeded those of controls, and this was so especially in the C_{16} group. The C_{10} group showed significant increases in the saponification number of fat from both sources; the C_8 group a smaller increase in the skin fat only, and both C_{10} and C_{16} groups had reduced iodine numbers. The steam-volatile fatty acids per 10 g. skin fat rose from 100 mg. on normal diet to 610 mg. with C_8 triglycerides, to 760 mg.

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with C_{10} , but only to 180 mg. with C_{16} ethyl ester. The corresponding values for subcutaneous fat were 90, 160, 770 and 140 mg.

It is concluded that the subcutaneous fat can store up fatty acids from C_{10} upwards, but little C_8 acid, while the skin can accumulate significant amounts of C_8 acids.—D. Duncan.

3837

GROSSMAN, M. I., PALM, L., BECKER, G. H. and MOELLER, H. C. Effect of lipemia and heparin on free fatty acid content of rat plasma. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 312-315. [Med. Nutrit. Lab., Fitzsimons Army Hosp., Denver, Colo.]

Heparin was injected intravenously into rats, some of which were fasting; others had been given maize oil by stomach tube. Blood was withdrawn at intervals and free fatty acid was estimated by the method of Davis (Abst. 73, Vol. 18).

The injection of heparin produced a moderate increase in the free fatty acid content of the plasma of fasting animals and a greater increase in those with free blood fat; in the latter a definite decrease in the total fatty acid content of plasma was found. In rats not given heparin, but with free blood fat, a moderate rise in plasma free fatty acid values was found.—G. A. Garton.

3838

GARNER, R. J. and ROBERTS, R. Effect of acetate on the fasting blood-sugar level of the rat. *Nature*, 1954, 174, 1194-1195. [Vet. Lab., Univ. Bristol.]

Rats were fasted for 17 hr. and then anaesthetised with Nembutal. Blood samples were taken by heart puncture before and 30, 60, 120 and 180 min. after intraperitoneal injection of sodium acetate, 100 or 200 mg. per 100 g. bodyweight, or the same amount of Na as saline. The acetate produced a transient rise of blood sugar, without a subsequent fall.

Weanling rats tolerated acetate in the diet at levels up to 13 per cent., but at higher levels growth was depressed. Acetate at 13 per cent. of the diet had no effect on the blood sugar estimated after a 17-hr. fast.—D. Duncan.

3839

WEINMAN, E. O., LOSSOW, W. J., CHAIKOFF, I. L. and DAUBEN, W. G. Conversion of 15th carbon of palmitic acid to CO_2 by the intact rat. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 414-417. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Fasting rats received an intravenous injection of 1 ml. of an emulsion containing tripalmitin- ^{14}C 2, olive oil 2, glycerylmonostearate 1, glucose 5, and water 90 per cent. Respiratory CO_2 was

collected continuously for 24 hr., during which time 16 separate samples were taken for estimation of the $^{14}\text{CO}_2$ content.

The amounts of $^{14}\text{CO}_2$ expired and the specific activity-time relations of the $^{14}\text{CO}_2$ corresponded closely with results obtained earlier (Weinman *et al.*, *J. Biol. Chem.*, 1950, **184**, 735) with tripalmitin- ^{14}C , tripalmitin-6- ^{14}C and tripalmitin-11- ^{14}C . On the average 66 per cent. of the injected ^{14}C was expired as $^{14}\text{CO}_2$. The present findings support the postulate that all the C atoms of palmitic acid are converted to CO_2 at almost identical rates.

G. A. Garton.

3840

COLWELL, A. R. (Jr.) **Occurrence of accumulation of fat in the liver and its relation to excess weight gain in patients convalescing from viral hepatitis.** *Ann. Int. Med.*, 1954, **41**, 963-979. [U.S. Army Hosp., Kyoto, Japan.]

In biopsy material from 144 soldiers with infective hepatitis an accumulation of liver fat was found in about half, in whom the disease was in the sub-acute, 6 weeks' duration, or in the chronic, 13 weeks' duration, phases; none was seen in the early acute phase. In patients in both of those phases the gain of bodyweight was more than twice that in patients without liver fat. Liver function as measured by the bromosulphalein test was not impaired. The fat deposition is attributed to diets high in energy, protein and fat while the patients were relatively inactive. Vitamin B_{12} had no lipotropic effect.—D. Harvey.

3841

ARATA, D., HARPER, A. E., SVENNEBY, G., WILLIAMS, J. N. (Jr.) and ELVEHJEM, C. A. **Some effects of dietary threonine, tryptophan, and choline on liver enzymes and fat.** *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 544-549. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

A basal diet including 9 per cent. casein, choline, methionine, and tryptophan produced deposition of liver fat in rats. The addition of threonine reduced liver fat and increased endogenous oxidation and carboxylation and the activity of the soluble enzymes xanthine oxidase and tyrosine oxidase in liver homogenates. The activity of the mitochondrial enzyme systems choline oxidase, succinic oxidase and pyruvic oxidase appeared to vary inversely with the rate of endogenous oxidation. Both threonine and tryptophan were necessary for growth. When choline was omitted threonine increased endogenous oxidation and carboxylation and the activity of the 2 soluble enzymes, but did not reduce liver fat. When tryptophan was omitted threonine reduced liver fat, but did not affect endogenous metabolism or enzyme activities.

It was concluded that the accumulation of liver fat was not associated with the change in enzyme activity.—A. Hepburn.

3842

BUCKLEY, G. F. and HARTROFT, W. S. **Pathology of choline deficiency in the mouse: observations with special reference to liver.** *Arch. Pathol.*, 1955, **59**, 185-197. [Banting and Best Dept. Med. Res., Univ. Toronto.]

Ninety mice were fed from 3 weeks old on a choline-deficient basal diet, but half received 0.5 per cent. choline chloride. Animals were killed after from 3 to 25 weeks for histological study of the liver. Another 20 mice given the same diets at weaning were killed after from 2 to 24 days.

In choline-deficient mice the livers became much enlarged, but "hobnail liver" was never seen. Surface irregularity was due to fatty cysts below the capsule. The lobules were easily seen because they were distended with fat. Even after 2 days of deficiency there was stainable fat in nearly every parenchymal cell, and the deposits rapidly increased. A fatty cyst was seen as early as the eighth day in one mouse, and cysts were present in all by the end of a month. They became as large as $150\ \mu$, or more in diameter. Fibrosis was never appreciable. Ruptured cysts were rare. Bile-duct hyperplasia was seen from the 24th day onwards, and was accompanied by adenomatous change in 11 of the 51 choline-deficient animals. Ceroid deposits were common. The kidneys often contained stainable fat deposits in the proximal convoluted tubules.

The lesions are compared with those seen in rats.—D. Duncan.

3843

LACHAZE, A. and LÉVY, M. **Influence du froid sur la stéatose hépatique produite par des régimes hypoprotéiques-hyperlipidiques. Variations de l'oxydase des acides gras dans le foie. [Effect of cold on fatty liver produced by low-protein, high-fat diets. Variations in fatty acid oxidase of the liver.]** *Arch. Sci. physiol.*, 1955, **9**, 63-70. [Lab. Physiol. Gén., Sorbonne.]

Groups of rats were fed for 14 days on a diet of lard 40, sucrose 48, casein 5, agar 2 and salts 5 per cent., supplemented with vitamins A, D and those of the B group. Control animals received a diet of lard 10, sucrose 58, casein 25, agar 2 and salts 5 per cent., with the same vitamin supplement. The rats were housed at environmental temperatures of 5° , 12° or 24°C . At the end of the experiment the animals were killed and their livers were removed for estimation of total lipids and fatty acid oxidase activity. The experiments were repeated with thyroidectomised rats housed at 12° and 24°C .

Deposition of fat in the liver was much less at 5° than at 12° or 24° C. The fatty acid oxidase activity of the livers of the animals on the high-fat diet at 5° C. was slightly less than that in the rats similarly housed at 5° C. but given a normal diet. The activity of the livers of animals given the high-fat diets at 12° and 24° C. was very low compared with the oxidase activity of the livers of rats given the normal diet, or there was none. Under similar conditions, the amount of fat deposited and the reduction of fatty acid oxidase activity in thyroidectomized rats given the high-fat diet were less than in normal rats.—G. A. Garton.

3844

FENTON, P. F., DOWLING, M. T. and MERSHON, J. S. Relation of dietary fat level to fatty livers in several strains of mice. *J. Nat. Cancer Inst.*, 1954, 15, 429-432. [Dept. Biol., Brown Univ., Providence, R.I.]

Groups of weanling male mice of 5 strains were fed for 4 to 7 months on a high-fat diet containing maize oil 5 and Crisco 45 per cent., or for 8 to 17 months on a stock diet containing about 5 per cent. fat. When the animals were killed total body fat and liver fat and liver choline oxidase were studied.

The mice of 4 of the strains developed fatty livers on the diet with 50 per cent. fat; this was due neither to low liver choline oxidase activity nor to deficiency of choline. One strain of mice could not be made obese and did not develop fatty livers.—G. A. Garton.

3845

RUBINO, F., GIACALONE, O. and ZIZZA, F. Comportamento della piruvemia nei ratti albini alimentati con dieta steatogena. [Blood pyruvate in white rats fed on a diet to produce fatty liver.] *Bol. Soc. ital. Biol. sper.*, 1954, 30, 245-246. [Ist. Fisiol., Univ. Palermo.]

Pyruvic acid was estimated by the method of Friedemann and Haugen (Title 16, Vol. 13) in the blood of groups of 5 rats fed on a stock diet, or for 8, 16 or 24 days on a diet of sucrose 48, beef fat 40, casein 5, agar 2 and salts 5 per cent., with adequate vitamins. The respective mean values, in mg. pyruvic acid per 100 ml. blood, were 1.8, 2.9, 3.4 and 3.3.—E. M. Hume.

3846

BARATTA, P. F., ANGELI, G., LUSIANI, G. B. and CAVAZZUTI, F. Azione dell'eparina sulla steatosi epatica da dieta iperlipidica-ipoproteica. [Effect of heparin on fatty liver induced with a diet high in fat and low in protein.] Azione dell'eparina sulla steatosi epatica da dieta ipercolesterolica. [Effect of heparin on fatty

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liver induced with a diet high in cholesterol.] *Bol. Soc. ital. Biol. sper.*, 1954, 30, 161-164; 164-166. [Ist. Clin. Med., Univ. Modena.]

Of 20 rats maintained on a complete diet with 42 per cent. fat and 7 per cent. casein 10 were given an intraperitoneal injection of 2.5 mg. heparin every other day. After 18 days, all were killed and fat in the liver was estimated. For those not given heparin, the mean fat content, in g. per 100 g. fresh liver, was 9.98, range 7.10 to 18.00, and for those given heparin 6.71, range 5.30 to 7.50. The value for normal rats ranged from 4.76 to 5.75.

Twenty-seven rats were maintained on a stock diet to which 4 per cent. cholesterol had been added; 2 groups of 8 received in addition an intraperitoneal injection of heparin every 3 days for 15 or 25 days. At the end of the experiment fat was estimated in the liver as before. The mean fat content, in g. per 100 g. fresh liver, for those given and not given heparin, respectively, was after 15 days, 6.55, range 5.75 to 8.25, and 9.05, range 7.50 to 11.50, and after 25 days, 9.59, range 6.25 to 14.25, and 14.12, range 10.00 to 18.50.

E. M. Hume.

3847

SHILS, M. E., FRIEDLAND, I. and STEWART, W. B. Rapid development of portal fatty liver in rats consuming various plant materials. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 473-476. [Sch. Pub. Health, Coll. Phys. Surg., Columbia Univ.]

See also Abst. 4833, Vol. 24.

Groups of black weanling rats were fed for several weeks on diets in which the protein was exclusively of plant origin, maize, rice, wheat or cassava. A portal type of fatty liver was rapidly and consistently produced; the lesion was similar to that observed in kwashiorkor.—G. A. Garton.

3848

CLÉMENT, J. Variations des teneurs en esters phosphoriques accompagnant les phosphatides du foie et du sérum de rat sous l'influence de divers régimes déséquilibrés. [Variations in the phosphoric esters accompanying the phosphatides of the liver and serum of the rat as affected by different unbalanced diets.] *Arch. Sci. physiol.*, 1955, 9, 51-61. [Lab. Physiol., Inst. Recherches Cancer, C.N.R.S., Paris.]

The basal diet, A, contained, per 100 g., casein 17, lactalbumin 3, lard 10, salts 5, agar 2.5, yeast 2.5, sucrose 55 and cholesterol 5 g., with all the known vitamins and 0.2 per cent. choline. Modifications were: diet B contained also 0.6 per 1000 of butter yellow; C, 0.6 per 1000 butter yellow, no choline; D, no cholesterol, no choline; E, 20 per cent. lard, 30 per cent. sucrose, 15 per cent.

lactose, no choline, no cholesterol, 0.6 per 1000 butter yellow. Groups of 40 rats received the first 4 diets from the age of 2 months; a fifth group received diet E when they were 6 months old. Analyses were made of liver and blood after from 7 to 22 months.

In control rats on stock diet there was no phosphoric ester P in the liver phosphatide fraction. Diet A produced fatty livers in which phosphoric esters accounted for from 18.4 to 26.2 per cent. of the total phosphatide P. In diet B the butter yellow produced no tumour even after 2 years, but it reduced the amount of fat stored, and the phosphoric ester was 8.6 to 16 per cent. Diet C produced after 6 or 7 months much deposition of lipid, and P distribution in 3 rats killed at that time was variable. Tumours appeared in survivors after 9 to 12 months and the fat then disappeared. In tumour-free liver tissue phosphatide P was low and phosphoric ester P varied from 0 to 41 per cent. The hepatoma was rich in ester P. With diet D there was no tumour, little or no fat deposition, and ester P varied from 4 to 17 per cent. Diet E gave results similar to those with diet C.

In the 2 groups which developed tumours, C and E, there was a considerable rise in total lipid P in the serum, but no phosphoric ester P.

D. Duncan.

3849

REISER, R. and DIECKERT, J. W. **Synthesis of mucosa and lymph phospholipide during fat absorption.** *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 622-626. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., Agric. and Mech. Coll. System, College Station.]

Fasting rats were given either trilinolein labelled with ^{14}C in the α - and α^1 -positions of the glycerol and containing conjugated linoleic acid, or tripalmitin labelled with ^{14}C in both the α -position of the glycerol and the carboxyl group of the fatty acid. The triglycerides were incorporated in a fat-free basal mixture and the animals were killed 3 hr. after the test meal. The small intestines were removed, washed and extracted with ethanol-ether. Phospholipins were prepared from the extract and the component fatty acids were examined spectrophotometrically for conjugated linoleic acid or assayed for ^{14}C activity.

From a consideration of the results obtained and those reported earlier (Abst. 863, Vol. 22) it is concluded that, in the rat, phospholipins of the intestinal mucosa and lymph are derived from re-synthesised triglycerides.—G. A. Garton.

3850

HELLMAN, L., ROSENFELD, R. S., ELDINOFF, M. L., FUKUSHIMA, D. K., GALLACHER, T. F., WANG,

C. I. and ADLERSBERG, D. **Isotopic studies of plasma cholesterol of endogenous and exogenous origins.** *J. Clin. Invest.*, 1955, **34**, 48-60. [Div. Phys., Sloan-Kettering Inst. Cancer Res., New York.]

Cholesterol labelled with ^{14}C or tritium was given by mouth to subjects with normal and high plasma sterol values and its incorporation into plasma cholesterol was studied for a long time. Endogenous and exogenous cholesterol metabolism were studied in some instances by administration of isotopically-labelled acetate and cholesterol.

From 4 to 27 per cent. of a 10-mg. dose of cholesterol appeared in the plasma; 14 to 43 per cent. was recovered from the faeces during the first 4 days and about 1 per cent. appeared in the urine. Traces were found in the plasma within 1 hr. and the radio-activity of free and ester cholesterol was maximum after 2 to 3 days. In contrast, labelled plasma cholesterol formed from acetate showed its maximum specific activity within 8 hr. No difference in the pattern of incorporation was found in 2 patients with raised plasma cholesterol associated with *xanthoma tendinosum*, though differences in the proportions of free and ester cholesterol were found in subjects with high blood cholesterol associated with *xanthoma tuberosum* and nephrosis.

It is concluded that dietary cholesterol mixes indistinguishably with cholesterol formed in the body.—G. A. Garton.

3851

FROBLICH, A. L., WACHSMUTH, H., BUYSSENS, N. and VAN KOEKHOVEN, L. **Les altérations du métabolisme des phosphatides et des stéroïdes au cours de l'anémie pernicieuse. [Changes in the metabolism of phosphatides and sterols in pernicious anaemia.]** *Acta gastro-enterol. belg.*, 1954, **17**, 761-775. [Lab. Biochim., Inst. Bunge, Antwerp.] Dutch, English, German, and Spanish summaries.

In 10 patients with pernicious anaemia the total blood fat was low, from 292 to 740 mg. per 100 ml., mainly because of low levels of phospholipins and cholesterol. The phospholipin content was related to the red cell count. Free cholesterol was at the lower limit of normal, but esterified cholesterol was usually about half the normal amount. Cholesterolase activity in serum was normal.

All the subjects responded with the reticulocyte crisis after parenteral administration of 30 μg . vitamin B_{12} . The blood cholesterol began to rise slowly after the reticulocyte response, and reached a peak between the 30th and 45th days after treatment, then gradually returned to normal. The phospholipin level rose much more rapidly before the end of the reticulocyte crisis, and reached its

maximum in the fourth or fifth week, when the red cell count became normal. The neutral fat varied irregularly, but when the red cell count became normal it was usually somewhat lower than before treatment.

Bile obtained by duodenal intubation from 8 patients with pernicious anaemia was low in choline and bile acids and sometimes in cholesterol also. All these responded after treatment with vitamin B₁₂. Liver biopsies revealed no steatosis during anaemia, though haemosiderin and lipofuchsin were constantly found. Post-mortem examination of tissues from 2 patients showed normal phospholipin and lecithin contents.—D. Duncan.

3852

BLOCH, K., CLARK, L. C. and HARARY, I. Utilization of branched chain acids in cholesterol synthesis. *J. Biol. Chem.*, 1954, **211**, 687-699. [Dept. Biochem., Univ. Chicago, Ill.]

The branched-chain acids 3-¹⁴C- β -hydroxy- β -methylglutaric acid, 3-¹⁴C-*cis*- β -methylglutaconic acid, 3-¹⁴C- β -hydroxyisovaleric acid and 3-¹⁴C- β -dimethylacrylic acid were given to rats. Cholesterol and fatty acids were subsequently isolated from the livers of the animals for study of their radioactivity. Cholesterol from liver and other organs was also partly degraded for estimation of ¹⁴C concentration in carbon atoms 10 and 25.

The branched-chain acids were converted to cholesterol without first being metabolised to acetate or acetoacetate. In experiments with liver homogenates limited conversion of branched-chain acids to cholesterol was found.

G. A. Garton.

3853

FRIEDMAN, M. and BYERS, S. O. (with OMOTO, C., HAYASHI, W. and GUNNING, B.) Pathogenesis of dietary-induced hypercholesteremia in the rabbit. *Amer. J. Physiol.*, 1954, **179**, 201-215. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

The rate of cholesterol formation, the rate of intestinal absorption and excretion of cholesterol and the rate of its disappearance from plasma were studied with many groups of rabbits, in which high plasma values of cholesterol can readily be induced by high-cholesterol diet, and rats, in which high values of plasma cholesterol cannot be similarly induced.

It was concluded that the species difference was primarily due to a much slower clearance of absorbed dietary cholesterol from the plasma in the rabbit, because the hepatic reticulo-endothelial system is slower to remove cholesterol-containing chylomicrons. In addition, rabbits absorbed a greater proportion of dietary cholesterol than did rats.—G. A. Garton.

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3854

HEPTINSTALL, R. H. and BRONTE-STEWART, B. Visceral and plasma changes in cholesterol-fed rabbits with raised blood-pressure. *J. Pathol. Bacteriol.*, 1954, **68**, 395-405. [Dept. Pathol., St. Mary's Hosp., London.]

Groups of rabbits, 11 and 9 in number, in which blood pressure was raised after nephrectomy, were given Bruce and Parkes' diet 18 (Abst. 3677, Vol. 16) with between 0.5 and 0.6 g. added cholesterol daily or without; 12 and 16 normal rabbits were given the same diet. Total plasma cholesterol was estimated at 2-week intervals and most of the rabbits were killed after 72 days; 1 from each group was killed after only 35 days and 1 retained for 100 days. The pathological changes were studied.

In rabbits given no cholesterol its level in plasma did not increase; in most of those given cholesterol its level in plasma rose, but operative treatment had no effect on the level reached. The ratio of adrenal weight to carcase weight was higher in those given cholesterol, but hypertension was without effect. The ratio of heart weight to carcase weight was greater in those with hypertension, but cholesterol was without effect.

D. Harvey.

3855

BRONTE-STEWART, B. and HEPTINSTALL, R. H. The relationship between experimental hypertension and cholesterol-induced atheroma in rabbits. *J. Pathol. Bacteriol.*, 1954, **68**, 407-417. [Med. Unit, St. Mary's Hosp., London.]

The rabbits with hypertension were those mentioned in the preceding Abst. The findings after cholesterol feeding for 72 days in terms of range of blood pressure, number of rabbits and extent of atheroma as average percentage of aorta involved, were: 80 to 89, 5, 12.8; 90 to 99, 5, 15.1; 100 to 109, 4, 61.2, and 110 and over, 3, 50.3. There was some indication that cholesterol caused a slight but significant rise in blood pressure in both treated and normal rabbits.—D. Harvey.

3856

CHAKRAVARTY, R. N., DEY, U. N. and MUKERJI, B. Preliminary observation on experimental cholesterol atherosclerosis in rabbits with special reference to the reticular structure of the arterial wall. *Indian J. Med. Res.*, 1955, **43**, 79-87. [Central Drug Res. Inst., Lucknow.]

Groups of rabbits were fed on a stock diet containing gram, bran and fresh vegetables supplemented with 5 ml. cottonseed oil or 5 ml. cottonseed oil containing from 0.5 mg. to 1.0 g. cholesterol per head daily. After about 3 weeks

the cholesterol-fed animals began to show proliferation of the reticular connective tissue of the aortic intima and pulmonary artery, followed by deposition of esterified cholesterol. Atheromatous changes were found in one animal given cottonseed oil alone.—G. A. Garton.

3857

LOEWE, L., GOLDNER, M. G., RAPOPORT, S. M. and STERN, I. Failure of protein to protect against cholesterol atherogenesis in underfed rabbits. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 360-362. [Jacques Loewe Res. Found. Labs., Jewish Hosp., Brooklyn, N.Y.]

One group of adult rabbits was given a restricted diet containing 35 per cent. protein and supplementary choline and methionine, the other group an isocaloric diet containing 16 per cent. protein. The animals were given also 2 g. cholesterol daily for 9 weeks. At intervals blood samples were analysed for total cholesterol, phospholipids, fatty acids and lipoproteins. Finally the animals were killed and the aortas were examined for arteriosclerotic lesions.

Marked atherosclerosis and increased concentrations of blood lipids and lipoproteins were found in all animals.—G. A. Garton.

3858

GOLDBERG, L. and SMITH, J. P. The influence of aureomycin on the response of the rabbit to cholesterol feeding. *J. Pathol. Bacteriol.*, 1954, **68**, 475-493. [Dept. Pathol., Univ. Manchester.]

Aureomycin and cholesterol, alone or in combination, were added to 2 basal diets given to adult rabbits. One was low in fat, the other had cottonseed oil in final concentration of 12.4 per cent. In the low-fat experiments the doses of cholesterol and aureomycin were 500 and 25 mg., respectively, per kg. bodyweight daily. In the high-fat experiments cholesterol was given as 1.4 per cent. of the diet and aureomycin at the same rate as in the low-fat experiments. Feeding continued for 8 weeks.

The rabbits given aureomycin alone or the low-fat diet with cholesterol and aureomycin lost weight; control animals, those on the high-fat diet with aureomycin and cholesterol or cholesterol alone and those on the low-fat diet with cholesterol maintained their weight. On the low-fat diet the incidence and severity of liver cirrhosis were lower in the group given both aureomycin and cholesterol than in that given cholesterol alone; on the high-fat diet with these same additions the incidence was similar in the 2 groups. On both low- and high-fat diets aureomycin reduced the total lipid content of liver.

Histologically 2 types of cirrhosis are described. In the first, found in 15 of 18 rabbits given the low-fat diet with cholesterol and in only 3 of 11 given the same treatment with aureomycin in addition, there was an increase in reticulin and collagen fibres without gross structural alteration other than fatty change; in the second, fibrosis occurred generally round deformed liver cells laden with fat and cholesterol and on its incidence aureomycin had no beneficial effect.

It is suggested that the effects of aureomycin may result from its action on tissue enzymes.

D. Harvey.

3859

BACHHUBER, T. E. and LALICH, J. J. Effect of sweet pea meal on the rat aorta. *Arch. Pathol.*, 1955, **59**, 247-253. [Dept. Pathol., Med. Sch., Univ. Wisconsin, Madison.]

3860

LINDSAY, S., NICHOLS, C. W. (Jr.) and CHAIKOFF, I. L. Aortic lesions induced in the bird by diethylstilbestrol injections and cholesterol feeding: a study of their development and regression. *Arch. Pathol.*, 1955, **59**, 173-184. [Dept. Pathol., Univ. California Sch. Med., San Francisco.]

Cockerels in 3 groups were fed on Purina broiler chow with 5 per cent. cottonseed oil; one group received 24 mg. diethylstilbestrol implanted subcutaneously each month for 1 to 10 months, another 2 per cent. cholesterol in the diet for 1 to 11 months. Birds were killed at intervals during these treatments and for up to 12 months after the last hormone implant or 8 months after withdrawal of cholesterol.

Both treatments produced high plasma lipid values, which fell when treatment stopped. Two of the control birds showed intimal thickening of the thoracic aorta as a result of lipid infiltration; some lipid infiltration was found in the thoracic aorta of about half the group, but cholesterol in none. All but one of the group showed intimal thickening of the abdominal aorta, but this was primarily fibrous and lipid substances appeared later. Traces of refractile substance, probably cholesterol, were seen in 3. The lesions in the experimental groups were similar, but more severe because there was more lipid infiltration. Thoracic lesions regressed when stilbestrol or cholesterol was withdrawn, but the abdominal lesions showed little or no regression. Cholesterol and calcified material continued to accumulate in the abdominal aorta after the blood lipid levels fell.

It is suggested that in man, too, diets designed to reduce plasma lipids and cholesterol will produce little regression once severe arteriosclerotic lesions have been established.—D. Duncan.

N.A. and R., July 1955

3861

WELLS, W. W. and BAUMANN, C. A. Skin sterols
7. Removal of Δ^7 -cholesterol from blood
of rats. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**,
519-521. [Dept. Biochem., Coll. Agric., Univ.
Wisconsin, Madison.]

An emulsion containing Δ^7 -cholesterol or its
acetate was injected into the heart of anaesthetised
adult rats, in amounts ranging from 5 to 14.7 mg.
per 200 g. rat. Blood samples and organs were
removed at intervals and analysed for Δ^7 -chole-
sterol.

Less than half the injected sterol or its acetate
remained in the blood after 2 hr.; at this time 34
per cent. of the amount was accounted for in the
lungs, spleen and liver. These organs still con-
tained 26 per cent. of the amount injected after
24 hr.; most was in esterified form. Injected
 Δ^7 -cholesterol acetate was metabolised without
any corresponding accumulation of free sterol.
Transient increases in the cholesterol content of
liver, spleen and lungs were observed after injection
of free Δ^7 -cholesterol.—G. A. Garton.

3862

VAN PUTTEN, L. M., VAN BEKKUM, D. W. and
QUERIDO, A. Influence of hypothalamic
lesions producing hyperphagia, and of feeding

regimens on carcass composition in the rat.
Metabolism, 1955, **4**, 68-74. [Dept. Endo-
crinol., Hosp. Univ. Leyden.]

Bilateral hypothalamic lesions in rats were so
placed as to produce increased appetite for food.
Controls had a sham operation. The rats with
lesions were paired with controls and allowed the
quantity of food voluntarily consumed by the
controls. In a second, similar experiment all the
rats were trained to eat their daily ration in 2
periods of 1 hr. each, to eliminate differences in the
rate of eating.

There was no difference in bodyweight increase
between rats with and without lesions, but in the
first experiment the mean body fat contents were
 30.5 ± 9.1 and 15.3 ± 3.3 per cent., respectively.
Differences in N and glycogen content were
negligible, so the difference in fat content was
thought to be due to lower energy expenditure by
the rats with lesions. In the second experiment
all the rats except 6 pairs had to be eliminated
for one reason or another, but the difference in fat
content appeared to have been reduced or pre-
vented by restriction of the time spent in eating.

D. Duncan.

See also Absts. 3276, 3540-42, 3663, 3668, 3669, 3691,
3712, 3725, 3772, 3790, 3926, 3928, 4126, 4195,
4197, 4515.

MINERALS

GENERAL

3863

BLACK, D. A. K. Mineral metabolism in alimen-
tary disease. *Proc. Nutrition Soc.*, 1955, **14**,
50-54. [Dept. Med., Royal Infirmary, Man-
chester.]

3864

CARTWRIGHT, G. E. The relationship of copper,
cobalt, and other trace elements to hemo-
poiesis. *Amer. J. Clin. Nutr.*, 1955, **3**, 11-
17. [Dept. Med., Coll. Med., Univ. Utah,
Salt Lake City.]

Present knowledge of the physiological role of
Cu, Co, Zn and Mo, which is briefly reviewed,
appears to have little clinical application.

F. C. Aitken.

See also Absts. 3921, 4309.

CALCIUM AND PHOSPHORUS

3865

MORATA GARCÍA, F., NÚÑEZ CARRIL, J. and
ORTIZ DE LANDAZURI, E. La respuesta a la
hipercalcemia provocada en el metabolismo
Ca/P en el hipoparatiroidismo. [The response
of the metabolism of calcium and phosphorus

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to induced hypercalcaemia in hypopara-
thyroidism.] *Rev. clín. española*, 1954, **55**,
72-80. [Clín. Med. Univ., Secc. C.S.I.C.,
Granada.] English, German and French
summaries.

The "normal" subject had a diagnosis of hys-
teria and a tendency to high serum Ca levels, and
the experimental subject had idiopathic para-
thyroid insufficiency. Each received 15 mg. Ca
per kg. bodyweight by intravenous infusion lasting
4 hr., with 1 litre of saline.

In the normal subject serum Ca rose in 6 hr.
from 14.7 to 17.7 mg. per 100 ml. and serum inor-
ganic P rose in the same time from 2.75 to 3.6
mg. per 100 ml. Phosphate excretion in the urine
fell from 703 and 709 mg. on the 2 control days to
320 mg. on the day of injection, but rose again
the next day to 798. Ca in the urine was 40.7
and 79.4 mg. on the control days, 466.7, 223.2 and
189 mg. on the day of injection and the next 2
days, i.e., 61, 21 and 17 per cent. of the dose
injected was recovered in 3 days. In the hypo-
parathyroid subject serum Ca rose in 6 hr. from
5.1 to 8.6 mg. per 100 ml., but inorganic P remained
constant, 6.8 and 6.75 mg. Phosphate excretion
rose from 580 and 632.5 mg. on the control days to
1117 mg. on the day of injection. Ca in the urine

rose only from 114 and 55.2 mg. to 231, and fell on the subsequent days to 41.3 and 81.5 mg. Thus only 25 per cent. of the dose injected was recovered on the first day.

It is concluded that in the normal subject the rise of serum Ca provoked mobilisation of tissue P and inhibition of the parathyroid, which reduced the loss of P in the urine and thus resulted in higher serum P. In parathyroid insufficiency the first effect takes place but not the second, and increased loss of P prevents a rise of the serum level. It is suggested that the lower recovery of Ca indicates an increased deposition of Ca and P in the skeleton.

D. Duncan.

3866

HOLEMANS, K., LAMBRECHTS, A. and MARTIN, H. Les particularités du métabolisme du phosphore dans la malnutrition et le kwashiorkor. [Peculiarities of phosphorus metabolism in malnutrition and kwashiorkor.] *Presse méd.*, 1955, **63**, 154-155. [Lab. Nutrit., Fonds Reine Elisabeth d'Assistance Médicales aux Indigènes, Feshi, Belgian Congo.]

A summary of findings which are to be reported in detail in *Brit. J. Nutrition*.

3867

HALVORSEN, S. Osteoporosis, hypercalcemia and nephropathy following immobilization of children. *Acta med. scand.*, 1954, **149**, 401-408. [Bærum Hosp., Sandvika, Norway.]

A 9-year-old boy with a fractured femur was immobilised in a plaster cast for 20 weeks. After 5 or 6 weeks he began to show thirst, polyuria, poor appetite, vomiting and deafness. Investigation showed osteoporosis, renal insufficiency and high blood and urine Ca values, all of which improved when he began to move about. The deafness persisted.

Similar cases reported earlier are reviewed and the cause of the disturbance is discussed.

D. Duncan.

3868

BRONNER, F., HARRIS, R. S., MALETSKOS, C. J. and BENDA, C. E. Studies in calcium metabolism. Effect of food phytates on calcium ⁴⁵ uptake in children on low-calcium breakfasts. *J. Nutrition*, 1954, **54**, 523-542. [Dept. Food Technol., Massachusetts Inst. Technol., Cambridge.]

Nineteen adolescent boys of poor intelligence but otherwise normal, who lived in a state school under uniform nutritional and environmental conditions, were given daily for one month a quart of milk and one multivitamin tablet. The subjects then received one of 3 different breakfasts, consisting of oatmeal, farina or farina with added sodium phytate; the 3 meals also included, respectively,

55, 60 and 60 ml. milk, 91, 83 and 83 mg. Ca, 116, 0 and 78 mg. phytin P and 0.85, 0.85 and 0.85 μ C. radio-active Ca. Ca uptake was estimated from the ⁴⁵Ca content of serum, urine and faeces during the 5 days after the test meal. Each subject received 2 of the breakfasts with 30 days between. Results are analysed statistically.

The uptake of ⁴⁵Ca by boys given the oatmeal breakfast was 74 per cent. of that shown by boys given the farina breakfast; the uptake of ⁴⁵Ca by boys on the farina meal with phytate was 45 per cent. of that of farina alone. The differences were significant at the 5 per cent. probability level. Significantly less ⁴⁵Ca was taken up in the presence of sodium phytate than in the presence of an equivalent quantity of phytates P supplied by oatmeal.—G. F. Garton.

3869

BLAU, M., SPENCER, H., SWERNOV, J. and LASZLO, D. Utilization and intestinal excretion of calcium in man. *Science*, 1954, **120**, 1029-1031. [Div. Neoplastic Dis., Montefiore Hosp., New York.]

Two subjects on a diet low in Ca were given single doses by mouth of 50 μ C. of ⁴⁵Ca with 30 mg. Ca as carrier. Serum, urine and faeces were analysed for Ca and ⁴⁵Ca, balances being measured for four 6-day periods. Radio-activity appeared in blood 15 min. after ingestion of ⁴⁵Ca. Specific activities of serum and urine soon became equal and fell exponentially with a half-time of 8 or 9 days. On the assumption that the ratio of the specific activity of the faeces to that of the plasma or urine represents the fraction of endogenous Ca in faeces, utilisation by the subjects was calculated to be 44 and 67 per cent. of ingested Ca. Good agreement with these findings was obtained when the calculation was made from the total excretion of ⁴⁵Ca in faeces less an amount of endogenous origin arrived at by extrapolation of the graph for specific activity of the faeces.

An extension of the technique to the study of the calcium compartments of the body is being investigated.—D. Harvey.

3870

DAUM, K., TUTTLE, W. W., WEBER, A., SCHUMACHER, M. T. and SALZANO, J. Calcium and phosphorus utilization in older men. *J. Amer. Dietetic Assoc.*, 1955, **31**, 149-151. [Dept. Nutrit., State Univ. Iowa, Iowa City.]

Results are presented of Ca and P balance studies of 7 men aged from 53 to 83 years who were the subjects of an investigation of the physiological effects of different breakfasts (*Abst.* 771, Vol. 22). On the basis of group means the daily intake and balances of Ca and P were not significantly influenced by the type of breakfast. Ca retentions

were slightly less than in a group of younger men, subjects of a similar experiment (Abst. 3705, Vol. 21), but the differences were not significant. Urine Ca values for the older men tended to be low. Urine P values were about 50 per cent. of intake.—F. C. Aitken.

3871

HEINEMANN, W. W., ENSMINGER, M. E., HAM, W. E. and OLDFIELD, J. E. The calcium and phosphorus composition of the animal body as influenced by the chemical composition of plants grown on soils of varying phosphorus levels. *J. Animal Sci.*, 1954, 18, 988. *Proc.* [State Coll., Washington.]

3872

MOORE, J. H. and TYLER, C. Studies on the intestinal absorption and excretion of calcium and phosphorus in the pig. 1. A critical study of the Bergeim technique for investigating the intestinal absorption and excretion of calcium and phosphorus. 2. The intestinal absorption and excretion of radioactive calcium and phosphorus. *Brit. J. Nutrition*, 1955, 9, 63-80; 81-93. [Dept. Agric. Chem., Univ. Reading.]

1. Six pigs 9 to 10 weeks old were fed for 7 days on a diet containing 1.67 per cent. Ca, mostly as carbonate, and 0.78 per cent. P. On the following day pairs of pigs were killed 2, 4 and 6 hr. after the morning feed. The digestive tract was divided into 12 sections and the contents of each were analysed for pH, dry matter, soluble Ca and P, insoluble ash, total Ca and P and phytate P.

The contents of the stomach, particularly in the pyloric region, became increasingly acid with increasing time after feeding, but the pH values of the contents of all sections of the small intestine were relatively constant.

Absorption of Ca and P was most active in the upper parts of the small intestine. There was no evidence of excretion of either Ca or P into the large intestine. Hydrolysis of phytate apparently took place in the stomach until the pH was sufficiently low to inhibit phytase, which happened between 2 and 4 hr. after feeding.

2. Two pigs 9 to 10 weeks old were fed for 10 days on a diet containing 2 per cent. calcium phosphate. On the 11th day the morning feed contained radio-active Ca and P as calcium phosphate and the animals were killed 4 hr. after feeding. A similar pair of pigs were fed on the diet with the labelled Ca and P for 10 days, then on the inactive diet for 4 days, and were killed next day 4 hr. after the morning feed. The contents of the digestive tract were analysed as in the previous experiment. In addition, radio-active Ca and P were estimated as well as total and radio-active

Ca and P in the wall of each section of the digestive tract.

The most active absorption of Ca and P was again in the upper parts of the small intestine, in which the solubilities of Ca and P were greatest. P and, to a small degree, Ca was secreted into the upper part of the small intestine, but much was re-absorbed in the lower parts. There was little evidence that Ca and P were excreted into the large intestine.

The contents of the large intestine were slightly more acid in pigs fed on calcium phosphate than in those fed on calcium carbonate. The difference was apparently responsible for the greater degree of phytate hydrolysis in the large intestine of phosphate-fed pigs.—R. Hill.

3873

ARRINGTON, L. R. and DAVIS, G. K. Metabolism of phosphorus³² and molybdenum⁹⁹ in rats receiving high calcium diets. *J. Nutrition*, 1955, 55, 185-192. [Florida Agric. Exp. Stat., Gainesville.]

Of 2 groups of 24 mature rats one received a diet containing, in g., powdered whole milk 3415, sucrose 3380, NaCl 34, FeSO₄.7H₂O 0.136, MnSO₄.2H₂O 0.06, CuSO₄.5H₂O 0.1, thiamine hydrochloride 0.023 and pyridoxine hydrochloride 0.033; the Ca : P ratio was 1.3 : 1. The second group received a diet in which the Ca : P ratio was 3 : 1, prepared by adding CaCO₃ to the basal diet. The diets were given to appetite and caliciferol was given weekly. After 5 weeks the rats were given, by mouth, either 5 μ C. ³²P or 15 μ C. ⁹⁹Mo; collections were made of urine and faeces and at the end of the metabolism period the animals were killed.

When Ca intake was high there was less excretion in the urine and more tissue deposition of ³²P. The metabolism of ⁹⁹Mo was not affected by the high Ca intake; the ⁹⁹Mo was excreted extremely rapidly, 50 per cent. being recovered in the urine within 12 hr.—G. F. Garton.

3874

RANDOIN, L., LE GALLIC, P. and FOURNIER, P. Conceptions nouvelles du besoin en calcium dans ses rapports avec l'équilibre fonctionnel. [New views on calcium requirement in relation to functional equilibrium.] *C.R. Acad. Sci.*, 1955, 240, 230-232.

Rats received a low-protein diet with 4 per cent. casein, either to appetite, about 8 g. daily, or restricted to 5 g. After 10 days they received stock diet for 2 days and the experiment was then repeated with the groups reversed. The amount of Ca retained was closely related to the food intake. When the intake of Ca was reduced because of low food intake the coefficient of utilisation did not

rise. It is concluded that there is a functional equilibrium between utilisation of Ca and energy intake, and this relation is to be studied.

D. Duncan.

3875

WILHELM, G. Elektronenoptische Untersuchungen zur Verknöcherung. [Electron microscopy of calcification.] *Ztschr. Kinderheilk.*, 1955, **76**, 73-78. [Kinderklin., Univ. Frankfurt a.M.]

Electron microscopy of thin sections of the epiphyseal line of young rats revealed a difference in appearance between resting and growing cartilage cells, probably due to deposition of substances of high atomic weight. This was not seen in rachitic cartilage. Calcium is deposited round cartilage cells, and electron diffraction showed that even in the pre-calcification zone the calcium salt is apatite.—W. M. Deans.

3876

PATRICK, H. and SCHWEITZER, G. K. Factors associated with the movement of calcium from the food to the bones of chicks. *Poultry Sci.*, 1954, **33**, 1199-1201. [Univ. Tennessee, Knoxville.]

Chicks were fed for 5 days after hatching on ground wheat, and thereafter on a soya bean basal diet containing different quantities of added Ca. Radio-active Ca as chloride was injected on the thirteenth day after hatching and 36 hr. later the birds were killed. The amount of radio-active Ca in the tibia was inversely related to the amount of Ca in the diet.

The addition of casein or milk albumin to a groundnut basal diet containing large amounts of Ca and P increased the proportion of radio active Ca in the tibia. The ash of casein did not give this effect.

The substance affecting the retention of Ca in the tibia apparently operated directly on bone and not by any effect on absorption.—R. Hill.

3877

NAKAJIMA, T., OMORI, S. and OTSUKA, J. [On the influence of the feed upon bones. 9. Skeletal calcium turnover in rats reared with cereals.] *Bull. Nat. Inst. Agric. Sci., Japan* [G], 1954, No. 9, 81-87. In Japanese: English summary.

Three groups of young rats were given a complete diet, polished rice only or rye only for 40 days, at the end of which each animal was given by mouth a dose of $^{45}\text{CaCl}_2$. They were killed after 1, 2, 5 or 10 days and by examination of the radio-activity of humerus, distal epiphysis and diaphysis of femurs it was found that the turnover of Ca in those given rye, which had developed osteoporosis, differed from that in the animals given unpolished rice, in which a rickets-like condition occurred.

In osteoporosis there was more ^{45}Ca in the shafts of the long bones than in normal rats or in those with the rickets-like disease; for the distal epiphysis of the femur the opposite was true. (From summary.)—D. Harvey.

3878

NARAYANA RAO, M. Is there a negative calcium balance in adult rats fed with poor South Indian diet supplemented with coconut oil and groundnut oil? *Indian J. Physiol. Allied Sci.*, 1954, **8**, 41-46. [Food Technol. Lab., Indian Inst. Sci., Bangalore 3.]

A diet low in protein and Ca and supplemented with 5 per cent. coconut or groundnut oil did not produce loss of Ca in adult rats.—A. Hepburn.

3879

LIBBY, D. A., SCHABBLE, P. J. and WOLTERINK, L. F. The effect of complexing agents on the uptake of Ca^{45} in chicks and embryos *in vivo*. *Poultry Sci.*, 1954, **33**, 1066. *Proc.* [Michigan State Coll., East Lansing.]

See also Absts. 3438, 3439, 3442, 3722, 3890, 3893, 4237, 4238, 4310, 4427.

MAGNESIUM

See Abst. 4427.

SODIUM, POTASSIUM, AND SODIUM CHLORIDE

3880

DARROW, D. C., COOKE, R. E. and SEGAR, W. E. Water and electrolyte metabolism in infants fed cow's milk mixture during heat stress. *Pediatrics*, 1954, **14**, 602-617. [Med. Centre, Univ. Kansas, Kansas City 3.]

Complete balance studies of water, fat, N, Cl, Na, K and Ca were made on healthy male infants aged less than 1 year while exposed to a hot and a cool environment. Eight milk mixtures were tested as feeds during these studies; 6 consisted of evaporated milk with or without added carbohydrate and diluted with water to different extents. One of the 6 had skimmed milk added as well as carbohydrate. Two mixtures, of high and low electrolyte content, were made from dialysed milk solids, water, added carbohydrate and the required amounts of Na, K and Cl.

The results confirmed previous observations that water, Na and Cl were retained during exposure to a hot environment. At water intakes of 150 ml. per 100 Cal. the usual cow's milk mixtures with or without added carbohydrate did not lead to concentration of urine approaching the physiological limits in the hot environment. Protein or electrolyte concentrations greater than in the usual evaporated milk mixtures produced more concentrated urines. Limitation of water to 100

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ml. per 100 Cal. of evaporated milk mixture induced maximum urinary concentration at the high temperature, with signs of impending heat prostration.—F. C. Aitken.

3881

ZETTERSTRÖM, R. and ÅBERG, B. Infants of diabetic mothers. 2. Studies on the electrolyte metabolism and the effects of starvation during the first days of life. *Acta paediat.*, 1955, **44**, 1-16. [Paediat. Clin., Karolinska Sjukhuset, Stockholm.] French, German and Spanish summaries.

In the 10 infants studied food and water were withheld for the first few days of life because of generalised oedema. During this time there was no tendency to pathologically low blood sugar, blood N.P.N. was not abnormally high and serum electrolytes were within normal limits.

Cumulative electrolyte balance was studied in 5 of the infants. During starvation there was continued loss of Na, K and Cl. When milk was given there was considerable retention of K, but at first the loss of Na continued and was greater than the loss of Cl in relation to the composition of extracellular fluid.—F. C. Aitken.

3882

KORANSKY, W. and WOLF, M. Über die Beeinflussung der enteralen Natrium- und Kaliumbindung an Kationenaustauscher. [Binding of sodium and potassium by cation-exchange resins in the intestine.] *Arch. exp. Pathol. Pharmacol.*, 1955, **224**, 232-242. [Pharmakol. Inst., Freie Univ., Berlin.]

Studies were made on 3 normal subjects and a patient with cirrhosis of the liver and severe ascites. Each of the normal subjects was given 60 g. daily of an exchange resin. In each Na was lost and K retained, and the patient, also given 60 g. resin daily, lost 21.5 kg. weight, about 18 litres water and Na which exceeded the binding capacity of the resin. In this process, the loss of Na paralleled the loss of water.—I. Leitch.

3883

DAILEY, R. E., SWELL, L., TROUT, E. C. (Jr.) and FIELD, H. (Jr.) The hypertonic concentrations of sodium and potassium in the contents of the terminal ileum during the administration of a cation exchange resin. *J. Lab. Clin. Med.*, 1954, **44**, 784. *Proc.* [Martinsburg, W. Va.]

3884

LADELL, W. S. S. The effects of water and salt intake upon the performance of men working in hot and humid environments. *J. Physiol.*, 1955, **127**, 11-46. [Hot Climate Physiol. Res. Lab., Oshodi, Lagos, Nigeria.]

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3885

DIECKMANN, W. J. and POTTINGER, R. E. Prolonged balance studies of sodium²² and its relation to sodium intake. *J. Lab. Clin. Med.*, 1954, **44**, 789. *Proc.* [Chicago, Ill.]

3886

KÜHNS, K. and EHLERS, K. T. Über Wasser- und Elektrolytverschiebungen in Organen nach Infusionen von K- und Na-Salzen. [Displacement of water and electrolytes in organs after infusion of potassium and sodium salts.] *Arch. exp. Pathol. Pharmacol.*, 1955, **224**, 253-261. [Med. Klin., Univ. Göttingen.]

3887

ANDERSSON, B. Observations on the water and electrolyte metabolism in the goat. *Acta physiol. scand.*, 1955, **33**, 50-65. [Dept. Physiol., Kgl. Veterinärhögsk., Stockholm.]

The experiments were made on fullgrown goats weighing from 35 to 40 kg., some with free access to salt and others having had none for more than 3 months. Large volumes of water, up to 20 per cent. of bodyweight, could be introduced through a rumen fistula without producing intoxication; after such treatment the rate of excretion rose from the normal of 50 ml. to as much as 1200 ml. hourly. Diuresis persisted for up to 6 hr. and the return to normal required as long as 7 hr. more. Pituitrin given after diuresis was established caused an immediate but temporary reduction in it.

Some goats developed polyuria spontaneously on undergoing preparation for the experiments. This was most frequent in animals without access to salt and in its response to pituitrin this form resembled water diuresis. Injections of 0.5 mg. adrenaline or 50 mg. ephedrine by vein generally produced polyuria with increase of excretion in urine of Na and Cl and of inulin clearance in goats with and without access to salt. The concentrations of Na and Cl in urine differed; in those with access to salt and in which they were already high, concentrations fell towards plasma levels after injection, but in those without access to salt and in which they were low, concentrations rose.

D. Harvey.

3888

MEYER, J. H., WEIR, W. C. and SMITH, J. D. A study of sheep during starvation and water deprivation. *J. Animal Sci.*, 1955, **14**, 160-172. [Dept. Animal Husband., Univ. California, Davis.]

Two pairs of sheep in metabolism crates were starved and deprived of water for 36 hr., followed by 9 hr. on water only before restoration to full feed. One pair had a ration calculated to satisfy TDN requirements and the other had the same plus 11 per cent. NaCl. Both got water to appetite.

27

Before starvation the pair receiving extra salt drank 3 times as much as the other pair, and after starvation did not return to this level until feed was given again. During the early period when feed was given again, all sheep refused one or more feeds. Before starvation the pair getting NaCl had a much greater flow of urine, but in both pairs urine was reduced during starvation, especially in the NaCl pair. In both pairs the Na, Cl and K excreted in the urine followed the same pattern as the volume of urine. With the sheep on NaCl there was a marked decrease in urine N, but in the other pair the decrease was very slight. Plasma albumin and haematocrit rose during starvation in the pair getting NaCl. The pair on the basal ration lost 5 per cent., and the other pair 7.5 per cent. of bodyweight during starvation. N and extracellular fluid were lost by both pairs during starvation.—T. D. Bell.

3889

KEMPNER, W., PESCHEL, E. and BLACK-SCHAFER, B. Effect of diet on experimental hypertension and on the development of polyarteritis nodosa in rats. *Circulation Res.*, 1955, 3, 73-78. [Dept. Med., Sch. Med., Duke Univ., Durham, N.C.]

High blood pressure was produced in female rats by removing one kidney and enclosing the other in a latex capsule; both operations were completed by the time the rats were 45 to 50 days old. Until high blood pressure was established the rats were fed on dog chow and tap water, and then 5 groups with comparable ranges of systolic pressure received different diets, with 4 sub-groups on each diet. The diets, in order of decreasing Na intake, were dog chow, bread, meat, peas and rice. The sub-groups received no extra salt, 50 mg. KCl, 100 mg. NaCl, or 50 mg. KCl plus 100 mg. NaCl daily, given in 5 ml. solution before tap water was supplied *ad libitum*. Vitamin supplements were given.

Control, unoperated rats had systolic pressures between 90 and 120 mm. Hg, which were independent of diet and salt intake. In operated rats the systolic pressures after from 4 to 7 days were between 160 and 200 mm. Hg. There was always some degree of damage to the remaining kidney, and renal insufficiency with rising blood urea concentration was common.

There was no difference between the sub-groups receiving KCl and those receiving no salt, or between those given NaCl plus KCl and those given NaCl only, so the groups are considered as 2 instead of 4. There was no significant difference in blood pressure between any diet sub-groups except that in the sub-group on rice diet without NaCl, a lower average systolic pressure of 170 mm. Hg in 24 rats included the pressures of the only

10 rats of the whole series which returned to normal. In this group even the rats with persistently high systolic pressure survived longer than those of other groups and on the average survival was about 6 times as long as in rats fed on chow, bread or meat without NaCl supplement. Rats on peas without NaCl lived half as long as those on rice. Additional NaCl reduced the survival time significantly only in rats fed on peas or rice.

Of 132 rats examined histologically, 31 showed typical *polyarteritis nodosa*. The incidence was highest in the rats on dog chow and bread, with or without NaCl; in these groups taken together 15 out of 31 rats had lesions. On unsupplemented meat, peas or rice only 2 of 52 animals had lesions, but on these diets with added NaCl the incidence was 14 out of 49. The one rat fed on peas alone and the one on rice alone which did develop lesions nevertheless survived 364 and 344 days after operation, and the last-mentioned rat had most of its remaining kidney tissue replaced by a sarcoma.

It is concluded that the rice diet greatly increased survival and reduced the risk of *polyarteritis nodosa* in experimental high blood pressure.—D. Duncan.

3890

BAUER, G. C. H. Metabolism of bone sodium in rats investigated with Na^{22} . *Acta physiol. scand.*, 1954, 31, 334-350. [Orthopaedic Clin., Malmö, Sweden.]

Rats of 2 series each received a single subcutaneous injection of about 90 μCi of ^{22}Na . Rats of the adult series were killed after 1 to 120 hr., rats injected at 6 weeks of age were killed after 1 to 64 days. Bones and teeth were analysed.

Blood serum Na showed a steady fall in specific activity. In the mature rats, specific activity of bone samples rose rapidly in the first 8 hr. and then remained constant until the end of the 120-hr. experiment. Specific activity was highest in growing ends of bone and lowest in the shafts of tibias and femurs. Activity of incisor teeth rose rapidly at first, but continued to rise more slowly until the end of the experiment. If the amount of Na ascribable to the amount of water in bone and tooth samples was supposed to have the same specific activity as the serum Na, the specific activity ratio of the excess bone Na: serum Na was almost identical in all the samples. The excess bone Na estimated in this way suggested Na:Ca ratios by weight of between 1:35 and 1:60.

In the young rats the serum specific activity, high at the end of the first day, fell more rapidly and to lower values than the initially lower specific activity of bone. The bone values fell more rapidly in the growing ends than in the shafts of long bones. At 25 days after the injection there was 10 times as much specific activity in bone as

in serum; at 64 days the specific activity in the shafts had not fallen, but that of the serum was zero. The labelled Na incorporated into the growing bone or tooth was thus partly fixed in a stable form, estimated to represent 60 to 70 per cent. of the excess bone Na and half the excess Na in the teeth.

Deductions are made about the rate of incorporation of Na into the stable fractions.

D. Duncan.

3891

CHEROUX, R. Les déficiences potassiques en clinique humaine. [Potassium deficiencies in the human clinic.] *Bull. Soc. sci. Hyg. aliment.*, 1954, **42**, 139-151.

A review.

3892

MCCALLEN, P. M. Myocardial changes occurring in potassium deficiency. *Brit. Heart J.*, 1955, **17**, 5-14. [W. Middlesex Hosp.]

Clinical, biochemical and post-mortem findings in 2 patients with well-established prolonged potassium deficiency are presented. In each extensive myocardial lesions were present, yet the coronary arteries were patent and free from disease. There was close resemblance between the myocardial changes and those constantly found in experimental K deficiency. The cardiac lesions are considered to be the direct result of K deficiency, and the findings indicate that a low K state should be corrected as quickly and completely as possible, in order to avoid permanent cardiac injury.

M. B. Richards.

3893

LENKEIT, W. and STAHN-TAUPITZ, E. Zu dem Einfluss steigender Kaliungaben, nach Versuchen an Hühnern. [Effect of increasing amounts of potassium in feed, in experiments with poultry.] *Arch. Tierernährung*, 1954, No. 5, Beihefte, 197-209. [Inst. Tierphysiol., Univ. Göttingen.]

The subjects were 4 hens initially 6 months old, weighing 1481 to 1781 g. and at the beginning of the laying period. The basal ration consisted, in g. per hen daily, of wheatmeal 66, fishmeal 4, yeast 5, casein 3, cellulose 2 and calcium phosphate 4; it supplied 0.27 to 0.31 g. K daily, and 0.145 g. Na. Distilled water was supplied and was used also for mixing the diet. Extra K was given as chemically pure KHCO_3 in aqueous solution twice daily by stomach tube. In successive periods of about a month the total daily intake in g. was 0.31, 1.29, 1.84, 1.84, 2.65, 3.43 and 4.99, or from 190 to 4340 mg. per kg. bodyweight.

With intakes up to 2.65 g. (60 m. equiv.) of K daily, appetite and egg production were not impaired, but with higher amounts both were

adversely affected. When the dose was increased above 5 g. the hens died in 36 hr. One hen given 2.65 g. without a gradual increase in intake died within 36 hr. The volume of excreta increased progressively, but although there was an initial increase in dry matter excretion normal levels were regained after about the first month. K excretion rose with K intake and the K content of the eggs was not affected. Blood K was affected only by the highest dose of K. Up to 1.84 g. K did not affect Na excretion, but in one hen it was increased by higher doses. Na depletion was not demonstrable, nor any effect on N, Ca and P metabolism.

D. Duncan.

See also Absts. 3672, 3721, 3795, 3922, 4026, 4027, 4427.

HALOGENS

3894

MCCLENDON, J. F. and GERSHON-COHEN, J. Reduction of dental caries and goiter by crops fertilized with fluorine and iodine. *J. Agric. Food Chem.*, 1955, **3**, 72-73. [Dept. Res. Biochem., Albert Einstein Med. Centre, N. Div., Philadelphia, Pa.]

Two groups of rats were fed from weaning at 22 days till 3 months of age on diets composed of maize grain and roots, camellia leaves and yeast, containing 3.1 and 66.3 p.p.m. of fluorine, respectively. The maize and camellia leaves were grown on soil heavily fertilised with Tennessee brown rock phosphate containing 3.6 per cent. F, 12 tons to the acre. The control diet was obtained by hydroponic culture. The rats fed on the crops with the high F content gained more weight than the controls. The bones were normally calcified, as seen by X-ray examination. The incidence of dental caries was lower. The incisors showed fluorosis.

A similar experiment was made with sunflowers grown on plots iodised with different I compounds. Most of the rats fed on the low-iodine diet developed goitres, which did not occur in rats fed on the plants grown on iodine-fertilised plots.

B. W. Simpson.

3895

MUHLER, J. C. and WEDDLE, D. A. Utilizability of fluorine for storage in the rat when administered in milk. *J. Nutrition*, 1955, **55**, 347-352. [Dept. Chem., Indiana Univ., Bloomington.]

In the first experiment weanling rats were given 5 p.p.m. F in a dry diet, in milk or in water; in the second, rats between 55 and 60 days of age had 10 p.p.m. [but 5 p.p.m. stated on p. 348] in milk or in water, and in the third weanling rats had 2 p.p.m. in milk or in water. The total amounts of F ingested in 40 days were 1.64, 6.87

and 1.33 mg. per rat in the 3 groups. Estimations were made of F in one femur and in the remainder of the carcasses.

In the first test F was least readily available from the dry diet and there was evidence, which was not considered significant, that it was retained in greater amount from water than from milk. The second test did not confirm this difference between milk and water groups. In the third test there was a significant difference in retention of F in favour of the water group.

It is concluded that, for the concentration of F required for human consumption, milk would be less suitable as a vehicle than water. The suggested explanation is that at the lower concentration, 2 p.p.m., the Ca and Mg in milk may interfere with the availability of F and that at the higher, 10 p.p.m., there is no such interference.

D. Harvey.

3896

MUHLER, J. C. Retention of fluorine in the skeleton of the rat receiving different levels of fluorine in the diet. *J. Nutrition*, 1954, **54**, 481-490. [Dept. Chem., Univ. Indiana, Bloomington.]

Four diets containing 3.1, 2.2, 1.8 and < 0.1 p.p.m. F were given to groups of rats; the drinking water for the first 3 contained 0.09 and that for the fourth 0.005 p.p.m. F. In all 222 rats were used and the extent of storage of F was measured by estimation of the F content of their femurs after varying periods of feeding.

In both sexes the concentration decreased when a certain age was reached. With 3 p.p.m. F in the diet the age was between 50 and 90 days, with 2.2 p.p.m. about 80 days and with < 0.1 p.p.m. about 50 days. The total F content of the femurs did not decrease. There was a sex difference; the concentration in females was greater than in males after it had begun to fall in both sexes. In a paired-feeding experiment with a diet with 1.8 p.p.m. F, in which the female was fed to appetite and the male was given the same amount of food, the fall in concentration was confirmed at about 70 days, and the sex difference again appeared. It is thought to have been due possibly to differences between the sexes in the rate of skeletal growth.

D. Harvey.

3897

WALLACE-DURBIN, P. The metabolism of fluorine in the rat using F^{18} as a tracer. *J. Dent. Res.*, 1954, **33**, 789-800. [Div. Med. Phys., Univ. California, Berkeley.]

Young adult and mature female rats were used in studies in which F^{18} was administered by mouth or by intravenous injection in the carrier-free state or with added fluoride carrier.

Disappearance of injected F from the blood was rapid and equilibrium was quickly established

between F^{18} in the blood and in most of the tissues. Fifteen minutes after injection levels in tissues which are highly vascular, liver, spleen and small intestine, were nearly the same as in blood. In all tissues except kidney and salivary gland they remained nearly parallel to the levels in blood. There was some evidence of excretion in faeces. Deposition was mainly in teeth and bones and to a less extent in cartilage; there was no accumulation in the thyroid.

Distribution in soft tissues was not affected by the age of the animal, but the uptake by teeth and bones was less in mature than in young adult rats. It was the same whether the F was given by mouth or by vein.—D. Harvey.

3898

WEDDLE, D. A. and MUHLER, J. C. The effects of inorganic salts on fluorine storage in the rat. *J. Nutrition*, 1954, **54**, 437-444. [Dept. Chem., Indiana Univ., Bloomington.]

About 100 weanling rats were divided into 6 groups, of which one received 2 ml. of aqueous NaF solution containing 1000 μ g. F per ml. daily; for a second group sufficient $CaCl_2$ was added to the fluoride solution to give final concentrations of 1.0, 0.1 and 0.01 per cent. Ca and to make the final F concentration identical with that received by the animals of the first group. A third group received Ca pyrophosphate at a Ca concentration of 0.1 and 0.01 per cent., a fourth group $MgCl_2$ at 1.0, 0.1 and 0.01 per cent. Mg, a fifth group Al chloride at 1.0, 0.1 and 0.01 per cent. Al and the sixth group Al oxide at 0.1 and 0.01 per cent. Al. All the animals received the same stock diet containing 0.5 μ g. F per g. and drinking water containing 0.05 μ g. F per ml. The experimental solutions were all given by stomach tube once daily for 14 days, after which the animals were killed and F was estimated in the right femur and in the remainder of the carcass.

In a second series of experiments 18 rats were divided into 3 groups: the first received a stock diet to which was added sufficient NaF to produce a fluoride concentration of 5 μ g. per g., the second received an identical concentration of F in the drinking water, and the third group had no F supplement and acted as control. After 40 days both experimental groups were estimated to have had identical amounts of F and the animals were killed and analysed as before.

Ca, as $CaCl_2$, decreased F storage in the skeleton even when administered at a concentration of 0.01 per cent.; Ca pyrophosphate and Al oxide did not alter F storage. Mg, as $MgCl_2$, and Al, as chloride, decreased F storage; the effect of Al was more pronounced than that of Mg and both had a more pronounced effect on Ca. In the second series of experiments, when fluoride was added to

the dry diet there was less F in the skeleton than when identical amounts were taken in the drinking water. A maximum of 50 per cent. of the total F ingested was stored in the entire carcass when the F was given in aqueous solution.

G. F. Garton.

3899

MUHLER, J. C. and DAY, H. G. **Effect of pH and state of oxidation of different fluorides in the drinking water on dental caries and fluoride storage in the rat.** *J. Dent. Res.*, 1955, **34**, 68-72. [Dept. Chem., Univ. Indiana, Bloomington.]

In continuation of earlier work (see Abst. 3402, Vol. 24), groups of about 40 weanling rats on a cariogenic diet were given 20 μ g. F as stannous fluoride, stannous chlorofluoride or sodium fluoride in oxygen-free drinking water at pH 3.5 or 5.5, or no supplement.

At pH 5.5 the tin compounds were not more effective than NaF in reducing dental caries. Their activity at pH 3.5 was less in another experiment in which the water contained oxygen.

As was found before, the amount of F stored in the femur was less with the tin compounds than with NaF; it was unaffected by pH.

W. M. Deans.

3900

OKUSHI, I. **Changes of the heart muscle due to chronic fluorosis. 2. Experimental studies on the effects of sodium fluoride upon the heart muscle of a rabbit.** *Shikoku Acta Med.*, 1954, **5**, No. 4, 52-59. [Dept. Int. Med., Sch. Med., Tokushima Univ.] Japanese summary.

Groups of 11, 10, 13 and 3 rabbits were given 10, 30, 50 and 100 mg. NaF per kg. bodyweight daily by mouth; a fifth group of 16 animals received no additional F. The periods of administration of F were from 81 to 135, 14 to 80, 2 to 114 and 3 to 5 days. At the end the rabbits were killed and histological examinations were made of their hearts.

Electrocardiographic changes were depression of ST and inversion of T waves and prolongation of QT interval; histological changes were infiltration of cells, hyperaemia, haemorrhages and thickening of the vessel walls. They are discussed in relation to earlier findings in man (Abst. 2640, Vol. 25).

D. Harvey.

3901

KONO, K., OKUSHI, I., HIRAO, M., KAWAHARA, H., KAKIHARA, H. and AKAIKE, K. **[The heart changes of growing albino rats fed on varied contents of fluorine.]** *Shikoku Acta Med.*, 1954, **5**, No. 4, 104-107. [Dept. Int. Med., Sch. Med., Tokushima Univ.] In Japanese: English summary.

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Growing rats aged between 30 and 50 days were given a diet containing 375, 100, 50, 10 or 5 p.p.m. F as NaF, amounts equivalent, respectively, to between 24.2 and 31.0, 10.7 and 12.2, 5.8 and 6.9, 1.1 and 2.9, and 0.5 and 0.7 mg. per kg. bodyweight. Littermates were kept as controls with no added NaF.

The changes in myocardial fibres of the animals given F were cloudy swelling, vacuolar degeneration, infiltration of round cells and small haemorrhages; their extent corresponded to the level and duration of feeding, but individual differences occurred. These changes in rats were thought to be less severe than those in rabbits similarly treated (preceding Abst.).—D. Harvey.

3902

FLEMING, H. S. and GREENFIELD, V. S. **Changes in the teeth and jaws of neonatal Webster mice after administration of NaF and CaF₂ to the female parent during gestation.** *J. Dent. Res.*, 1954, **33**, 780-788. [Dept. Pathol., Sch. Med., Yale Univ., New Haven, Conn.]

Fluoride was given to mice during pregnancy, in drinking water as NaF in 80 and CaF₂ in 50 and as injections of NaF in 60 and CaF₂ in 55. It was estimated that the intakes by mouth were from 60 to 80 μ g. daily and the amounts injected were 100 μ g. daily, each in terms of NaF or CaF₂. Administration throughout pregnancy often caused resorption of the foetuses; it was, therefore, generally limited to the latter half of gestation. Illustrations typical of the histological changes are reproduced.

Calcification of bone in the jaws of the newborn mice was retarded and there was alteration of the cell structure of the ameloblasts with retardation of maturation of the enamel matrix. The pulp vessels in the teeth appeared hyperaemic. The Ca salt seemed to be more toxic to the foetuses than the Na salt.—D. Harvey.

3903

WYNN, W. and HALDI, J. **Dental caries in the albino rat on fluoridated and distilled water.** *J. Nutrition*, 1955, **55**, 235-240. [Dept. Physiol., Div. Basic Sci. Health Serv., Emory Univ., Emory University, Ga.]

Two diets, one of which readily produced caries (Abst. 2665, Vol. 22) and the other rather less readily, were each given to 30 pairs of littermate rats for 80 days. To accelerate the appearance of caries the salivary glands were removed from all animals (see Abst. 4882, Vol. 23). Of each pair of rats one drank distilled water free from F and the other the same amount of tap water containing between 0.7 and 1.0 p.p.m. F. The amount of F thus given had no effect on the incidence of caries with either diet.—D. Harvey.

3904

RICHARDSON, A. W., MUHLER, J. C. and BISHOP, J. G. The vasodepressor response of fluorine administered orally to dogs. *J. Pharmacol. Exp. Therap.*, 1955, **113**, 200-205. [Dept. Physiol., Sch. Med., Univ. Indiana, Bloomington.]

NaF or SnF₂ was given by stomach tube in amounts of 1 or 5 mg. F to 28 dogs and measurements were made of blood pressure and F content and of pulse pressure, heart rate, and rate of blood flow. After 45 min. the blood pressure had fallen by 3 and 16 per cent. and by 9 and 11 per cent., respectively, for the 1 and 5 mg. doses as Na and Sn salts. Blood F 45 min. after administration of 5 mg. F showed that absorption from NaF was much more rapid than from SnF₂. Changes in pulse pressure, heart rate and rate of blood flow were those expected of a hypotensive agent. For earlier work on intravenous injection of F see Title 2347, Vol. 25.—D. Harvey.

3905

SCHWALB, H., BAUERNFEIND, A. and HENSEL, H. Die Wirkung von Natriumfluorid auf die renale Ausscheidung von p-Aminohippursäure, Kreatinin, Chlorid und Harnstoff beim Hund. [Effect of sodium fluoride on renal excretion of p-aminohippuric acid, creatinine, chloride and urea in the dog.] *Arch. exp. Pathol. Pharmacol.*, 1955, **224**, 285-294. [I. Med. Klin., Univ. Munich.]

3906

RAY, C. T., THREEFOOT, S. A. and BURCH, G. E. Studies on the excretion of chloride by man with and without congestive heart failure, using long-life radiochloride, Cl³⁶. *J. Lab. Clin. Med.*, 1954, **44**, 663-701. [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

Four subjects with congestive heart failure and 2 controls, with thyrotoxicosis and tuberculous lymphadenitis, respectively, each received intravenously 50 μ Ci. of ³⁶Cl as NaCl. Blood, urine, ascitic and pleural fluids and faeces were collected at intervals for from 30 to 70 days, with frequent blood and urine samples in the first 2 hr.

³⁶Cl appeared in the urine within 7 min. after injection in all subjects and there was no detectable difference between the 2 groups. In the first 90 min. 3 subjects with oedema excreted the smallest amounts of ³⁶Cl, and their clearance rates of ³⁶Cl were lower than those of controls. The fourth subject, with mild heart failure and recovering, had the highest clearance rate of all.

At the end of 30 days 76.3 and 86.8 per cent. of the dose had been recovered from the control subjects; 75.2 and 82.8 per cent. in urine, 1.1 and 4.0 per cent. in faeces. For the 3 patients for

whom the exact dose injected was known, 60.8, 36.8 and 63.7 per cent. had been recovered, 54.7, 19 and 60.3 per cent. in the urine, 6.1, 2.0 and 1.6 per cent. in the faeces; from the second, 15.8 per cent. was in thoracic and abdominal fluid, and for the third, 1.7 per cent. in vomitus and sputum. Apparently little if any ³⁶Cl was permanently bound in the tissues. After 70 days from 95 to 99 per cent. had been recovered from 3 subjects.

The daily chloride balances were studied. The control subjects showed very similar curves of excretion of ³⁵Cl and ³⁶Cl when these were expressed as percentages of the amounts remaining in the body, but the curves of the 4 patients were irregular. The clearances of ³⁵Cl and ³⁶Cl were similar, except for discrepancies which are explained by lags in chloride exchange and sequestration.

Several aspects of chloride metabolism are discussed in the light of these findings.—D. Duncan.

See also Absts. 3726, 3981.

IRON AND COPPER

3907

SCHAPIRA, G. and DREYFUS, J. C. Fer et nutrition. [Iron and nutrition.] *Ann. Nutrit. Alimentation*, 1955, **9**, 39-92. [Lab. Recherches, Biochim. M^d. H^{op}. Enfants Malades, Paris.]
A review.

3908

STERN, P., KOŠAK, R. and MISIRLIJA, A. Über die Resorption des Eisens aus sterilem Darmkanal. [Absorption of iron from the sterile gut.] *Acta med. jugoslav.*, 1954, **8**, 164-173. [Farmakol. Inst., Med. Fak., Sarajevo.]
Serbian summary.

See Abst. 890, Vol. 25.

3909

STEINKAMP, R., DUBACH, R. and MOORE, C. V. Studies in iron transportation and metabolism. 8. Absorption of radioiron from iron-enriched bread. *Arch. Int. Med.*, 1955, **95**, 181-193. [Dept. Int. Med., Sch. Med., Univ. Washington, St. Louis, Mo.]

See also Title 4904, Vol. 24.

In 32 healthy young people no significant difference was found in the amount of ⁵⁹Fe absorbed from bread enriched with ferrous sulphate, reduced iron, ferric orthophosphate or sodium ferric pyrophosphate. Of the 2 to 4 mg. ⁵⁹Fe in the test meal 1 to 12 per cent. was absorbed by 28 of the subjects. The other 4 subjects, who absorbed from 26 to 38 per cent. of the ⁵⁹Fe, were thought to have low Fe stores. In 3 subjects with Fe-deficiency anaemia absorption was of the order of 45 to 64 per cent. A supplement of ascorbic acid given with the enriched bread increased absorption of ⁵⁹Fe in normal subjects. The amount of ⁵⁹Fe

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absorbed was about the same whether the ^{59}Fe salt was baked into the bread or given with un-enriched bread. Ferrous sulphate was better absorbed when given alone than when given in or with bread.

Methods of synthesising the ^{59}Fe salts are given in an appendix.—F. C. Aitken.

3910

REISSMANN, K. R., COLEMAN, T. J., BUDAI, B. S. and MORIARTY, L. R. **Acute intestinal iron intoxication. 1. Iron absorption, serum iron and autopsy findings.**

REISSMANN, K. R. and COLEMAN, T. J. **2. Metabolic, respiratory and circulatory effects of absorbed iron salts.** *Blood, J. Hematol.*, 1955, 10, 35-45; 46-51. [Dept. Med., Sch. Med., Univ. Kansas, Kansas City.] Interlingua summary.

3911

SHARNEY, L., SCHWARTZ, L., WASSERMAN, L. R., PORT, S. and LEAVITT, D. **Pool systems in iron metabolism; with special reference to polycythemia vera.** *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 489-492. [Dept. Haematol., Mount Sinai Hosp., New York.]

3912

ABBOTT, W. E., LEVEY, S., KRIEGER, H. and DAVIS, J. H. **Studies involving copper, iron, and zinc metabolism in surgical patients.** *J. Lab. Clin. Med.*, 1954, 44, 761. *Proc.* [Cleveland, Ohio.]

3913

BERTOLANI, F., BENDANDI, A. and SQUADRINI, F. **Ricerche sulla mobilitazione di anormali depositi di ferro nel fegato. [Mobilisation of abnormal deposits of iron in the liver.]** *Arch. Sci. biol., Bologna*, 1955, 39, 1-7. [Ist. Clin. Med. Gen., Univ. Modena.]

A group of 20 rats weighing about 130 g. were fed for 37 days on a diet of whole flour 800 g., lard 200 g. and cod liver oil 15 ml., with a vitamin B complex preparation, and each rat received on the first, eighth and 20th day by intravenous injection 10 mg. Fe as saccharated iron oxide solution. A second group of 20 similar rats received the same diet for 27 days but with 3 per cent. ferric citrate added. Five animals from each group were then bled repeatedly for 4 months, and then they and 5 others from each group, not bled, were killed for estimation of liver Fe. Another 5 of each group had about 65 per cent. of the liver removed and were kept on the same diets for 2 days and then killed for a study of liver regeneration. Eight other rats fed on the diet containing ferrous citrate for from 4 to 8 days before partial

removal of the liver were killed from 48 to 96 hr. after operation.

Both bleeding and partial hepatectomy were followed by reduction in the amount of Fe stored in the liver, especially when the storage resulted from the Fe-rich diet. The reduction in concentration of liver Fe was greatest 72 hr. after partial hepatectomy.

Histologically the distribution of iron deposits after Fe injection was mainly reticulo-endothelial, while that after dietary Fe was parenchymal and especially periportal. Both types were much less after bleeding or partial hepatectomy.

It is concluded that Fe deposited in experimental siderosis can readily be mobilised.—D. Duncan.

3914

BERTOLANI, F. and BENDANDI, A. **I gruppi sulfidrilici del fegato nella siderosi sperimentale. [The sulphhydryl groups of the liver in experimental siderosis.]**

BERTOLANI, F. and BENATTI, G. **Comportamento della siderosi dietetica sperimentale dopo surrenectomia e per somministrazione di desossicorticosterone, ormone adrenocorticotropo e tiroxina. [Behaviour of experimental dietary siderosis after adrenalectomy and during administration of deoxycorticosterone, adrenocorticotrophic hormone and thyroxine.]**

BERTOLANI, F. **Aminoacidi e siderosi epatica sperimentale. [Amino-acids and experimental iron deposition in the liver.] Fosfati e siderosi sperimentale. [Phosphates and experimental siderosis.]** *Bol. Soc. ital. Biol. sper.*, 1954, 30, 169-170; 170-173; 173-175; 175-178. [Ist. Clin. Med., Univ. Modena.]

Seven groups of rats weighing from 130 to 180 g. were given extra iron in the diet or by intravenous injection, and part of the liver was removed from 2 groups. SH groups were estimated in the liver by the method of Fujita and Numata as previously used (*Bol. Soc. ital. Patol.*, 1953, 3, 65), but results were not consistent.

Rats weighing about 120 g. were given a diet containing ferric citrate. Some were given thyroxine, some had the adrenals removed and were given NaCl or deoxycorticosterone acetate, and some were given adrenocorticotrophic hormone. After about 40 days, Fe was estimated in the liver, spleen and kidneys and a histochemical examination was made. Administration of thyroxine caused a considerable rise in the Fe content of the liver, and adrenocorticotrophic hormone a moderate one, but deoxycorticosterone acetate had little effect. Removal of the adrenals was followed by a decrease.

Fifty-two rats weighing about 120 g. were maintained for 43 days on the diet mentioned above, containing ferric citrate, without addition or with

3 per cent. methionine or glycine or glutamic acid, or 1 per cent. of each or with 6 per cent. of amino-acids obtained from enzymic hydrolysis of casein and fibrin, or of the same hydrolysate subsequently treated with HCl to destroy tryptophan and tyrosine. The Fe content of the liver was higher with all diets containing ferric citrate than without it. Methionine and glutamic acid increased the pathological accumulation of Fe in the liver; glycine by itself had no effect, but with methionine and glutamic acid had some effect in counteracting their action. The enzymic hydrolysate counteracted the deposition of Fe, but its protective action was impaired by acid treatment.

In 2 other experiments administration of sodium phosphate, either by mouth or intramuscularly, tended to counteract the pathological deposition of Fe.—E. M. Hume.

3915

EARL, C. J., MOULTON, M. J. and SILVERSTONE, B. **Metabolism of copper in Wilson's disease and in normal subjects: studies with Cu-64.** *Amer. J. Med.*, 1954, **17**, 205-213. [Dept. Neurol., Harvard Med. Sch., Boston, Mass.]

A solution of $^{64}\text{CuCl}_2$ was given by mouth to 4 control subjects and 5 patients, and intravenously to 2 controls and one patient with Wilson's disease (hepatolenticular degeneration). Radio-activity was estimated in plasma and urine.

The plasma radio-activity when $^{64}\text{CuCl}_2$ was given by mouth rose rapidly to a peak about 1 hr. later in the controls, fell sharply and then more gradually, and in 3 again rose later. The patients with Wilson's disease showed somewhat similar variations except that in 2 there was no secondary rise and 1 had a very slow rate of fall. Plasma radio-activity declined rapidly after intravenous administration in the patient and in the controls. Fractionation of plasma by half saturation with $(\text{NH}_4)_2\text{SO}_4$ showed that in the controls most of the activity in the early samples was in the albumin fraction; after 24 hr. it was mostly in the globulin fraction, with which caeruloplasmin, the copper-containing protein, is precipitated. The patient with Wilson's disease had most activity in the albumin fraction even after 24 hr.

The amount of ^{64}Cu excreted in the urine varied from hour to hour and was unrelated to the plasma concentration. The concentration and rate of excretion were much higher in the patients than in the controls.—A. Hepburn.

3916

WYNNE, K. N. and MCCLYMONT, G. L. **Copper-molybdenum-sulphate interaction, in induction of hypocuprosis.** *Nature*, 1955, **175**, 471-472. [Nutrit. Res. Lab., Vet. Res. Stat., Glenfield, N.S.W.]

Copper deficiency has been diagnosed in sheep on pastures in New South Wales containing 3 to 10 p.p.m. Cu, 3 to 9 p.p.m. Mo and 0.1 to 0.7 per cent. sulphate. Merino sheep in pens were given a diet of wheat chaff 40, wheat 24, oats 30, meal 5, urea 0.75, limestone 0.5 and salt 0.25 parts, with vitamin A and Co, with Cu 6 p.p.m., Mo 0.7 or 5 p.p.m. and sulphate 0.04 or 0.4 per cent. The high-sulphate groups on both Mo intakes showed the most pronounced fall in liver Cu content after 4 months, and their blood Cu rose. Sheep restricted to half the feed intake of the other group on the ration with 5 p.p.m. Mo and 0.4 per cent. sulphate also showed the fall in liver Cu, suggesting that it is the proportions of these constituents which are important and not the absolute intakes.

The levels used in this experiment are closer to those encountered in the field, but otherwise the results agree with those of Dick (Abst. 2518, Vol. 24).—D. Duncan.

See also Absts. 3973, 4209, 4220, 4222.

OTHER MINERALS

3917

MAHALANOBIS, S. K. and ROY, R. N. **Effect of selenium on haemoglobin level.** *Indian J. Physiol. Allied Sci.*, 1954, **8**, 57-60. [Dept. Physiol., Univ. Coll. Sci., Calcutta.]

In 8 rats which received in the diet 200 mg. selenium per kg. bodyweight for 45 days there were falls in Hb value, red blood cell (RBC) count and weight. Normal values were restored 15 days after withdrawal of Se. Daily intramuscular injections of 0.1 mg. Se for 15 days did not affect Hb and RBC count, but deaths occurred within 2 hr. when the dose was increased to 0.2 mg. Intramuscular injection of CoCl_2 even after injection of Se raised the Hb value and RBC count.

A. Hepburn.

3918

MACHLIN, L. J., PEARSON, P. B. and DENTON, C. A. **The utilization of sulfate sulfur for the synthesis of taurine in the developing chick embryo.** *J. Biol. Chem.*, 1955, **212**, 469-475. [Animal and Poultry Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

The distribution of ^{35}S in eggs during incubation was estimated after injection of $\text{Na}_2^{35}\text{SO}_4$ into the whites. In the developing embryo both sulphate and organic S increased, the latter containing in the day-old chicken 65 per cent. of the dose injected. Chromatographic fractions corresponding to methionine and cystine were inactive. Taurine was crystallised and found to be the radio-active organic substance. It was not bound to protein, but most of the sulphate occurred as a protein complex.—A. Hepburn.

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3919

LOWE, I. P. and ROBERTS, E. Incorporation of radioactive sulfate sulfur into taurine and other substances in the chick embryo. *J. Biol. Chem.*, 1955, **212**, 477-483. [Wernse Lab. Cancer Res., Sch. Med., Washington Univ., St. Louis, Mo.]

Taurine and unknown radio-active substances were identified chromatographically in extracts of chick embryos 30 min. after injection of sulphate labelled with ^{35}S . Methionine, cystine and glutathione, free or in the form of protein, were not

active even after 24 hr. Autoradiographs of leg bones from embryos showed activity in areas corresponding to cartilage after 30 min. Incubation of homogenates of embryos with pyruvate, acetate and ^{35}S -sulphate produced several active substances, but not taurine. Coenzyme A, adenosinetriphosphate and diphosphopyridine nucleotide added to homogenates significantly increased the amount of radio-activity in the largest unidentified spot on the chromatograms.

A. Hepburn.

See also Absts. 3440, 3817, 3873, 3977.

ACID BASE EQUILIBRIUM

3920

GRIBBEL, W. Die diätetische und balneologische Beeinflussbarkeit des Säure-Basen-Haushalts als Möglichkeit unspezifischer Therapie. [Dietetic and balneological modification of acid base equilibrium as a possible non-specific treatment.] *Ztschr. ges. exp. Med.*, 1954-55, **125**, 289-304. [Hautklin., Univ. Freiburg i. Br.]

Of the 7 experiments described, 3, in which the author served as subject, were studies of the effect of diet on acid base equilibrium, as indicated by the acidity quotient of the urine (titratable H ions $\times 100$ /titratable OH ions) and a corresponding quotient in which ammonia excretion is taken into account. The results are shown graphically. The treatments were: (1) 13 days of a uniform strongly acid-producing diet, combined in the second week with special baths; (2) after an intervening day of ordinary diet, 6 days of strongly alkaline diet; (3) 4 days of acid-producing diet less rigorous than before.

The shift to the acid side as a result of the acid-producing diet was gradual; after the first week there was little further change. The curves illustrate the predominant effect on the acidity quotient of secretion of HCl by the stomach. After the long period of acid-producing diet, it took 5 days of alkaline diet for large amounts of base to be excreted. The results of the third experiment were like those of the first, but slighter. The other 4 experiments were on the effect of different special baths on acid-base equilibrium.

Acid-producing and alkaline diets in alternate periods of about 6 days are suggested as unspecific treatment for certain skin disorders.

W. M. Deans.

3921

SCHWAB, M., KOCH, R., KOCH, K. E., GÖLTNER, E. and RIGGERT, H. Der Einfluss der Ammoniumchlorid-Acidose auf Gesamtwasser, extra- und intracelluläres Flüssigkeitsvolumen und extracelluläre Elektrolyte. [Effect of ammonium

chloride acidosis on total water, extracellular and intracellular fluid volume and extracellular electrolytes.] *Arch. exp. Pathol. Pharmacol.*, 1954, **223**, 425-442. [Med. Klin., Univ. Göttingen.]

Eleven women were given 10 g. NH_4Cl on 3 successive days between the 2 periods of 3 days on which studies were made; 8 controls received no drug between the 2 periods of investigation. In the subjects receiving NH_4Cl bodyweight fell by 1.1 kg., mean total water by 1.25 litre to 30.09 litres and extracellular fluid by 1.25 to 8.33 litres, while intracellular fluid volume remained constant at 21.8 litres. Thus the loss of bodyweight and total water was due solely to diminution in volume of extracellular fluid. A diminution of 251.4 m. equiv. in the amount of Na in the extracellular fluid is explained by the Na content of the excreted fluid, and by increased Na excretion for the neutralisation of the extra chloride excreted. The data indicate that the loss of base is the primary result of taking NH_4Cl , with increased water excretion as a consequence. The tendency to low-chloride alkalosis resulting from the use of a mercury diuretic can be averted by giving NH_4Cl also.—M. B. Richards.

3922

COOKE, R. E., SEGAR, W. E., REED, C., ETZWILER, D. D., VITA, M., BRUSLOW, S. and DARROW, D. C. The role of potassium in the prevention of alkalosis. *Amer. J. Med.*, 1954, **17**, 180-195. [Dept. Paediat., Sch. Med., Yale Univ., New Haven, Conn.]

Groups of rats on a low-electrolyte diet were given drinking water containing a large concentration of NaHCO_3 and different amounts of K and Cl. Alkalosis developed only in rats with inadequate intakes of K as shown by low muscle K. Less K was required to prevent alkalosis when Cl intake was moderate than when Cl intake was restricted, but when K intake was restricted increase of Cl intake did not prevent alkalosis.

Injection of 15 mM NaHCO_3 per kg. bodyweight into normal and K-deficient rats produced alkalosis in the latter within 12 hr. The normal rats excreted Na and K, but no Cl, in the 12 hr. The K-deficient rats excreted less Na, no K and 1 m. equiv. Cl per kg. bodyweight.

Alkalosis with low blood Cl in K-deficient rats was corrected by injection of KHCO_3 . In these

animals serum bicarbonate fell to normal and serum Cl rose to normal. There was no change in muscle Cl. There was relatively little increase in bicarbonate excretion. Cation was excreted with organic anion, a large part of which was citrate.—F. C. Aitken.

See also Abst. 4238.

METABOLISM OF WATER

3923

RYAN, R. J., PASCAL, L., INOUE, T. and BERNSTEIN, L. Some mathematical considerations of the volume of distribution of radiosulfate.

RYAN, R. J., INOUE, T. and BERNSTEIN, L. The zero time radiosulfate space in normal and abnormal subjects. *J. Lab. Clin. Med.*, 1954, 44, 922-923; 923-924. *Proc.* [Chicago, Ill.]

3924

KERSLAKE, D. M. The rate of diffusional water loss through human skin. *J. Physiol.*, 1955, 127, 18P-19P. [R.A.F. Inst. Aviation Med., Farnborough, Hants.]

3925

BENTLEY, P. J. Some aspects of the water metabolism of an Australian marsupial *Setonix brachyurus*. *J. Physiol.*, 1955, 127, 1-10. [Dept. Zool., Univ. W. Australia.]

A large population of the small kangaroo *Setonix brachyurus* lives on the island of Rottnest, off Western Australia, where there is much salt or brackish water but only one perennial source of fresh water. In summer it is hot and dry.

The kidney is of primitive mammalian type, with small glomerular volume and high tubular weight relative to bodyweight. Animals caught in winter excreted urine at about 25 ml. per hr., with mean

osmolality (calculated according to McCance, *J. Physiol.*, 1945, 104, 196) 456, range 154 to 928. Animals caught in summer at least 2 miles from fresh water excreted 3 ml. per hr. or less of a highly concentrated urine, mean osmolality 1163. Under laboratory conditions with food and water to appetite the mean osmolality of the urine was 433; after 2 days on diet providing 52 g. metabolic plus free water per 100 g. it was 1528. Eight kangaroos received this dry diet for 2 days and were then given sea water or 3.5 per cent. NaCl solution by stomach tube, after which the osmolality of the urine was similar to that after simple dehydration. Animals were kept in good condition for several days when drinking solutions containing up to 2.5 per cent. NaCl, but they would not drink sea water, and when it was given in large amounts by stomach tube one died.

Temperature regulation in the range 21° to 40° C. with relative humidity 44 to 60 per cent. compared well with that of placental mammals. The animals sweated from the paws and salivated slightly.

It is considered unlikely that *Setonix* drinks sea water; it probably maintains its water balance by conservation and by selecting the most succulent plants available.—D. Duncan.

See also Absts. 3706, 3734, 3753, 3754, 3880-82, 3887, 3888, 3921, 3970, 3971.

METABOLISM OF OTHER SUBSTANCES

3926

KLATSKIN, G., KREHL, W. A. and CONN, H. O. The effect of alcohol on the choline requirement. 1. Changes in the rat's liver following prolonged ingestion of alcohol.

KLATSKIN, G. and KREHL, W. A. 2. Incidence of renal necrosis in weanling rats following short term ingestion of alcohol. *J. Exp. Med.*, 1954, 100, 605-614; 615-627. [Dept. Int. Med., Sch. Med., Yale Univ., New Haven, Conn.]

1. Groups of 7 to 15 rats received a basal diet containing, per cent., casein 12, Crisco 20, maize oil 5, sucrose 57.8, cystine 0.2 and salts 5, with vitamins added but not choline. Some groups

received instead of drinking water a 15 per cent. dilution of 95 per cent. ethanol in unrestricted quantity. Pair-fed with rats on the basal diet plus ethanol were groups given supplements of 0.5 per cent. methionine, or 0.5 per cent. choline, or without alcohol, or with the alcohol replaced by an isocaloric amount of sucrose, with or without choline or methionine. The 25 controls received the basal diet to appetite. Survivors were killed after 223 or 226 days.

All rats grew well, but those given alcohol consumed less total energy and gained less weight. The mean intake of 15 per cent. alcohol was 12.5 ml. daily, equivalent to 17 per cent. of the total

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energy. Neither alcohol nor extra sucrose produced significantly more liver fat than the basal diet given to appetite, but each produced more than in pair-fed controls on basal diet. This was prevented by choline or methionine.

It is considered that alcohol increases the choline requirement of the rat, but not by augmenting the energy intake.

2. Groups of 50 weanling rats received a basal diet containing, per cent., groundnut meal 30, casein 6, cystine 0.1, sucrose 39.5, lard 19, cod liver oil 1 and salt mixture 4.4, with vitamin B₁, pyridoxine, riboflavin, calcium pantothenate, nicotinic acid, inositol, α -tocopherol, α -tocopherol acetate and 2-methyl-1:4-naphthoquinone. The choline content was 88.8 mg. per 100 g. One group received this diet and alcohol to appetite, another was pair-fed and given sucrose instead of alcohol, another was pair-fed, but without alcohol or sucrose, and the fourth was given the basal diet to appetite. The survivors were killed after 7 to 14 days.

Kidney necrosis was developed in rats given alcohol, and in a few animals in both pair-fed control groups. The addition of 0.08 per cent. choline to the basal diet was enough to prevent kidney damage in all groups.—D. Duncan.

3927

STEVENS, C. M., JOHNSON, C. A. and WATANABE, R. Preparation of *S*-allyl-DL-homocysteine and related compounds and tests of their growth effects in rats. *J. Biol. Chem.*, 1955, **212**, 49-57. [Fulmer Chem. Lab., State Coll. Washington, Pullman.]

DL-Ethionine inhibited growth in rats on a diet low in choline and methionine, but *S*-allyl-DL-homocysteine, the vinyl analogue of methionine, and *S*-*n*-propyl-DL-homocysteine did not. These substances neither maintained bodyweight on a diet deficient in methionine and cystine but adequate in choline, nor inhibited growth when cystine or homocysteine was added. Their sulphoxides and that of *S*-allyl-L-cysteine had similar effects on rats on a diet deficient in cystine.

A. Hepburn.

3928

CONSTANTINIDES, P., CAIRNS, A. and WERNER, A. Antilipemic activity of sulfated polysaccharides. *Arch. internat. Pharmacodyn.*, 1954, **99**, 334-345. [Dept. Anat., Univ. British Columbia, Vancouver.]

Sulphated samples of alginic acid, cellulose, amylopectin, agar, mesquite gum, gum arabic, pectin, amylose, xylan, inulin, glycogen, starch, glucose and glucuronic acid were injected into rats which received at the same time by stomach tube a dose of maize oil. The antilipemic property of the substances was estimated by measurement of

turbidity of the diluted serum 2 hr. later, and also the blood clotting time.

Only the first 5 sulphated polysaccharides significantly reduced blood lipids and their approximate activities, in comparison with heparin expressed as unity, were 1.0, 0.5, 0.2, 0.1 and 0.1. The average clotting times for the minimum antilipemic amounts were 2.3, 3.5, 1.9, 5.7 and 8.5 min., against more than 5 hr. for heparin. Raising the S content of alginic acid from 9.6 to 10.7 per cent. significantly raised the blood clotting time. High sulphation of alginic acid, 19.7, and cellulose, 23.6 per cent. S, destroyed the antilipemic activity. Sulphated alginic acid, cellulose and amylopectin produced some loss of bodyweight in mice. This was least with alginic acid, which, unlike heparin, produced no subcutaneous bleeding.

The data suggested that antilipemic activity decreased with molecular size or with weaker resistance to the acid hydrolysis produced during sulphation of the original material.—A. Hepburn.

3929

WESTERFELD, W. W. and RICHERT, D. A. Acetaldehyde utilization by protein-depleted dogs and rats. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 524-526. [Dept. Biochem., Med. Coll. State Univ. New York, Syracuse.]

The rate at which acetaldehyde disappeared from the blood was not altered when dogs were fed on a protein-free diet for 8 weeks, but xanthine oxidase and Mo in the liver decreased. Acetaldehyde was removed more slowly in rats given a protein-free diet for 1 month and xanthine oxidase and Mo decreased considerably. Xanthine oxidase and other enzymes containing Mo were not considered to be of major importance in the metabolism of acetaldehyde *in vivo*.—A. Hepburn.

3930

O'DELL, B. L., STOLZENBERG, S. J., BRUEMMER, J. H. and HOGAN, A. G. The antithyrototoxic factor: its solubilization and relation to intestinal xanthine oxidase. *Arch. Biochem. Biophys.*, 1955, **54**, 232-239. [Dept. Agric. Chem., Univ. Missouri, Columbia.]

The so-called antithyrototoxic factor was assayed with rats which had been fed for a week on a purified casein ration containing 0.15 per cent. iodinated casein, by comparing the growth-promoting effect of the supplement to be tested with that of 10 per cent. liver residue. The supplements tested were aqueous extract of liver, brewer's yeast, wheat germ, soya bean meal and its aqueous extract and insoluble residue, and gelatine. The soya bean meal residue was at least as active in supporting growth of the rats as was liver residue; water extract of liver was moderately active, so

were wheat germ and whole soya bean meal. When liver residue was hydrolysed with several agents all released some of the antithyrototoxic factor, but the hydrolysates with 0.1 N NaOH or NH_4SO_4 were equal to the original residue.

Inactive substances tested were lyxoflavin, thioctic acid, orotic acid, guanine, a mixture of glycine, methionine and arginine, and a mixture of potassium acetate and MgO .

The intestinal xanthine oxidase activity was low on the basal diet of purified casein with or without iodinated casein; without iodinated casein Mo restored activity to normal, but with iodinated casein only to two-thirds of normal. With or without iodinated casein, liver residue restored activity to normal. Mo did not stimulate growth.

D. Duncan.

See also Abst. 3441.

METABOLISM OF CELLS, TISSUES, ETC.

GENERAL PHYSIOLOGY

3931

DEFAZIO, V., HELLEMS, H. K., LEIGHT, L., TALMEERS, F. N. and REGAN, T. J. The effects of fructose on myocardial metabolism. *J. Lab. Clin. Med.*, 1954, **44**, 786-787. *Proc.* [Detroit, Mich.]

3932

ZACCO, M. Studies of glucose intermediaries of rat diaphragm by paper chromatography. *Arch. internat. Pharmacodyn.*, 1954, **99**, 298-313. [John Herr Musser Dept. Res. Med., Univ. Pennsylvania, Philadelphia.] Italian summary.

Diaphragms from normal fasted rats were equilibrated *in vitro* in a medium containing Na_2PO_4 , $NaCl$, $MgCl_2$, and glucose uniformly labelled with ^{14}C . After 45 min. paper autoradiographs were made of the extracts. Glucose, alanine, lactic acid, glycogen and, to a less extent, succinic acid, fumaric acid, pyruvic acid, phosphoglyceraldehyde, dihydroxyacetone phosphate, phosphopyruvic acid and probably 3-phosphoglyceric acid, glucose-1-phosphate, glucose-6-phosphate, fructose-6-phosphate, fructose-1:6-diphosphate and α -ketoglutaric acid were found to be labelled. As a relatively small amount of $^{14}CO_2$ was found, the small activity of pyruvic acid and the intermediates of Krebs' cycle may have been due to transformation of pyruvate to lactic acid and alanine at the expense of oxidation.

The addition of insulin to the medium did not qualitatively affect the radio-active intermediates, but the activity was increased in glycogen and glucose, probably by activated adsorption by the muscle cells of the diaphragm, and especially in the triose phosphates and 3-phosphoglyceric acid. The activities of lactic acid and alanine were only slightly increased.—A. Hepburn.

3933

RAPOPORT, S. and NIERADT, C. Inwieweit verläuft die Glykolyse im Säugetiererythrocyten über 2,3-Diphosphoglycerinsäure? Über eine Variante des glykolytischen Cyclus auf dem

Niveau der Phosphoglycerinsäuren. [To what extent does glycolysis in mammalian erythrocytes involve 2:3-diphosphoglyceric acid? A variant of the glycolytic cycle at the phosphoglyceric acid level.] *Biochem. Ztschr.*, 1955, **326**, 231-236. [Physiol. Chem. Inst., Humboldt Univ., Berlin.]

3934

DIANZANI, M. U. and BIAGGINI, G. C. Alcuni aspetti citochimici dell'ipertrofia renale di compenso. [Cytochemical aspects of compensatory renal hypertrophy.] *Arch. Sci. biol., Bologna*, 1954, **38**, 582-596. [Ist. Patol. Gen., Univ. Genoa.]

Rats weighing 150 to 170 g. were maintained on stock diet with bread and greenstuff. Some had one kidney removed to induce hypertrophy in the remaining kidney. Homogenates were prepared from normal and hypertrophied kidneys and fractionated in the centrifuge.

Hypertrophied kidneys were examined 3, 7 or 25 to 30 days after operation, when they weighed 18.2, 36.7 and 60.5 per cent. more than the kidneys first removed. The N content of homogenates was increased at 3 days, more so at 7, and somewhat less at 30; the increase was especially great in the microsome fraction, and was slight in the mitochondria. The increase in ribonucleic acid was greatest, especially in the supernatant and microsome fractions, at 3 days and then the level tended to return to normal. Deoxyribonucleic acid changed little. Succinoxidase, which is mostly in the mitochondria, increased early and remained high at 30 days, and so did *d*-amino-acid oxidase.

The findings support the theories that nucleic acids control protein synthesis, that the energy necessary for synthesis is provided by oxidative processes, and that the mitochondria are derived from the microsomes.—D. Duncan.

3935

DIANZANI, M. U. and BIAGGINI, G. C. Comportamento della fosforilazione ossidativa nell'ipertrofia renale di compenso. [Oxidative phosphorylation in compensatory renal hyper-

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trophy.] *Arch. Sci. biol., Bologna*, 1955, **39**, 72-79. [Ist. Patol. Gen., Univ. Genoa.]

Renal hypertrophy was produced in adult rats fed on diets containing bread and greenstuff, either by removal of one kidney or by ligation of one peduncle. Oxidative phosphorylation was studied in the normal kidneys removed, and later the rats were killed and the other kidneys were studied. The substrates were glutamate, citrate and ketoglutarate, and both homogenates and mitochondrial fractions were used. The results are tabulated.

Phosphate utilisation and oxygen consumption were increased in the hypertrophic kidneys, the P:O ratio remaining constant. In the hypertrophic kidneys with peduncles ligated the utilisation of P fell more than that of oxygen, so the P:O ratio was reduced. The increased oxygen consumption in hypertrophic kidneys began before the increase in nucleic acid and N occurred, and it is concluded that the extra oxygen was used to supply energy for the synthesis of new cytoplasmic materials.—D. Duncan.

3936

FRUNDER, H. and RICHTER, G. Über Änderungen der DPN/DPNH-Konzentrationen in Schnitten normaler und verfetteter Lebern während des Warburg-Versuches. [Changes in the concentrations of DPN and DPNH in sections of normal and fatty livers during Warburg experiments.] *Hoppe-Seyler's Ztschr.*, 1955, **299**, 39-47. [Physiol. Chem. Inst., Univ. Leipzig.] English summary.

The injury to cell and tissue structure involved in the preparation of liver slices causes enzymic destruction of the oxidised (DPN) and reduced (DPNH) diphosphopyridine nucleotides of the live cell. The DPN of the cut tissue is apparently not so well protected from the DPN-ase as it is *in vivo*. After 60 min. of continuous Warburg incubation under aerobic or anaerobic conditions, slices of normal livers contained about 50 per cent., and slices of fatty livers 25 to 30 per cent., of the total DPN and DPNH concentrations found in live tissues. In fatty livers the DPNH was almost entirely lost on incubation. When nicotinamide was added to the medium higher concentrations of DPN were found, but DPNH remained unchanged; this indicates the significance of DPN-ase for the destruction of DPN in cut tissues. Intact livers showed changes fundamentally similar but less far-reaching than those in slices.

M. B. Richards.

3937

EMMELOT, P. and BOSCH, L. The influence of oestrogens on the protein and lipid metabolism of the mouse uterus, studied with acetate- 1-C^{14} . *Rec. Trav. chim. Pays-Bas*, 1954, **73**, 874-877.

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[Dept. Biochem., Netherlands Cancer Inst., Amsterdam.]

Ovariectomised mice were given an intraperitoneal injection of 0.1 μg . oestrone, 17 β -oestradiol or oestriol contained in 0.2 ml. ethanolic buffer solution; control ovariectomised animals were injected with buffer alone. The mice were killed 24 hr. later and uterine segments were incubated for 5 to 6 hr. at 37° C. in Krebs Ringer bicarbonate buffer containing $\text{CH}_3^{14}\text{COOK}$. The tissue was then fractionated into proteins, cholesterol and fatty acids and the radio-activity of each fraction was measured.

After injection of the oestrogens the surviving uterine segments showed significantly greater incorporation of ^{14}C into proteins, cholesterol and fatty acids than the control group; the activity was in the order 17 β -oestradiol > oestrone > oestriol (in one experiment oestriol was without effect).—G. A. Garton.

3938

ELIASCH, H., SELLERS, A. L., ROSENFELD, S. and MARMORSTON, J. Protein metabolism in the mammalian kidney. *J. Exp. Med.*, 1955, **101**, 129-134. [Inst. Med. Res., Cedars of Lebanon Hosp., Los Angeles, Calif.]

Significantly higher concentrations of amino-acids and polypeptides were found in the renal vein than in the aorta or the inferior vena cava of the rabbit. The results are consistent with the hypotheses that plasma proteins normally pass the glomerular filter and are re-absorbed and broken down by cells forming the proximal convoluted renal tubule, and that the re-absorbed protein is partly broken down by proteolytic enzymes. It is possible also that the metabolism of cellular proteins of the kidney itself contributes to the amino-acid and peptide content of renal vein blood.—M. B. Richards.

3939

DANCIS, J. and BALIS, M. E. A possible mechanism for disturbance in tyrosine metabolism in phenylpyruvic oligophrenia. *Pediatrics*, 1955, **15**, 63-66. [Labs. Sloan-Kettering Inst. Cancer Res., New York.] Spanish summary. L-Phenylalanine, but not D-phenylalanine or DL-alanine, partly inhibited the breakdown of tyrosine by tyrosinase *in vitro*. It is suggested that L-phenylalanine competes with tyrosine for the enzyme, and that this may explain the beneficial effect of a low phenylalanine intake in phenylpyruvic oligophrenia.—D. Duncan.

3940

KINNORY, D. S., TAKEDA, Y. and GREENBERG, D. M. Isotope studies on the metabolism of valine. *J. Biol. Chem.*, 1955, **212**, 385-396.

[Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

After incubation of rat liver homogenates with DL-valine labelled with ^{14}C in the 4, 4' positions, α -ketoisovaleric, isobutyric, β -hydroxyisobutyric and propionic acids were isolated. The same acids were isolated from rat liver after intraperitoneal injection of labelled valine. Carbon atoms 1 and 3 of propionic acid were equally radio-active, but atom 2 was hardly labelled. Incubation of DL-valine-4:4'- ^{14}C with rat kidney homogenate, which cannot oxidise beyond propionic acid, yielded negligible amounts of $^{14}\text{CO}_2$, but the CO_2 obtained from DL-valine-2- ^{14}C was radio-active. The data support the hypothetical catabolic sequence: valine \rightarrow α -ketoisovaleric acid \rightarrow isobutyric acid \rightarrow β -hydroxyisobutyric acid \rightarrow propionic acid.

A. Hepburn.

3941

RUTMAN, J., RUTMAN, R. J. and TARVER, H. Studies on protein synthesis *in vitro*. 5. The effect of diet and fasting on the incorporation of methionine- S^{35} into liver protein. *J. Biol. Chem.*, 1955, **212**, 95-103. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

For previous parts, see Absts. 709, Vol. 17; 736, Vol. 20; *Arch. Biochem. Biophys.*, 1953, **42**, 387.

Liver slices from rats fed on a protein-free diet, a stock diet or diets containing 15 or 45 per cent. casein were incubated with glucose and DL-methionine labelled with ^{35}S . The incorporation of labelled methionine as such into the liver protein was estimated by hydrolysis and precipitation as benzidine sulphate. It was assumed that such protein was synthesised and that labelling was not due to adsorption or an exchange reaction, that normal liver contained 23 per cent. protein and that the protein synthesised contained normal amounts of methionine.

The highest rate of incorporation of methionine was with the 45 per cent. casein diet, which gave twice the rate with the protein-free diet, the lowest. After 1 day's fasting the rate of incorporation into livers from rats fed on diets containing no protein or 15 per cent. casein was higher than before, but on the high-protein diet the rate decreased. The rate of incorporation in all rats after 4 days' fasting was below that in fed rats.—A. Hepburn.

3942

ÅGREN, G., DE VERDIER, C. and GLOMSET, J. A study of the phosphorus-containing proteins of cells. 2. The turnover rate of P^{32} -labelled phosphoserine of the Schneider protein residues of several rat organs. *Acta chem. scand.*, 1954, **8**, 1570-1578. [Inst. Med. Chem., Univ. Uppsala.]

For part 1, see Abst. 69, Vol. 25.

After phosphate labelled with ^{32}P had been injected into rats the Schneider protein residues (see part 1) from liver, kidney, intestine, spleen and heart were separated into 6 fractions by chromatography. By far the largest active fractions were inorganic P and phosphoserine; the others were complex mixtures of peptides. Specific activity of the phosphoserine fraction reached a peak after about 3 hr., mainly in liver and kidney. Further separation of the fractions led to isolation of phosphoserine in a pure state, and its radioactivity during 30 hr. is tabulated.—A. Hepburn.

3943

FELL, H. B. and MELLANBY, E. The biological action of thyroxine on embryonic bones grown in tissue culture. *J. Physiol.*, 1955, **127**, 427-447. [Strangeways Res. Lab., Cambridge.]

Skeletal explants were obtained from the leg- and wing-buds of embryonic chicks 4 to 7 days old. The limb-buds were classified according to the stage of differentiation. Thyroxine was added at the rate of approximately 16 μg . per 100 ml. medium.

The same concentration of added hormone could be ineffective, stimulatory or toxic according to the stage of differentiation of the bone rudiments at the beginning of treatment. The youngest rudiments were stimulated to grow and the cartilage cells matured more quickly than those of the controls. The older explants were more liable to toxic action and grew much more slowly; leg bones were more severely affected than those of the wing, and of the wing bones the humerus was the most susceptible to damage and the radius the most resistant.—B. W. Simpson.

3944

RUDRA, M. N. The effect of selenium on the isolated rabbit intestines. *Indian J. Physiol. Allied Sci.*, 1954, **8**, 155-157. [Dept. Biochem., Darbhanga Med. Coll.]

Se in concentrations of 100 to 500 μg . per 100 ml. reduced the rate of contraction of segments of rabbit jejunum in Ringer Locke solution. The effect was reversible.—D. Duncan.

See also Absts. 3407, 3523, 3789.

GROWTH AND METABOLISM OF TUMOUR CELLS

3945

EADES, C. H. (Jr.) and POLLACK, R. L. Urinary excretion of fourteen amino acids by normal and cancer subjects. *J. Nat. Cancer Inst.*, 1954, **15**, 421-427. [Dept. Biochem., Univ. Tennessee, Memphis.]

Free and total amounts of 14 amino-acids were estimated microbiologically in 24-hr. specimens of urine from 10 subjects with cancer and 10 without, on the fourth day of a controlled diet. Free and

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total amounts of glycine and histidine in the cancer patients were significantly less than in the controls. The other amino-acids were not significantly different.—A. Hepburn.

3946

ALLISON, J. B., WANNEMACHER, R. W. (Jr.), HILF, K., MIGLIARESE, J. F. and CROSSLEY, M. L. Dietary protein and tumor-host relationship in the rat. *J. Nutrition*, 1954, **54**, 593-600. [Bur. Biol. Res., Rutgers Univ., New Brunswick, N.J.]

Male rats were hosts for the sarcoma R-1 (Babson, *Cancer Res.*, 1954, **14**, 89) and its induction period was taken as the time in which it reached a weight of 0.5 g. The effect of N, N', N'' triethylenephosphoramidate was studied.

A diet with 12 per cent. casein gave the shortest induction period. Adding methionine to the diet or increasing its casein content lengthened the induction period and favoured carcass development. When the drug was injected intraperitoneally, 1 mg. per kg. bodyweight daily, the rate of growth of both tumour and carcass was reduced and the chance of survival increased.—D. Harvey.

3947

FISCHER, W. Durch Buttergelb erzeugte Tumoren. [Tumours produced by butter yellow.] *Arch.*

Geschwulstforsch., 1954, **7**, 301-320. [Inst. Mikrobiol., Jena.]

Five white rats which had received from 20 to 30 mg. butter yellow almost daily in their diet for between 200 and 300 days, total amounts from 1.386 to 2.282 g., developed large liver tumours, which are described in great detail, with photomicrographs. The tumours could be transferred to other rats.

None of 17 mice and only 1 of 10 hamsters given butter yellow have developed tumours so far. The hamster had on the average 30 mg. butter yellow for about 100 days, 2.7 g. in all. The tumour, which is described, was transferred to other hamsters.

The findings are discussed with reference to the possible connection between liver cirrhosis and primary liver cancer in man.—W. M. Deans.

3948

MACDOWELL, E. C. Mouse leukemia. 15. Resistance to spontaneous cases in hybrids induced by milk. 16. Spontaneous cases in strain C58 resisted by milk of old STOLI foster nurses. *Cancer Res.*, 1955, **15**, 19-22; 23-25. [Dept. Genetics, Carnegie Inst. Washington, Cold Spring Harbor, N.Y.]

See also Absts. 3417, 3515, 3534, 3562, 3563, 3600, 3709, 3843.

METABOLISM OF GROWTH, REPRODUCTION AND SENESCENCE

GROWTH

3949

CAUSERET, J. Alimentation et croissance. [Nutrition and growth.] *Bull. Soc. sci. Hyg. aliment.*, 1954, **42**, 228-260. [Inst. Nat. Recherche Agronom.]

A review.

3950

HAHN, L. Doubling the birthweight: a study of the rate of growth during the first five months of life. *Med. Officer*, 1955, **93**, 75-77. [Dept. Maternity and Child Welfare, Leicester.]

The subjects were healthy infants, 171 boys and 149 girls, attending infant welfare centres in Leicester in 1952 and 1953; about two-thirds were breast fed for at least 2 months.

Mean birthweights were 7.6, s. d. ± 1.1 lb. (3.454 ± 0.5 kg.) for boys and 7.2 ± 0.98 lb. (3.273 ± 0.445 kg.) for girls. Time taken to double the birthweight ranged from 8 to 31 weeks, mean 17.98 ± 5.1 weeks for boys and 18.7 ± 4.12 weeks for girls. It increased with birthweight, the coefficients of correlation being $r = +0.64$ for boys and $r = +0.69$ for girls.

Average daily gain for girls was almost constant

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for all birthweights at about 0.87 oz. (24.7 g.); this was also the value for boys of birthweight over 8 lb., but lighter boys put on weight more quickly. Hence a linear regression equation could be used to predict time to double birthweight from birthweight for girls but not for boys. Three simple formulae which can serve as a rough criterion of satisfactory growth are put forward. In the author's opinion, the statement that a baby doubles its birthweight at 5 or 6 months is misleading and should be dropped from textbooks.

W. M. Deans.

3951

THOMSON, J. Height and weight at three years. *Health Bull., Dept. Health Scot.*, 1955, **13**, 16-17.

Mean weights and crown-heel and crown-rump lengths are given for healthy Edinburgh children aged 3 years, 109 boys and 101 girls. Comparison with Edinburgh child welfare clinic data of 30 years ago showed a rise of about $2\frac{1}{2}$ lb. in weight and 1.27 inches in length, of which 2 lb. and 0.9 in. are accounted for by the first year of life (Abst. 1956, Vol. 25). Body length was significantly correlated with height of mother.—W. M. Deans.

3952

ACHESON, R. M. and HEWITT, D. **Physical development in the English and the American pre-school child. A comparison between findings in the Oxford and the Brush Foundation Surveys.** *Human Biol.*, 1954, **26**, 343-356. [Social Med. Unit, Univ. Oxford.]

The 500 children whose development was studied from birth to 5 years of age in the Oxford Survey were from different economic levels. The Brush study of Cleveland children aimed at describing the process of development in an optimum environment.

Data on height and skeletal maturity according to Todd's standard of boys and girls in both surveys are tabulated according to calendar age. Increases in height and skeletal maturity between the ages of 2 and 5 years and increases in height of children in the same phase of skeletal maturity are tabulated also. On the average, the Oxford children were shorter and skeletally less mature than the Cleveland children. The difference in maturity was slightly less for girls than for boys. The differences were similar to those found between different economic strata within the Oxford Survey.—F. C. Aitken.

3953

DREIZEN, S., CURRIE, C., GILLEY, E. J. and SPIES, T. D. **The effect of nutritive failure on the growth patterns of white children in Alabama.** *Child Development*, 1953, **24**, 189-202. [Dept. Nutrit. Metabol., Northwestern Univ., Chicago, Ill.]

In continuation of previous studies of "chronic nutritive failure" in children (see Abst. 1012, Vol. 18) mean heights in inches and weights in lb. and standard deviations are tabulated at 3-month intervals from 3 years to 15 years 9 months for test groups of 267 boys and 294 girls with chronic nutritive failure and control groups of 1182 boys and 1222 girls without evidence of nutritive failure. The results are plotted on the Wetzel grid. All the children were of Anglo-Saxon extraction and lived in or near Birmingham, Alabama.

At almost every age the mean height of the control children exceeded that of the children with nutritive failure, though not by more than one standard deviation. Differences in mean weights generally exceeded one standard deviation. Both sets of differences tended to be greater and more persistent for boys than for girls. The mean height of the boys with nutritive failure at 15 years 6 months was 64.5 in., a height reached by the control boys at 14 years; that of the girls with nutritive failure at 15 years 3 months was 62.7 in., reached by the control girls at 14 years. Nevertheless, individual values overlapped to some

extent and it is concluded that though "failure to reach the average height, weight or speed of growth for a particular sex at a particular age is suggestive of poor quality growth due to faulty nutrition, corroborative clinical evidence is essential in the final evaluation of the nutritional status of the child."—W. M. Deans.

3954

MEREDITH, H. V. and MEREDITH, E. M. **The body size and form of present-day white elementary school children residing in west-central Oregon.** *Child Development*, 1953, **24**, 83-102. [State Univ. Iowa, Iowa City.]

This forms the concluding section of a study of white children in Oregon in 1950 to 1952; for previous parts see *Growth*, 1951, **15**, 39; *Absts.* 978, Vol. 22, 715, Vol. 23 and Title 4976, Vol. 24.

Mean, standard error, standard deviation and 5th, 10th, 30th, 70th, 90th and 95th percentiles are tabulated for weight, height and 9 other body measurements, in kg. and cm., for groups each of over 200 boys of 7 and 9 and of about 150 girls of 7, 9 and 11 years, mainly of northwest-European descent, attending public elementary schools in Eugene and 2 other places in Oregon.

The children were taller than Californian children of the nineties (Boas, *Science*, 1895, **1**, 402) by 2½ to 3 inches, and heavier by 7 lb. at age 7 and by 10 to 15 lb. at ages 10 and 11, and were significantly taller and heavier than children in California, Utah, Texas, Maryland, Virginia and Minnesota in the thirties and than English children in 1948, according to Sutcliffe and Canham, "The heights and weights of boys and girls" (John Murray, 1950).

Tables are given for 5 ratios of body measurements which indicate slenderness or stockiness and the relative dimensions of the upper and lower halves of the body. Examples are given of the use of the tables to indicate body form, and age changes and sex differences in body form are discussed.—W. M. Deans.

3955

EPPRIGHT, E. S. and SIDWELL, V. D. **Physical measurements of Iowa school children.** *J. Nutrition*, 1954, **54**, 543-556. [Iowa Agric. Exp. Stat., Ames.]

Measurements were made of height, weight, chest breadth, hip width and leg girth on 1200 Iowa schoolchildren aged from 6 to 18 years and chosen at random throughout the State. Nutrient intakes and nutritional status were studied concurrently (see *Absts.* 4045-4047).

The means at successive ages agreed closely with those obtained for Iowa City children. Mean weights at most ages tended to be greater than those obtained in Iowa 10 years earlier, but mean

heights were similar. By most standards of comparison fewer girls than boys were "normal"; at 12, fewest children were within the normal range. More girls than boys were overweight, and more older girls than younger ones. Major differences in mean body measurements of children of successive ages are compared with mean nutrient intakes. Increments in mean bodyweight from year to year were irregular for boys and regular for girls. During adolescence mean weight and height of girls tended to increase although the average nutrient intake failed to increase or, in some instances, notably Ca, decreased with age.

G. F. Garton.

3956

YANO, K. An analytical study on the annual physical growth of school children in Japan. *Kurume Med. J.*, 1954, 1, 109-112. [Dept. Environmental Hyg., Sch. Med., Kurume Univ., Kurume-shi, Japan.]

The growth of Japanese children was seriously affected by the war [no data are given]. The rate of relative increase in height and weight (see Abst. 965, Vol. 25) was calculated for 3 sets of children grouped according to the year of their entering primary schools, 1900 to 1911, 1916 to 1930 and 1941 to 1947. The ages at which these rates were at their maximum were, for heights: boys, 14-1, 13-7, 14-7 and girls 12-3, 11-9, 12-0 years, and for weights: boys 14-2, 13-9, 14-7 and girls 12-5, 12-3, 12-8 years. It is concluded that the children in the second group grew up under conditions more favourable than those which existed during war time for the third group.—D. Harvey.

3957

DU PAN, R. M., MENTHA, G. and PROBST, J. H. Comparaison entre les mensurations du poids et de la taille des enfants à Genève, en Suisse et dans le monde. [Comparison between measurements of the weight and height of children in Geneva, in Switzerland and elsewhere.] *Ann. paediat.*, 1954, 183, 362-363. *Proc.* [Geneva.]

3958

HAIGHT, T. H. and PIERCE, W. E. Influence of small doses of antibiotics on the weight behavior of young males. *J. Lab. Clin. Med.*, 1954, 44, 807-808. *Proc.* [Great Lakes, Ill.]

3959

TYLER, F. T. Organismic growth: P-technique in the analysis of longitudinal growth data. *Child Development*, 1954, 25, 83-90. [Univ. California, Berkeley.]

Until recently most studies of growth have depended on cross-sectional data obtained from

groups of subjects of different ages more than on longitudinal data from the same subjects at different times. Statistical methods for longitudinal data have not been extensively investigated. An example is given of the application to this purpose of factor analysis, originally developed in connection with intelligence tests. The data consist of the rates of increment, over 14 successive intervals of about 6 months each, of 12 physical measurements made on a single subject in a study of adolescent growth. Measures are obtained of the correlation over time between each pair of rates of increment, and 3 factors are extracted from the correlation matrices obtained. For the most part the factor loadings are not significant, indicating that there was not a high degree of unity in the rates of growth of the 12 physical characteristics of the adolescent boy in question.

I. McDonald.

3960

DE WIJN, J. F. Over de methodiek van het beoordelen van lichamelijke groei en ontwikkeling met behulp van standaard-groeilijnen. [Methods for assessing bodily growth and development with the help of a standard growth curve.] Over factoren, die groei en ontwikkeling kunnen beïnvloeden. [Conditions influencing growth and development.] [Nederlands Inst. Praeventive Geneesk.] *Maandschr. Kinderheilk.*, 1954, 22, 378-396; 418-429. English summaries.

Modifications are suggested in the Wetzel grid, and curves are presented in illustration for an adolescent boy and girl, for groups of children aged from 7 to 9 years from 2 different social classes, and for groups of Javanese and Toradja girls in Indonesia.

The conditions, other than directly nutritional ones, which may influence the growth curve of human beings are reviewed.—E. M. Hume.

3961

DUPERTUIS, C. W. and MICHAEL, N. B. Comparison of growth in height and weight between ectomorphic and mesomorphic boys. *Child Development*, 1953, 24, 203-214. [Sch. Med., W. Reserve Univ., Cleveland, Ohio.]

From 125 young men, former subjects of the Brush Foundation Study of Cleveland children, used for a somatotype study, 26 ectomorphic, i.e., "characterised by linearity and delicacy of body structure", and 28 mesomorphic, i.e., "with pronounced development and ruggedness of structure", were selected for a retrospective study of their growth. For both groups the mean age was about 21 years but the range was from 16 to 30; the mean height of the ectomorphs was then 2-3 in. greater than that of the mesomorphs, and their

mean weight was 26.7 lb. less. Curves of mean height and weight showed that the ectomorphs were taller than the mesomorphs after 4 years of age, but not significantly so, and significantly lighter at almost every age, and they had a significantly higher ratio of height : cube root of weight, which began to level off at about 11 years as against 9 for the mesomorphs. At every age mesomorphs had achieved a significantly higher percentage of their final adult stature than ectomorphs.

It is concluded that the type of body build tends to persist throughout childhood and adolescence and that in view of the differences in growth pattern, further studies of the growth of children of different body types are required.

W. M. Deans.

3962

NICHOLSON, A. B. and HANLEY, C. Indices of physiological maturity: derivation and interrelationships. *Child Development*, 1953, 24, 3-38. [Inst. Child Welfare, Univ. California.]

The data for this statistical examination of indices of maturity came from a longitudinal study up to age 18 of about 160 boys and girls representative of those born in Berkeley, California in 1928 and 1929.

Indices of maturity defined and considered for both sexes are age at reaching maximum growth (i.e., chronological age at which the largest increment in height occurs), skeletal development, percentage of mature height, age of walking; for girls, age at menarche, development of breasts, development of pubic hair; for boys, amount and pattern of pubic hair and size of genitalia.

A factorial analysis by Spearman's method of the intercorrelations of these indices is made, except age of walking, which was not correlated with the others. For each sex this yielded a general factor which accounted for well over half the variance of each index. In both sexes the best single measure of maturity was the age of reaching 90 per cent. of mature height. Other good indices, which could be used in the absence of adequate longitudinal data, were, for girls, age of reaching skeletal age 12.75 (Todd's standard), stages of development of pubic hair and breasts, and age at menarche; for boys, age of reaching skeletal age 11.25, age of reaching skeletal age 14.75, and stages of development of genitalia.

Multiple regression equations were used to obtain an overall maturity score for individuals.

Some of the findings are presented in tables and histograms. The mean age of reaching 90 per cent. of mature height was for boys 13.7 ± 1.04 (standard deviation), for girls 11.4 ± 0.78 years. The mean age of maximum growth was 13.77 ± 1.17 for boys and 11.51 ± 1.13 for girls. Sexual development in boys began to appear at mean age 11.8 ± 1 and reached adult stage at mean age

15.2 ± 1 . For breast development in girls the corresponding ages were 10.6 ± 1.2 and 13.9 ± 0.9 . The mean age of menarche was 12.8 ± 1.1 years.

W. M. Deans.

3963

PENDSE, G. S. Refraction and body-growth. *Indian Med. Res. Mem.* No. 38, August 1954, pp. vii + 94. [Eye Clin., Poona 2.]

About a quarter of this memoir consists of introductory matter on problems of refraction and body growth and on elementary statistical methods.

The subjects belonged to 2 communities, an "advanced" one, middle-class, mostly professional, people belonging to 2 endogamous Brahmin sub-castes, vegetarian but not rigidly so, living in a particular part of Poona, and a "backward" one, of several "untouchable" sub-castes, menially employed in the city, non-vegetarian but with a low standard of living, and anthropomorphically different from the Brahmins.

Mean heights (in.) and weights (lb.) are given in tables for unselected boys (497) and girls (685) aged from 6 to 18 years of the advanced community. Girls were taller than boys from 8 to 14 but the difference was significant only at ages 10 and 11. Weight was not studied closely, as it turned out not to be connected with refraction. Pubescence, judged by pubic hair, was studied in 584 unselected boys of this community aged from 7 to 16; at ages 12, 13 and 14 the more mature boys were taller than the less mature. At ages 6 to 12 the untouchables [number not stated] were on the average 1 to 2 in. taller than the Brahmins [whether the comparison is for both sexes together or only for males is not clear], the differences being significant at the 1 per cent. level.

The difference in mean refraction (measured under atropine by one observer) between 590 Brahmins and 645 untouchables aged from 6 to 12 was highly significant; the untouchables were more inclined to be myopic, contrary to the idea formerly prevalent that myopia is associated with educational stress. A sub-group of the Brahmins, believed on the basis of blood-group studies to be genetically distinct, did not differ in refraction from the others.

Results for 1182 Brahmins, namely, the 590 between 6 and 12 already referred to (162 boys and 428 girls) and 592 between 12 and 18 (335 boys and 257 girls) showed a general trend towards myopia with increasing age. There was no significant sex difference except at age 12, when the girls were more myopic than the boys. The 645 untouchables between 6 and 12 showed the same age trend. These groups did not include subjects with myopia exceeding - 6 D (dioptries).

In the group of Brahmins between 6 and 12 the children above average height were more myopic than those below, but this effect disappeared when

N.A. and R., July 1955

the effect of age was eliminated. But 25 subjects between 12 and 18, with myopia exceeding - 6 D but without degenerative change, were significantly tall for their age. High myopia seemed to be associated with rapid puberty changes, though biochemical studies showed no difference in serum inorganic P, serum Ca or plasma protein. Among the younger children those with high myopia had significantly low Hb and serum Ca values compared with non-myopic children, but there was nothing to show whether the defect was metabolic or nutritional in origin.—W. M. Deans.

3964

ROSENBAUM, S. **Heights and weights of the Army intake, 1951.** *J. Roy. Statistical Soc., Ser. A (Gen.)*, 1954, **117**, 331-347.

An analysis is made of height, weight and age data obtained in 1951, for 134,317 men who joined the army in that year, the measurements being recorded during the first days of a man's service. Details are recorded separately for National Servicemen and Regular Army recruits. The latter ranged in age from 17 to 49 and most of the former were 18 years old and none was over 24. The older National Servicemen constitute a selected group, having had their call-up deferred for educational or other reasons. The only earlier results with which comparisons can properly be made relate to recruits aged from 20 to 21 in 1939. Compared with the Regular recruits of 1951 of similar age the former were on the average half an inch shorter and 6 lb. lighter. On comparing recruits of the same year of birth, the mean increase in weight between 1939 and 1951 was found to be 12 lb.

Regression analyses were made of weight on height and of height on weight, and are used to produce standard tables of weight for given age and height. Over the groups from 20 to 40 years old there is a steady increase in weight, totalling 8 lb., and a decrease in height, totalling half an inch. Supplementary measurements on a random sample of the National Servicemen showed that during the 3 months of initial training in the army their rate of gain in weight was from 3 to 4 times as great as in the preceding 2 months.

I. McDonald.

3965

WEIKEL, J. H., BONNER, J. F. and NEUMAN, W. F. **Skeletal growth of the rat.** *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 122-124. [Div. Pharmacol., Dept. Radiation Biol., Sch. Med. Dent., Univ. Rochester, N.Y.]

Rats aged from 15 to 170 days, 225 in all, were killed and skeletons were ashed, individual bones of the limbs, skull and 4 lumbar vertebrae from the males being ashed separately. Skeletal weight is presented graphically as a function of bodyweight

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on a logarithmic scale; the function relating the 2 variables was the same as that for a colony of rats described earlier (Abst. 3207, Vol. 16). Such variations occurred among skeletal components as to make impracticable the use of any one bone as quantitatively representative of the skeleton. An equation for comparing the growth rates of the different bones, which requires only the weights at 2 ages after weaning, is proposed.—G. F. Garton.

See also Absts. 3701, 4241.

REPRODUCTION AND LACTATION: MAMMALS

3966

HUMPHREYS, R. C. **An analysis of the maternal and foetal weight factors in normal pregnancy.** *J. Obstet. Gynaecol. Brit. Empire*, 1954, **61**, 764-771.

The analysis was based on the records of 1000 normal mothers, booked hospital patients, who were delivered during 1944. The criteria of normality were that mothers should be free from pre-existing disease, should not develop toxæmia of pregnancy, and should produce normal live babies within 20 days of the expected date. They were also selected on grounds of first attendance at the antenatal clinic at or before the twelfth week of pregnancy and last attendance within 7 days of delivery. The average weight gain in the series was 13.7 lb., S.D. 5.71, in the second trimester and 10.6 lb., S.D. 5.68, in the third. It is assumed that the gain in the first trimester is negligible. Primiparae gained slightly more than multiparae and younger women more than older. There was evidence, not reaching a statistically significant level, that weight gains were less as weight at 12 weeks was greater. Greater weight gains were associated with greater birthweights, but no relation with duration of labour was found.

A. M. Thomson.

3967

SIMPSON, A. S. **The significance of haemoglobin estimations in pregnancy.** *J. Obstet. Gynaecol. Brit. Empire*, 1954, **61**, 807-810. [Ashton-under-Lyne, Lancs.]

Hb and haematocrit measurements were made at intervals during pregnancy on 216 women, and showed the expected decline which was attributed to haemodilution of pregnancy. On the other hand, mean cell Hb concentrations (M.C.H.C.) calculated from the data remained fairly stable, and it is argued that only the M.C.H.C. can be used reliably to indicate the presence of anaemia during pregnancy.—A. M. Thomson.

3968

BROWN, T. **Electrophoretic analysis of serum proteins in pregnancy: a preliminary study.** *J. Obstet. Gynaecol. Brit. Empire*, 1954, **61**,

781-787. [Dept. Res., Royal Maternity Hosp., Glasgow.]

Sera from 35 women, 5 non-pregnant and 10 in each trimester of pregnancy, were quantitatively analysed by paper electrophoresis. Total serum proteins and albumin rose slightly above the non-pregnant levels in the first trimester, then progressively declined by 11.5 and 32 per cent. from early to late pregnancy. Total globulin and the α_1 , α_2 and β -fractions correspondingly increased by 20, 7, 66 and 37.5 per cent. and γ -globulin decreased by 22 per cent. The albumin:globulin ratio fell steadily from 1.5 in the non-pregnant women to 0.8 in late pregnancy.—A. Hepburn.

3969

PFÄU, P. Die Serumverhältnisse während der normalen und gestörten Schwangerschaft. (Papierelktrophoretische Untersuchungen.) [Serum ratios during normal and disordered pregnancy. (Studies with paper electrophoresis.)] *Arch. Gynäkol.*, 1954-55, 185, 188-207. [Frauenklin., Univ. Heidelberg.]

A study was made of the agreement between estimates of serum albumin and α , β , and γ -globulin by paper electrophoresis made in duplicate at the same time, with different electrophoresis chambers and at intervals of 1, 2, 4 and 8 days after the blood was taken. A comparison was also made between the methods of Grassmann and Antweiler with 1 normal and 12 pathological sera. From these the conclusion is that results got by different methods are comparable only within limits.

Next, results for total protein, by the Zeiss immersion refractometer, and its fractions are presented for 20 healthy non-pregnant women and 10 pregnant women in each month of pregnancy from the first to the tenth. The means for the normal women were: total 7.5 \pm 0.09 g. per 100 ml. and, per cent., albumin 63.8, α -globulin 10.8, β -globulin 11.5 and γ -globulin 15.0. The means for the pregnant women, for the first and last months, in the same order were: 7.4 \pm 0.11 and 6.9 \pm 0.13 g. and 56.2 and 51.1; 14.4 and 18.1; 10.2 and 14.0; and 19.4 and 16.9 per cent. On the assumption that plasma volume is 2236 ml. in the non-pregnant and 3033 ml. in the pregnant woman, increases in total albumin and in all globulins occur. Mean data are given for women [no number stated] in the eleventh and twelfth months as total protein 7.0 \pm 0.88 g. and fractions 50.5, 18.3, 14.3 and 17.6 per cent.

Data are presented also for 20 patients with hyperemesis, within normal limits, and 48 with toxæmia in later pregnancy (one eclamptic), which are summed up as showing a fall of total albumin and a greater than normal rise of total globulins.—I. Leitch.

3970

TATUM, H. J. Compartmental distribution and shift of water and electrolytes in pre-eclampsia. 2. A comparison of the effects of isotonic and hypertonic glucose when administered intravenously to patients with pre-eclampsia. *Amer. J. Obstet. Gynecol.*, 1955, 69, 415-424. [Dept. Obstet. Gynaecol., Sch. Med., Louisiana State Univ., New Orleans.]

For part 1 see Abst. 868, Vol. 25.

A litre of 5 or 20 per cent. glucose solution was infused intravenously in 20 min. into normal pregnant and pre-eclamptic patients. Packed cell volumes (P.C.V.) and serum Na, K and Cl were estimated immediately before and 10 min. after the infusion and again one hour later. Pre-infusion plasma volumes were estimated by a dye method, and the changes consequent on infusion were calculated from the P.C.V. and electrolyte changes and the urine output.

In all groups, glucose infusion led to transient haemodilution. With 5 per cent. glucose there was a net gain of body water, with evidence of retention in the extravascular space in pre-eclampsia. Hypertonic glucose produced an output of urine in pre-eclampsia equal to or slightly greater than the volume of fluid administered. Neither 5 nor 20 per cent. solution significantly affected Na retention or excretion.

A. M. Thomson.

3971

SEITCHIK, J. and ALPER, C. The body compartments of normal pregnant, edematous pregnant, and pre-eclamptic women. *Amer. J. Obstet. Gynecol.*, 1954, 68, 1540-1545. [Div. Women, Hahnemann Med. Coll., Philadelphia, Pa.]

Antipyrine and mannitol space were measured in 4 non-pregnant, 4 normal pregnant, 8 pre-eclamptic, and 3 oedematous pregnant women without pre-eclampsia. From the data a number of calculations are made which, if the assumptions on which they are based are correct, indicate that extracellular fluid increases in normal pregnancy proportionately to the increase in lean body tissue, i.e., the ratio cell-mass:extracellular fluid remains relatively constant. In untreated pre-eclampsia and in pregnant women with oedema the ratio is reduced, indicating the presence of excess extracellular fluid. Different results reported in the literature, based on estimation of extracellular fluid volume by the inulin space method, are criticised on technical grounds.—A. M. Thomson.

3972

DA CUNHA, D. P. Phosphatase et grossesse. [Phosphatase and pregnancy.] *Arch. portugaises Sci. biol.*, 1952-53, 11, 1-2. [Inst. Rocha Cabral, Lisbon.]

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Alkaline phosphatase values did not differ in the serum in groups of 8 women in the last months of pregnancy, in labour, and suffering from eclampsia.—E. M. Hume.

3973

WÖHLER, F. Zur Physiologie und Pathologie des Speichereisens. 3. Über den intermediären Eisenstoffwechsel der Plazenta. [Physiology and pathology of storage of iron. 3. Intermediary iron metabolism in the placenta.] *Deutsch. med. Wochenschr.*, 1955, **80**, 30-32; 41; 49. [Med. Klin., Univ. Freiburg i. Br.]

For previous parts see Titles 4099, Vol. 24; 2364, Vol. 25.

Experiments on rabbits in late pregnancy given labelled ferrous sulphate intravenously suggested that uptake of Fe from maternal plasma is by way of ferritin in the chorionsyncytium or chorionic epithelium. Very large injections of *ferrum vitis* into 3 other rabbits showed that the placenta did not block the absorption of Fe.

Preliminary studies of human placentas *in vitro* showed that about 21 mg. ferritin per cent. was present in 3 placentas from healthy pregnancies; in 7 from disturbed pregnancy it ranged from 13 to over 33 mg. per cent. In all the percentage of Fe in the ferritin was from 21 to 23 per cent.

W. M. Deans.

3974

FÖLMEIER, W. Wachstumsfördernde Stoffe in der Placenta. [Growth-promoting substances in the placenta.] *Arch. Gynäkol.*, 1954-55, **185**, 179-187. [Frauenklin., Univ. Frankfurt a.M.]

Placentas were obtained at operations on women in early and in late pregnancy, in the first 4 months and in the eighth to tenth months, respectively. Dried powdered placenta was added to the water in which were frog tadpoles 10 days old and the growth of the tadpoles was studied for 24 days. With early and late placenta, but especially the latter, growth of the tadpoles was greater than that of normal controls.

A water-soluble preparation of chorionic gonadotropin and one of follicle-stimulating hormone from pregnant mare's serum also stimulated growth of tadpoles, but one of corpus luteum hormone did not. Extracts from late placentas were separated into 3 fractions; in the fraction which had the greatest effect on the growth of tadpoles neither chorionic gonadotropin nor follicular hormone could be identified. It is concluded that placenta contains another substance which promotes growth in embryonic tissues.—D. Duncan.

3975

AJELLO, P. and LOMBARDO, N. L'influenza delle sostanze gonadotrope sulla ovulazione della capra siciliana. [Effect of gonadotropic sub-

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stances on ovulation in the Sicilian goat.]

Zootec. Vet., 1955, **10**, 2-12. [Ist. Ostet. Vet., Univ. Messina.] English summary.

Ovulation was induced in 37 out of 41 Sicilian goats by a single intramuscular injection of gonadotropic substances, of either the follicle-stimulating or the luteinising type. Ovulation was generally preceded by oestrus, and occurred immediately when the treatment was given in the normal breeding season, or later when it was given out of season. The rate of ovulation could not be increased above the normal.—T. D. Bell.

3976

CHINARD, F. P., DANESINO, V., HUGGETT, A. ST. G., PAUL, W. M. and REYNOLDS, S. R. M. The passage of sugars across the monkey placenta. *J. Physiol.*, 1955, **127**, 8P-9P. [Dept. Embryol., Carnegie Inst. Washington, Baltimore, Md.]

3977

ROSENFELD, I. and BEATH, O. A. Effect of selenium on reproduction in rats. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 295-297. [Dept. Agric. Res. Chem., Univ. Wyoming, Laramie.]

Groups of 5 pregnant female rats were fed on Purina chow, and some of them received 1.5, 2.5 or 7.5 p.p.m. Se as potassium selenate in the drinking water. Experiments lasted a year and each rat was mated 5 times.

Rats given the 2 lower concentrations of Se had normal litters and reared them; second generation rats had normal litters, but the number of young reared fell by about half.

Rats which were first given 7.5 p.p.m. Se in the water 5 to 8 days before parturition gave birth to normal litters but reared only 13 per cent. of the young. They failed to conceive again when mated with males given Se. The young rats of the first litters, continued on the high Se intake, grew slowly and failed to reproduce. Females given Se and mated with normal males failed to reproduce, but normal females mated with males given Se produced and reared normal litters.—D. Duncan.

3978

MELAMPY, R. M. and COVAZOS, L. F. Comparative study of lipids in vertebrate testes. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 297-303. [Iowa Agric. Exp. Stat., Iowa State Coll., Ames.]

Testicular tissue was prepared for histological examination from sexually mature bulls, rams, boars, rats, guineapigs, cocks, horned lizards (*Phrynosoma cornutus*), grass frogs (*Rana pipiens*) and bluegill fish (*Lepomis macrochirus*).

Sudan dyes revealed the presence of lipids in the interstitial cell cytoplasm, basement membrane, cytoplasm of the Sertoli cells, spermatogonia,

spermatocytes and spermatids of each species except the bluegill fish. In that species lipids were present in the germ cells and the interlobular connective tissue sheath. Other stains suggested the presence of ketosteroids in the Leydig cells of all the species examined except boar, cock and fish. Phospholipins were detected in the testicular cells of all species examined; bluegill fish testes were not examined.

It is suggested that the similarity of the patterns of lipid distribution indicates a structural and metabolic importance in spermatogenesis.

G. A. Garton.

3979

McPHERSON, E. A. **Artificially induced lactation in sheep.** *Vet. Rec.*, 1955, 67, 200-202. [Dept. Vet. Med., Royal (Dick) Sch. Vet. Studies, Univ. Edinburgh.]

Lactation was induced in ewes by implantation or intramuscular or subcutaneous injection of stilboestrol, and they then reared healthy orphan lambs. Implantation of a single dose of 105 mg. gave udder development and milk secretion within 2 to 5 days. In 2 sheep an intramuscular injection of 5 mg. was given on the fifth day to hasten development. Daily intramuscular injections of 4 mg. for 15 days were equally successful, except that the development took longer. Forty mg. by subcutaneous injection in one dose gave quicker results, and the ewes produced more milk than the lambs required. In animals for which no lamb was available milk flow continued for 6 weeks, without any sign of mastitis. In the following season the ewes, which had been barren for 2 years, reproduced normally.—T. D. Bell.

3980

TURNER, H. G. **Changes in capacity of the udder of the dairy cow during the course of lactation.** *Austral. J. Agric. Res.*, 1955, 6, 145-160. [Div. Animal Health Prod., C.S.I.R.O., Animal Health Res. Lab., Melbourne.]

The udder capacities of 7 cows were studied in a series of observations with long and short intervals between milkings, at arbitrary intervals during lactation. The udders were emptied with the aid of injections of posterior pituitary extract at the beginning and end, and intramammary pressure was measured by a specially designed tympanometer applied to the surface of the udder.

When yields were plotted against intervals between milkings it was found that no significant inhibition of secretion occurred before 20 hr. Maximum yields were attained after intervals of 35 hr. It was concluded that udder capacity does not remain constant during lactation, but declines in proportion to the decline in daily milk yield.

Intramammary pressure plotted against the amount of milk in the udder at the time of each

reading showed that the maximum pressure attainable by allowing the udder to fill with milk declines with advancing lactation. Milk secretion was inhibited at a lower pressure in late lactation. The physiological implications of these results are discussed in detail.—J. N. Aitken.

3981

WRIGHT, W. E., CHRISTIAN, J. E. and ANDREWS, F. N. **The mammary elimination of radioiodine.** *J. Dairy Sci.*, 1955, 38, 131-136. [Sch. Pharm., Purdue Univ., Lafayette, Ind.]

Iodocasein labelled with ^{131}I and free of iodide was given by mouth to a lactating rabbit. Monoiodotyrosine, diiodotyrosine and iodide were detected in the milk, but no thyroxine.

Two lactating goats were given by mouth 1.5 g. radio-active iodocasein per 100 lb. bodyweight and were milked every 12 hr.; chromatograms of skimmed milk samples from the first 10 collections were prepared. Of the dose administered 15.5 per cent. was found in the milk, but no organic iodine compound. In 4 other experiments in which radio-active NaI was given to lactating goats, about half was eliminated in the milk as iodide. In one experiment the excretion of a dose of Na^{131}I in the milk, urine and faeces was 45.3, 40.7 and 2.3 per cent.—B. W. Simpson.

3982

SCHULTZE, M. O. **Weight increments of suckling rats as affected by litter size and maternal diet.** *J. Nutrition*, 1954, 54, 453-460. [Dept. Agric. Biochem., Univ. Minnesota Inst. Agric., St. Paul.]

Mother rats received diets of yellow maize, sucrose and casein or rolled oats and casein. They were allowed to nurse their entire litters and only data relating to litters in which none of the young died are presented. For each diet, weight increments from birth to 16 days of age per rat and per litter are tabulated for litters of 1 to 14 young. With increasing number of young in the litter, weight increment per rat decreased and weight increment per litter increased. Only when litters contained 7 or more young did the superiority of the rolled oats and casein diet become apparent.

F. C. Aitken.

See also Absts. 3342, 3348, 3385, 3503, 3621, 3682, 4070, 4071, 4223.

REPRODUCTION : BIRDS

3983

THIELKE, O. W. (with GOWIN, E.) **Über die Neubildung von Cholin-plasmaplogen im bebrüteten Hühnerei. [Formation of choline-plasmaplogen in the incubated hen's egg.]** *Hoppe-Seyler's Ztschr.*, 1955, 299, 151-155. [Med. Klin., Justus Liebig-Hochsch., Giessen.] English summary.

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In yolks of 5 infertile hen eggs most of the plasmalogen was in the choline phosphatide fraction and in 6 fertile eggs incubated for 11 days there was an increase of about 3 times in the plasmalogen in this fraction, from 0.16 to 0.48 per cent. The small amount of plasmalogen in the phosphatide-poor fraction did not increase much.

Plasmalogen is thought to be formed from ester phosphatide.—D. Duncan.

3984

NOZAKI, H., HORII, S. and TAKEI, Y. [Utilisation of shell Ca by chick embryo.] *Bull. Nat. Inst. Agric. Sci., Japan* [G], 1954, No. 9, 89-95. In Japanese: English summary.

⁴⁵Ca was administered by mouth to 6 laying hens; the first 2 eggs subsequently laid by each were incubated and changes in the distribution of ⁴⁵Ca were estimated on the fifth, twelfth and eighteenth days and at hatching.

During incubation the shell lost about 150 mg. Ca. In the early stages of embryonic development the Ca was derived mainly from the yolk and white. In the middle stages the Ca of the amniotic and allantoic fluids was derived mainly from the yolk. In the last half of incubation more than half the Ca in the embryo came from the shell, one-quarter from the yolk and the rest from the white. In the final stage yolk was the main supply of Ca to the embryo, the yolk receiving a considerable supply of Ca from the shell.—J. S. Thomson.

See also Absts. 3504, 3586.

SENESCENCE

3985

BOURLIÈRE, F. Alimentation et longévité. [Nutrition and longevity.] *Bull. Soc. sci. Hyg. aliment.*, 1954, 42, 268-276. [Fac. Méd., Paris.] A review.

3986

GILLUM, H. L. and MORGAN, A. F. (with JEROME, D. W., VOTAW, M. H. and SNOWDEN, M.) Nutritional status of the aging. 1. Hemoglobin levels, packed cell volumes and sedimentation rates of 577 normal men and women over 50 years of age.

GILLUM, H. L., MORGAN, A. F. and WILLIAMS, R. I. 2. Blood glucose levels. *J. Nutrition*, 1955, 55, 265-288; 289-303. [Dept. Home Econ., Univ. California, Berkeley.]

1. Physical examinations, medical and dietary histories, 7-day diet records and urine analyses were made on 280 men and 297 women over 50 years of age in San Mateo County, California. More than 80 per cent. lived in comfortable middle-class circumstances and all, except 47 who lived in a county home, lived in their own homes.

The average Hb value of men living in their own

homes was 14.5 ± 0.3 g. per 100 ml. blood, compared with 13.4 ± 0.3 for the women. After the age of 75 both values declined and the difference between men and women was not significant. The packed cell volume of men living in their own homes was on the average 47.1 ± 0.7 per cent. and that of women 44.6 ± 0.5 ; the mean corpuscular Hb was 31 and 30 per cent. Eighty-four per cent. of the men and 52 per cent. of the women had sedimentation rates of 0 to 20 mm. per hr. and 16 per cent. of the men and 48 per cent. of the women from 21 to 50. From the diet records it was established that the men living in their own homes consumed from 15 to 34 per cent. more energy and protein and up to 50 per cent. more Fe per kg. bodyweight than the women in the same age groups. In both sexes protein supplied 14 per cent. of the total energy. There was a positive correlation between dietary protein and Fe and Hb values.

The men in the county home had Hb values similar to those living in their own homes, but the packed cell volume was lower. Although the women had comparable intakes of protein and Fe in proportion to total energy and were all except one past the menopause they had low Hb values in comparison with men of the same age and circumstances. At every level of protein and Fe intake the percentage of men with an Hb value of 14 g. per cent. or more was about twice that of the women, at least up to 75 years of age.

2. Of the same 577 normal men and women the venous blood sugar values of 430 who had eaten a carbohydrate meal 2 hr. or more previously were recorded. Forty-five men were living in the county home and the other subjects in their own homes.

The average venous blood sugar value was 101 mg. per 100 ml. The values, when calculated for 5-year age intervals and separated by sex, showed little variation, but there was a slight indication of an increase with age in the women. Hyperglycaemia occurred in 2.1 to 5.6 per cent. of men and 1.3 to 4.4 per cent. of women. Glycosuria occurred to different extents in 36 subjects, in 18 of whom urine sugar was over 130 mg. per 100 ml. Glycosuria and hyperglycaemia occurred in 8 men and 2 women; 4 women and 14 men had glycosuria but normal or low blood sugar values.

The men in the county home over 65 years of age had an average blood sugar value of 85 mg. per 100 ml., which was significantly lower than that of men of the same age living at home. Six subjects had hyperglycaemia and 3 had diabetes.

In the women there was a moderate positive correlation between fat intake and blood sugar; there was no correlation between blood sugar and carbohydrate or protein intake in either men or women.—G. F. Garton.

See also Abst. 3870.

EXPERIMENTAL STUDIES OF IMMUNITY AND MICRO-ORGANISMS

- 3987
DUBOS, R. J. Effect of metabolic factors on the susceptibility of albino mice to experimental tuberculosis. *J. Exp. Med.*, 1955, **101**, 59-84. [Labs., Rockefeller Inst. Med. Res.]
- Mice after weaning received Purina chow to appetite or an experimental diet and were infected intravenously with virulent or attenuated strains of human or bovine tubercle bacilli. Groups of 10 to 20 mice were used and each experiment was repeated at least 3 and up to 10 times.
- Mice fed to appetite on chow, or on diet 191 (Abst. 1647, Vol. 15), or on the Sherman diet of wheat flour 66 parts, skimmed milk 33 parts and salt 1 part, survived much longer than those fed on the same diets but deprived of food for 30 consecutive hours each week. Mice receiving 75 per cent. of the voluntary food intake of others on the Sherman diet gained little weight, but survived as long as those fed to appetite.
- Mice on diets containing 4 or 5 per cent. skimmed milk of 37 per cent. protein content, plus 20 per cent. groundnut oil, were not more susceptible to tuberculosis than those receiving chow, Sherman diet or diets with 15 to 34 per cent. skimmed milk, but when the groundnut oil was replaced by cerelose or cocoa butter the mice on low-protein diet had very poor resistance. With 15 or 20 per cent. skimmed milk there was no obvious effect of cerelose, groundnut oil, cocoa butter or lard at the 20 per cent. level.
- The addition of 3 to 10 per cent. sodium citrate to any of the diets shortened the survival of infected mice; so did 1 per cent. glutarate in the drinking water, but 5 per cent. alcohol did not.
- There was no correlation between the effects of a diet on growth and on resistance to infection. Dinitrophenol, 0.025 per cent., or thyroid extract, 0.003 per cent., while reducing growth did not affect resistance, but larger doses enhanced susceptibility after a latent period of 18 days to 4 weeks. Citrate and dinitrophenol each brought about slowly progressive fatal disease in most of the mice infected with attenuated BCG-P.
- The results are considered compatible with the hypothesis that decreased resistance to infection may be caused by metabolic changes leading to depletion of glycogen reserves, reduced glycolytic activity of inflammatory cells, or increased concentration of some polycarboxylic acids and ketones in the tissues.—D. Duncan.
- 3988
FABIANI, G. and ORELLA, J. Apparition de l'immunité contre "Plasmodium berghei" chez les souris soumises au régime lacté ou à la sulfamidothérapie. [Appearance of immunity to *Plasmodium berghei* in mice given a milk diet or treated with sulphonamides.] *Ann. Inst. Pasteur*, 1955, **88**, 109-111. [Lab. Bacteriol., Fac. Méd., Algiers.]
- 3989
CAMIEN, M. N. and DUNN, M. S. The D- α -hydroxy fatty acid nutrition of *Lactobacillus casei* 280-16. *J. Biol. Chem.*, 1954, **211**, 593-604. [Chem. Lab., Univ. California, Los Angeles.]
- 3990
JANSEN, B. C. P. De invloed van de darmflora op de voeding. [Effect of the intestinal flora on nutrition.] *Nederland. Tijdschr. Geneesk.*, 1955, **99**, 626-631. [Amsterdam.]
A review.
- 3991
BRYANT, M. P. and DOETSCH, R. N. Factors necessary for the growth of *Bacteroides succinogenes* in the volatile acid fraction of rumen fluid. *Science*, 1954, **120**, 944-945. [Dairy Husb. Res. Branch, U.S. Dept. Agric., Beltsville, Md.]
- Fractionation of rumen fluid by either extraction and chromatography showed the presence, mainly in the valeric acid fraction, of a growth substance essential for the cellulolytic rumen anaerobe *Bacteroides succinogenes*. The organism was cultured in a complex medium, the carbohydrate being either glucose, with which growth was estimated turbidimetrically, or cellulose, when growth was estimated by visible loss of the latter.
- Commercial volatile fatty acids from C_2 to C_8 and isomers of C_2 to C_6 acids gave no significant benefit when added singly to the basal medium; but if any one of the branched-chain acids isobutyric, isovaleric, or DL-methyl-n-butyric, plus any one of the straight-chain acids C_5 to C_8 , was added, good growth occurred. The straight-chain components in rumen fluid were thought to be n-valeric and n-caproic acids. The minimum concentrations of isovaleric and n-valeric acids for good growth were about 1.5 and 3 μM , respectively, per 10 ml. medium.—E. S. McKay.
- 3992
MANN, S. O. and OXFORD, A. E. Relationships between viable saccharolytic bacteria in rumen and abomasum of the young calf and kid. *J. Gen. Microbiol.*, 1955, **12**, 140-146. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]
- From rumen contents of 8 young calves streptococci were isolated which, though belonging to

Lancefield group D, differed in some respects from streptococci which have been described in older animals. Abomasal contents of very young calves and kids supported a population of lactobacilli, identified as *Lactobacillus fermenti*, *L. acidophilus* and *L. acidophilus* var. *caprae*.—J. C. Appleby.

3993

STALLCUP, O. T. The release of ammonia nitrogen from urea, ammoniated molasses, and soybean oil meal in the presence of rumen micro-organisms. *J. Dairy Sci.*, 1954, **37**, 1449-1460. [Dept. Animal Indust., Arkansas Agric. Exp. Stat., Fayetteville.]

The artificial rumen was used to estimate the amount of free ammonia N liberated from urea, ammoniated cane molasses and ammoniated invert molasses containing equivalent amounts of N, before and at intervals during incubation for 6 hr. at 40° C. with rumen microflora and a mineral solution resembling concentrated saliva. A control was run with the medium alone. In a second series soya bean meal was compared by the same technique with the 2 samples of molasses. In the third series the materials were incubated with urease for 1 hr. In the fourth series a 3-year-old steer with a rumen fistula was fed first on a ration of lespedeza hay alone, after which the ammoniated substances were introduced into the rumen and the contents were sampled for free ammonia at intervals.

Some free ammonia was present in the ammoniated molasses, but the amount did not increase significantly during incubation with microflora or in the presence of urease. Considerable amounts of free ammonia were liberated from urea both *in vitro* and *in vivo* in the presence of microflora and also in the presence of urease. Release of ammonia N from soya bean meal was small, but increased in the presence of urease. The total amount released was small compared with that released from urea.—J. S. Thomson.

3994

ROBINSON, R. Q., DOETSCH, R. N., SIROTNAK, F. M. and SHAW, J. C. Production of lactic acid and an iodine staining substance by bovine rumen bacteria. *J. Dairy Sci.*, 1955, **38**, 13-19. [Dept. Bacteriol., Univ. Maryland, College Park.]

Washed cell suspensions of rumen bacteria were prepared and used as described earlier (*J. Dairy Sci.*, 1953, **36**, 825). Conditions governing production of lactic acid and synthesis of iodine-staining polysaccharide were investigated. Experiments were made at pH 5.6, 6.9 and 8.0, and with varying concentrations of different substrates, over 72-hr. periods.

Formation of polysaccharide from hexose sugars

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was more readily detected at pH 6.9 than at 5.6 or 8.0, and particularly with relatively high concentrations of substrate. Polysaccharide appeared to be utilised as reserve food material. Utilisation was increased by the addition of a mineral salt solution, but not by adenylic acid or by Mg ions; synthesis was inhibited by NaF and by the sodium salt of ethylenediaminetetra-acetic acid.

Lactic acid was not formed from xylose or arabinose, nor appreciably from pyruvate, malate or succinate, and with moderate amounts of suitable substrate it accumulated without dissimilation only at pH 5.6 and 8.0. With large amounts of substrate, 2000 μ M, lactic acid did accumulate at pH 6.9, which agrees with the results of feeding cattle on excessive amounts of carbohydrate. Lactic acid levels at pH 6.9 were affected by the speed of centrifuging used in preparation of the bacterial cell suspension.—J. C. Appleby.

3995

JURTSCHUK, P. (Jr.), DOETSCH, R. N., McNEILL, J. J. and SHAW, J. C. In vitro studies of the effect of aureomycin and terramycin on mixed suspensions of bovine rumen bacteria. *J. Dairy Sci.*, 1954, **37**, 1466-1472. [Dept. Bacteriol., Univ. Maryland, College Park.]

Aureomycin and terramycin suffered some non-specific inactivation when incubated with heated or unheated mixed suspensions of rumen bacteria. In the presence of antibiotics the bacteria did not readily utilise xylose, arabinose, glucose, maltose or cellobiose. Penicillin and terramycin actively inhibited the growth of most of 16 pure cultures of bacteria when the antibiotics were in concentrations of 1 and 2 μ g. per ml., respectively. Aureomycin, streptomycin and chloromycetin inhibited only a few cultures. Aureomycin and terramycin at 25 μ g. per ml. completely prevented growth of bacteria on Hungate's medium.

D. Duncan.

3996

FRANÇOIS, C. and MICHEL, M. Action de la pénicilline et de l'aureomycine sur les propriétés désammanantes de la flore intestinale du porc. [Effect of penicillin and aureomycin on the deaminating properties of the intestinal flora of the pig.] *C.R. Acad. Sci.*, 1955, **240**, 124-126.

A sample of flora obtained by fractional centrifuging of pig intestinal contents was cultured *in vitro*. Liberation of ammonia was inhibited by addition of aureomycin or penicillin. A culture obtained from pigs fed on these antibiotics inhibited deamination in glutamic and aspartic acids, arginine, citrulline, ornithine, histidine, β -alanine and lysine. The addition of aureomycin to a culture obtained from control pigs also

inhibited deamination of these acids (with *D*-alanine substituted for β -alanine) but penicillin was less active and did not inhibit deamination of aspartic acid, ornithine and *D*-alanine.—A. Hepburn.

3997

MICHEL, M. and FRANCOIS, A. C. Relation entre l'influence des antibiotiques sur la croissance du porc et l'inhibition des déaminases de la flore intestinale. [Relation between the effect

of antibiotics on growth of pigs and the inhibition of deaminases of the intestinal flora.] *C.R. Acad. Sci.*, 1955, 240, 808-810.

A direct relation was established between the stimulation of growth produced in the pig by different antibiotics and their inhibitory action on the deamination of arginine and citrulline by the intestinal flora *in vitro*.—A. Hepburn.

See also Absts. 3332, 3338, 3396, 3488, 3524, 3536, 3537, 3552, 3553, 3566, 3569.

MISCELLANEOUS FEEDING EXPERIMENTS

3998

ADOLPH, W. H., SHAMMAS, E. I. and HALABY, S. H. The nutritive value of legume proteins and legume-wheat mixed proteins in Near East diets. *Food Res.*, 1955, 20, 31-34. [Nutrit. Lab., American Univ. Beirut, Lebanon.]

Weanling rats, usually 10 for each mixture, were used in paired feeding experiments lasting 4 weeks during each of which 7, 8, 9 and 10 g. daily of the mixture, with 10 per cent. protein, were given. The legumes were usually cooked. Protein efficiency measured by g. weight increase per g. protein consumed was: chick pea uncooked 1.47, cooked 2.05, lentil 1.15, broad bean 1.17, kidney bean 1.51, parboiled wheat 1.44, wheat uncooked 1.39, 1:1 mixture chick pea and parboiled wheat 2.10, 1:1 lentil:parboiled wheat 1.55, 1:1 broad bean:parboiled wheat 1.62, 1:1 broad bean:chick pea 1.49, 1:1:1 broad bean:chick pea:parboiled wheat 1.94, 2:1 parboiled wheat:yoghurt 1.93.

The last 2 of these, known, respectively, as *falafil* and *kishk*, are commonly in use in the Near East and show that rural peoples with limited resources may have arrived at combinations of high nutritive value.—D. Harvey.

3999

CLARK, H. E., HOOPER, A. S. and McCORD, M. L. The nutritive value of the proteins of beef extracted with different solvents, and of egg, milk and wheat germ for the growing rat. *J. Nutrition*, 1955, 55, 63-79. [Dept. Foods Nutrit., Kansas State Coll., Manhattan.]

The simultaneous dehydration and defatting of beef by refluxing with ethylene dichloride or propylene reduced its nutritive value for growing rats. Several other proteins were unaffected. Growth was improved by methionine or cystine. Ether, heptane and trichloroethylene were satisfactory solvents from this point of view. The regression of daily weight gain on N intake was significantly greater for egg than for beef, milk and wheat germ, which were the same. Regressions of N balance on intake per 100 sq. cm. surface

area were similar for egg and milk and significantly higher than for beef or wheat germ. In N retention egg, but not beef, effectively supplemented milk, and both improved wheat germ.

A. Hepburn.

4000

DESEHPANDE, P. D. and RADHAKRISHNA RAO, M. V. The biological and supplementary nutritive value of (i) amaranth (*Amaranthus gangeticus*) and (ii) aconite bean (*Phaseolus aconitifolius*). 2. *Indian J. Med. Res.*, 1954, 42, 515-520. [Dept. Nutrit., Haffkine Inst., Bombay 12.]

For part 1 see Absts. 4276, Vol. 24.

The biological value and digestibility of amaranth leaves at the 10 per cent. protein level, estimated by N balance trials with rats, were 67 and 85 per cent.; aconite bean at the 5 and 10 per cent. level had biological values of 56 and 60 per cent. and digestibility coefficients of 83 and 87 per cent. Added at the 5 per cent. level to a poor diet containing 78.5 per cent. rice, amaranth had a supplementary nutritive value for rats. Aconite bean improved the diet only by increasing the total protein content.—A. Hepburn.

4001

PATWARDHAN, M. V. and VIJAYARAGHAVAN, P. K. Nutritive value of duck egg white. 1. Note on the essential amino-acid composition of duck egg white.

DIKSHIT, P. K. and PATWARDHAN, V. N. 2. A comparison of the digestibility and growth-promoting capacity of hen and duck egg whites.

NARASINGA RAO, B. S. and PATWARDHAN, V. N. 3. The presence of a growth inhibitor in duck egg white. 4. Antitryptic and growth inhibiting properties of the duck egg white ovomucoid. *Indian J. Med. Res.*, 1954, 42, 521-523; 525-532; 533-542; 543-554. [Nutrit. Res. Labs., Indian Council Med. Res., Coonoor, S. India.]

1. The low growth-promoting efficiency of duck egg white for rats, observed by Dikshit and

N.A. and R., July 1955

Patwardhan (*Current Sci.*, 1950, **19**, 18) could not be attributed to deficiency of any essential amino-acid.

2. Young rats fed on a steamed diet containing up to 9.4 per cent. duck egg white grew less well than those given hen egg white. With 15.5 per cent. duck egg white growth was better, but still less than with 8.2 per cent. hen egg white. The mean apparent digestibilities were 75.3 per cent. for duck and 84.2 for hen egg white. The difference was not so great as that previously found and did not account for the poor growth.

Rats fed on a rachitogenic diet containing 11.8 per cent. duck egg white neither grew nor developed rickets, but with 21.3 per cent. weight increased slightly and signs of rickets appeared.

3. The nutritive value of duck egg white as shown by growth of rats was improved by autoclaving, but that of hen egg white was not affected. Duck egg white dried in hot air was not improved further by autoclaving. Coagulated hen and duck egg whites produced similar growth. The precipitate from the incoagulable portion of duck egg white after half saturation with $(\text{NH}_4)_2\text{SO}_4$ contained the growth inhibitor.

4. The crude ovomucoids from hen and duck egg white had almost identical antitryptic activity.

Hen ovomucoid slightly improved growth in rats fed on casein, but duck ovomucoid retarded growth significantly, 2 per cent. of inhibitor giving a maximum inhibition of 30 per cent. Retardation of growth by duck ovomucoid was especially severe in a diet with Bengal gram as the source of protein. The growth of rats fed on acid or enzymic hydrolysates of casein was also depressed. This indicated that the growth-inhibiting activity of duck ovomucoid was possibly independent of its antitryptic activity.—A. Hepburn.

4002

FINK, H. and SCHLIE, I. (with RUGE, U. and GRAU, A.) Magermilch erhält Lebernekrose-verursachende Eigenschaften beim technischen Trocknen. [Skimmed milk acquires the property of producing liver necrosis during the drying process.] *Naturwissenschaften*, 1955, **42**, 21-22. [Inst. Garungswiss., Phil. Fak., Univ. Cologne.]

See also Abst. 2521, Vol. 25.

When dried skimmed milk provided 92 per cent. of the protein of the diet, 95 per cent. of 200 young rats died after 30 to 100 days and 85 per cent. of these had liver necrosis. When 27 rats received a similar diet, but with fresh, instead of dried, skimmed milk, none developed liver necrosis. The dried milk used came from 21 different samples taken throughout the year in a large milk factory. The implications of the results are discussed.

D. Duncan.

4003

NARAYANA RAO, M. Supplementary value of buffalo butter fat to poor South Indian diet. *Indian J. Physiol. Allied Sci.*, 1954, **8**, 131-136. [Food Technol. Lab., Indian Inst. Sci., Bangalore 3.]

Groups of 6 young albino rats were studied. One group received a typical poor South Indian diet of raw milled rice 78.5, tur dahl 5, salt 0.3, non-leafy vegetables 8.2, leafy vegetables 2.1, whole milk powder 0.9 and oil 5 per cent.; the other 3 groups received the same diet supplemented with 5 per cent. buffalo butterfat, 5 per cent. buffalo butterfat plus 3 per cent. casein, or 5 per cent. buffalo butterfat plus 3 per cent. Ca-free casein. Food was given to appetite; weights were recorded from the second week of experiment and faeces and urine were collected during the last week and analysed for N and Ca.

The addition of butterfat alone to the rice diet adversely affected growth and produced more serious pathological conditions than the rice diet alone. When casein was added to the butter the effects did not appear and there was an acceleration of growth which was so great that it could not be attributed to the effect of casein alone. The rats given Ca-free casein grew as well as those given casein containing Ca. It is believed, therefore, that the rice diet is deficient in a substance or substances essential for the normal utilisation of fat and that this substance is supplied by casein. It is suggested that the substance may be an essential amino-acid. There was no statistical difference between the Ca and N balances of the rats given different diets.—G. F. Garton.

4004

NARAYANA RAO, M. and SWAMINATHAN, M. The digestibility of safflowerseed and nigerseed oils. *Indian J. Physiol. Allied Sci.*, 1954, **8**, 61-68. [Central Food Technol. Res. Inst., Mysore.]

Safflower seed oil, niger seed oil and groundnut oil were less rapidly hydrolysed by lipase from pig pancreas or castor seed than was ghee. Digestibility coefficients of the 4 fats, estimated by trials with rats, were not significantly different.

A. Hepburn.

4005

KREHL, W. A., COWGILL, G. R. and WHELDON, A. D. Non-deleterious effects of polyoxyethylene esters in the nutrition of rats and cats. *J. Nutrition*, 1955, **55**, 35-61. [Dept. Biochem., Yale Nutrit. Lab., Sch. Med., Yale Univ., New Haven, Conn.]

Polyoxyethylene mono- and di-stearates, oleates and laurates and the octamer of ethylene oxide were included at 6 per cent. in the diet of rats. Polyoxyethylene-8-monostearate, the ester derived

from the octamer, was given at 10 and 20 per cent. to rats and cats. After the end of the experiments, which lasted over 1 and 1½ years for the cats and rats, respectively, no significant pathological difference was found between experimental and control animals. The inclusion of polyoxyethylene stearates up to the 20 per cent. level was considered quite safe, but their low palatability and the lack of nutritive value of the polyoxyethylene moiety make it practicable only at low levels.

A. Hepburn.

4006

GRAHAM, W. D., TEED, H. and GRICE, H. C.

Chronic toxicity of bread additives to rats.

GRAHAM, W. D. and GRICE, H. C. **Chronic toxicity of bread additives to rats.** *J. Pharm.*, 1954, **6**, 534-545; 1955, **7**, 126-134. [Food and Drug Labs., Dept. Nat. Health and Welfare, Ottawa.]

Bread containing 50 times the normal concentration of chlorine dioxide, propyl gallate and butylated hydroxyanisole, polyoxyethylene monostearate or sodium propionate was given to rats as 75 per cent. of their diet. Adequate amounts of all known essential substances were also given. During 12 months no harmful effect on growth or mortality of the rats was found, and no detectable effect on organ weights or on histopathology of the tissues. There was no evidence of any synergistic effect of the addition of high concentrations of more than one possible toxic substance to the bread.

The work reported in the previous paper was repeated but the toxic substances were added to the bread ingredients and given thus to the rats, instead of being mixed with them, having water added and being baked into bread. The only difference in effect on the rats was that the sodium propionate depressed growth during the first few weeks of feeding; it did not influence mortality. In addition to the points examined in the rats given the bread, these rats were examined for Hb content of the blood, and no detectable effect of the possible toxic substances was found.

K. H. Coward.

4007

DICKSON, W. M., PATTERSON, E. B., STERN, J. R. and MCGINNIS, J. **The effect of terramycin or fish solubles, or both, on the growth, adrenal glands and gonads of the rat.** *J. Nutrition*, 1954, **54**, 631-641. [Dept. Vet. Physiol., State Coll. Washington, Pullman.]

Gains in weight of the body, adrenals and sex organs and in tail length were studied in castrated and uncastrated male and female rats after 21, 49 and 77 days' feeding after weaning on diets supplemented with fish solubles or terramycin or both.

Fish solubles promoted early post-weaning

growth. Terramycin acted as a growth stimulant only in animals subjected to surgical stress. Neither supplement affected the weight of the male sex organs. Both may increase the weight of the adrenal. Fish solubles added to a semi-purified diet caused a significant increase in weight of ovaries and uterus.—J. V. Evans.

4008

COATES, M. E., DAVIES, M. K. and KON, S. K. **The effect of antibiotics on the intestine of the chick.** *Brit. J. Nutrition*, 1955, **9**, 110-119. [Nat. Inst. Res. Dairying, Univ. Reading.]

In chicks fed on a normal mash for 2, 3 or 4 weeks, penicillin at the rate of 45 mg. per kg. diet significantly reduced the weight of the small intestine relative to bodyweight, and to some extent also its length. The changes were not accounted for by fat or water content. In "uninfected" chicks, in which penicillin did not increase growth, the intestine was also unaffected. Arsanilic acid was similar in effect to penicillin, chloramphenicol less consistently so. Raw liver also had some effect on both bodyweight and intestine, but it was not significant.—D. Duncan.

4009

DASLER, W. (with MOSBY, M.) **Incisor ash versus femur ash in sweet pea lathyrism (odoratism).** *J. Nutrition*, 1954, **54**, 397-402. [Dept. Biochem., Chicago Med. Sch., Ill.]

Groups of 6 or 12 male and female weanling rats were given experimental and control diets containing 50 per cent. sweetpea seeds and 50 per cent. edible peas, respectively. A second control diet consisted of finely milled Rockland rat diet. After 3 weeks the animals were killed and both lower incisors and one femur were removed from each for estimation of ash.

The mean femur ash was significantly lower in rats of both sexes given the sweetpea diet than in those given control diets. The mean incisor ash was significantly higher in rats with advanced sweetpea poisoning than in controls.—G. F. Garton.

4010

BOROS, E., PÁLYI, A., KÓCS, T. and PAJZS, Zs. **Nahrungswahl von Ratten in Verbindung mit dem Aufbau von bedingten Reflexen. [Food choice of rats in relation to development of conditioned reflexes.]** *Acta physiol. hung.*, 1954, **6**, Suppl., 44-45. [2. Med. Klin., Med. Univ., Budapest.]

4011

TRIBE, D. E. **Choice of diet by rats. 4. The choice of purified food constituents during growth, pregnancy and lactation.** *Brit. J. Nutrition*,

N.A. and B., July 1955

1955, 9, 103-109. [Sch. Vet. Sci., Univ. Bristol.]

See also Absts. 373, 696, Vol 24.

Fifteen female rats weighing about 100 g. were placed in individual cages and allowed to select their food from containers of maize starch, glucose, margarine, yeast, casein, McCollum's salt mixture No. 185 and cod liver oil. The containers were identical in shape and colour and their positions were altered every second day. Tap water was given to appetite. After 6 weeks all the rats were mated and their food selection throughout pregnancy and 3 weeks of lactation was recorded. Five male and 5 female young were selected at weaning and their food preferences were recorded during 4 weeks of active growth.

Two of the 15 rats failed to thrive, but the other 13 chose a diet similar to those recommended as stock diets; no food was completely ignored. During pregnancy and lactation the diets selected were deficient in energy and protein and the does were unable to rear normal litters. The young rats were totally unable to select suitable diets and 8 of the 10 died during the 4 weeks.

G. F. Garton.

4012

ANAND, B. K., DUA, S. and SHOENBERG, K. **Hypothalamic control of food intake in cats and monkeys.** *J. Physiol.*, 1955, 127, 143-152. [Dept. Physiol., Lady Hardinge Med. Coll., New Delhi.]

Bilateral lesions were made in the hypothalamus of 16 cats and 17 monkeys (*Macacus*), which were then fed to appetite on their usual diet.

Four cats and 4 monkeys, although awake and active, would not eat even when food was placed in their mouths; they were fed by stomach tube and kept alive for 1 to 4 weeks, but they did not begin to eat. Two more monkeys could be made to eat when food was placed in their mouths. All these animals were found to have lesions in the lateral hypothalamus in the plane of the central part of the median eminence.

Two cats and one monkey developed an increased desire for food, and in these animals the medial hypothalamic area in the region of the median eminence was destroyed. The other 10 cats and 10 monkeys ate normally, and both hypothalamic regions described were intact. When both regions were destroyed, which was done later in one cat and one monkey, eating ceased.

Centres in the hypothalamus thus regulate the feeding reflexes both by facilitation and by inhibition.—D. Duncan.

4013

ANAND, B. K. and DUA, S. **Feeding responses induced by electrical stimulation of the hypo-**
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thalamus in cat. *Indian J. Med. Res.*, 1955, 43, 113-122. [Dept. Physiol., Lady Hardinge Med. Coll., New Delhi.]

Multilead electrodes, one set on each side, were implanted in different parts of the hypothalamus of 25 cats. At least a week after operation the cats were subjected to electrical stimulation for 1 hr. on each of 4 to 7 consecutive days in one hypothalamic area at a time.

In 8 cats, stimulation produced an increase in meat and milk intake on the day of stimulation, with only a day or two's lag in returning to normal when stimulation stopped. In all these cats the electrodes were in the lateral hypothalamus in the same rostro-caudal plane as the ventromedial nucleus.

In 5 cats stimulation led to some decrease in food intake on the day of stimulation, but never to complete loss of appetite. The electrodes in these cats were in the medial hypothalamus in the region of the ventromedial nucleus.

In cats which showed no change in food intake after stimulation the electrodes were always well outside the regions described above.

There was no change in rectal temperature, circulating eosinophil count or gastric secretion which could be related to change in food intake, and changes in blood sugar were somewhat irregular, though blood sugar tended to rise when appetite increased and fall when it was reduced.

D. Duncan.

4014

LARSSON, S. **On the hypothalamic organisation of the nervous mechanism regulating food intake.**
1. **Hyperphagia from stimulation of the hypothalamus and medulla in sheep and goats.**

FORSSBERG, A. and LARSSON, S. 2. **Studies of isotope distribution and chemical composition in the hypothalamic region of hungry and fed rats.** *Acta physiol. scand.*, 1954, 32, Suppl. 115, 1-40; 41-63. [Dept. Physiol., Kgl. Veterinärhögsk., Stockholm.]

1. In experiments with goats and sheep in which electrical stimulation was used, 8 points where stimulation caused increased appetite were mapped in the hypothalamus and 2 in the medulla. Associated licking, chewing and rumination movements were seen. In similar experiments in which solutions of 3 or 5 per cent. NaCl or 25 per cent. sucrose were injected into the hypothalamus of goats similar effects were produced. No effect was found on the blood sugar and no difference in effect between the solutions.

2. Rats were given $\text{NaH}^{32}\text{PO}_4$, ^{14}C -glucose or $\text{NaH}^{14}\text{CO}_3$ intraperitoneally and measurements were made in samples from 3 areas of the hypothalamus, one of which (C) included the centre regulating food intake, and 2 neighbouring

areas (A and B). Total activity and that of a number of fractions were estimated, and the total activities of blood, liver, muscle and cerebrum.

In hungry and fed rats total activity was similar for ^{32}P , but more appeared in the C than in the A and B areas in the hungry than in the fed animals. The concentration of P as adenosinetriphosphate and creatine phosphate was higher in C than in B samples from hungry rats, but in fed rats the opposite was true. In the other tissues ^{32}P activities differed, but there was no significant difference between hungry and fed groups. The findings for ^{14}C in both forms agreed with those for ^{32}P .

The possibility is discussed that the concentration of adenosinetriphosphate is of fundamental importance in these biochemical reactions.

D. Harvey.

4015

MEYER-LOHMANN, J. Über den Einfluss täglicher Futtergaben auf die 24-Stunden-Periodik der lokomotorischen Aktivität weisser Mäuse. [Effect of the daily food intake on the 24-hour locomotor activity of white mice.] *Pflügers Arch.*, 1955, 260, 292-305. [Physiol. Inst., Univ. Göttingen.]

The mice in actograph cages received a diet of, per cent., oats 60, wheat 30, shrimps 5 and sunflower seed 5. Three cages were in constant darkness during each test and 3 were illuminated at about 150 lux for from 7 to 19 hr. daily. There was an 8-day fore-period for each study.

In mice deprived of diurnal environmental change such as light and temperature rhythms the daily cycle of activity tended to take on a 23-hr. rhythm. When mice were fed once daily but allowed enough food to last all day, 8 g., there was only a slight peak of activity with 24-hr. periodicity superimposed on the 23-hr. cycle. When mice were fed once daily, but the intake and time spent in eating were restricted, the daily activity became completely dependent on the feeding cycle.

With a natural or artificial cycle of light and darkness the activity was primarily conditioned by light changes but, as in darkness, a food stimulus increased by reduced intake could cause a shift in the peaks of activity.—D. Duncan.

4016

RICHTER, C. P. and RICE, K. K. Comparison of the effects produced by fasting on gross bodily activity of wild and domesticated Norway rats. *Amer. J. Physiol.*, 1954, 179, 305-308. [Psychobiol. Lab., Med. Sch., Johns Hopkins Univ., Baltimore, Md.]

In control periods the average daily activities of wild and domesticated Norway rats were

similar. When they were deprived of food their activities, expressed as percentages of those of control periods, were for the wild 242 and for the domesticated 132. During the control period intake of food by the domesticated rats was about 10 per cent. less than by the wild and, in control and fasting periods, the water intake of the domesticated was the smaller.

The lower response in activity during starvation on the part of the domesticated rat would, it is concluded, tend to decrease its chance of survival.

D. Harvey.

4017

KEYES, P. H. Dental caries in the Syrian hamster. 6. Minimal dental caries activity in animals fed presumably cariogenic rations. *J. Dent. Res.*, 1954, 33, 830-841. [Harvard Sch. Dent. Med., Boston, Mass.]

For part 5 see Title 2412, Vol. 19.

An inbred strain of hamsters was derived from a single female and 5 diets containing high proportions of carbohydrates were used for study of the production of caries during periods lasting 100 days. The incidence of tooth destruction was small and contrasted noticeably with earlier findings (Abst. 887, Vol. 17). No explanation could be advanced. A small-scale study with animals bred in Boston and fed in New York on diets prepared in Boston gave similar results and excluded an environmental effect.—D. Harvey.

4018

LOSEE, F. L. and NEMES, J. L. Human type caries distribution in Osborne-Mendel rats kept on heated skim milk powder diet. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 429-431. [Naval Med. Res. Inst., Nat. Naval Med. Centre, Bethesda, Md.]

A diet consisting of skimmed milk powder 35, maize starch 45, cerelose 18, and liver powder 2 per cent., supplemented with vitamins A, D and E, produced caries of human type, with occlusal and surface lesions, in rats. It is suggested that the surface and occlusal types of caries developed independently of each other.—A. Hepburn.

4019

KAMRIN, B. B. Local and systemic cariogenic effects of refined dextrose solution fed to one animal in parabiosis. *J. Dent. Res.*, 1954, 33, 824-829. [Dept. Anat., State Univ. New York Med. Coll., Brooklyn.]

The left members of 18 parabiotic pairs of rats, which received a balanced diet for 16 to 35 days, and the right parabionts, which received in addition 1 ml. 25 per cent. glucose daily, had mean caries rates of 0.17 and 2.43. Corresponding values for 10 pairs of parabiotic rats after 36 to 105 days

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were 0.69 and 5.00. The differences were statistically significant. The greatest incidence of fissure caries occurred most rapidly when glucose was given immediately after weaning. The 13 parabolic pairs used as controls were free from caries

except for one pair aged 171 days, in which one molar cavity developed in each rat. Growth was normal in all and there was no significant difference in blood sugar between right and left parabionts.

A. Hepburn.

GENERAL METABOLISM AND FEEDING HABITS OF ANIMALS OTHER THAN MAMMALS AND BIRDS

4020

SIMPSON, J. The significance of the presence of pollen in the food of worker larvae of the honey-bee. *Quart. J. Microscop. Sci.*, 1955, 96, 117-120. [Bee Res. Dept., Rothamsted Exp. Stat., Harpenden, Herts.]

From counts of pollen grains in the gut of full-grown worker larvae and micro-Kjeldahl estimation of the N content of pollen, mean 3.59 per cent. of the dry weight, it was calculated that pollen had not supplied more than one-tenth of the N requirement of larvae examined in summer; some of the winter larvae had had much less or none at all.—W. M. Deans.

4021

MALUCELLI, P. Prove di alimentazione del baco da seta. Consumo di foglia di gelso in rapporto alle esigenze alimentari di comuni razze e microci del *Bombyx mori*. [The feeding of silkworms. Consumption of mulberry leaves in relation to the requirements of common strains and crosses of *Bombyx mori*.] *Ann. Sper. agrar.*, 1954, 8, 865-866. [Staz. Sper. Gelsicolt. Bachicolt., Ascoli Piceno.] English summary.

The consumption of mulberry leaves was studied with batches of 500 silkworm larvae during the third, fourth and fifth stages of development. Six strains and 2 crosses were compared, including old and new improved types.

The large white strains, White Italian and White Adrianople, ate the largest quantities per larva, but on the commercial basis they and the White Chinese ate the smallest quantities per ounce. The new types were much more efficient than the old in conversion of feed in terms of weights of cocoon and silk produced.

It is concluded that the white strains and crosses developed in Italy can compete successfully with those developed in Japan.—D. Duncan.

4022

LIPKE, H. and FRAENKEL, G. The toxicity of corn germ to the meal worm, *Tenebrio molitor*. *J. Nutrition*, 1955, 55, 165-178. [Dept. Entomol., Univ. Illinois, Urbana.]

In the germ of maize there is a toxic substance

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which inhibits growth of the larvae of the meal worm, *Tenebrio molitor*. If the germ or the whole maize is autoclaved before feeding, good growth results. The possibility that the inhibition of growth was due to a deficiency was ruled out by failure to get improved growth when known food essentials were added to the basal diet containing the unheated maize germ. When lysine and tryptophan were added to the maize from which the germ had been removed good growth resulted.

The toxic substance was not extracted by ethyl ether. It was extracted from the germ with 0.25 N H₂SO₄. From this extract a fraction was concentrated by dialysis and lyophilisation which was toxic at 1.6 per cent. of the diet.—G. C. Hunter.

4023

EDWARDS, R. L. The effect of diet on egg maturation and resorption in *Mormoniella vitripennis* (Hymenoptera, Pteromalidae). *Quart. J. Microscop. Sci.*, 1954, 95, 459-468. [Dept. Zool., Univ. Hull.]

The hymenopteran *Mormoniella vitripennis* is parasitic on the pupae of muscoid flies. Parasites were obtained in their late pupal stage by opening host puparia, and the imagines were paired with males when they emerged, but were then fed on honey, or starved, or fed on honey for 48 hr. and then allowed access to a supply of puparia of the housefly so that they laid eggs and fed on host blood.

In ovaries of females fed on honey there was a fairly large number of freshly matured eggs always available, maturation and resorption just keeping pace for about 16 days, after which time the number maturing began to fall. In starved females few eggs matured and resorption began early; death occurred in about 5 days. In females killed after access to hosts the number of mature eggs was small because they had been deposited; the number of immature eggs was greatly increased. The peak of the maturation rate and the number of eggs deposited was on the third day after the first meal of host blood. Females allowed hosts for 48 hr. and then starved died more quickly than those never fed, probably because their fat-bodies were depleted.

D. Duncan.

See also Absts. 3360, 3394, 3633, 3634.

5. HUMAN DIET IN RELATION TO HEALTH AND DISEASE

DIET

REQUIREMENTS

4024

- Cox, C. P. and CLARKE, P. M. Fallacies in nutritional requirement experimentation. *Arch. Biochem. Biophys.*, 1955, **54**, 246. [Nat. Inst. Res. Dairying, Univ. Reading.]

The measurement of changes in a biological response as the amount of a nutritional factor is varied in the diet was discussed by Almquist (Abst. 1058, Vol. 25). It was concluded that, since the law of diminishing returns so often applies in these cases, there would be less chance of detecting significant differences in response at higher than at lower values of a factor, if the levels being tested were equally spaced. He suggested that this might lead to underestimation of nutritional requirements and, as a solution, proposed the choice of levels of the factor with equal logarithmic spacing between them. This procedure is thought by the authors not to be desirable and they suggest that instead there should be increased replication at the higher levels of the factor. They note also that optimum nutritional requirements of animals are not necessarily arrived at by finding maximum individual biological responses to individual nutritional factors.—I. McDonald.

4025

- ELMAN, R. Caloric needs in surgical patients. *Surgery*, 1954, **36**, 1175-1194. [Dept. Surg., Sch. Med., Washington Univ., St. Louis, Mo.] A review with 60 references.

4026

- DOBOS, F., HAMAR, N. and TARJÁN, S. Adäquater und minimaler Kochsalzbedarf in der Hitzearbeit, unter besonderer Berücksichtigung der Hitzearbeiter in der ungarischen Eisen- und Stahlindustrie. [Adequate and minimum salt requirement during work in a hot environment, with special reference to workers in the Hungarian iron and steel industry.] *Acta med. hung.*, 1954, **6**, 433-451. [Staatl. Inst. Arbeitshyg., Budapest.] Russian summary.

Investigations were made on 82 workers of the iron and steel industry, acclimatised to heat, to study their salt, water and osmotic balances under the usual working conditions.

The workers consumed during work 5 to 6 g. NaCl, and outside their work 7 to 8 g. The salt intake did not depend on the requirement corresponding to the amount of sweat, but was a function

of food taken to cover their energy requirement. The daily intake of 12 or 13 g. NaCl is adequate to replace the salt loss only if the amount of sweat does not appreciably exceed 5 litres. With this intake some workers, when they lost for some days 10 litres of sweat, showed signs of salt deficiency. When the amount of sweat exceeds 5 litres, the minimum salt requirement in g. is reckoned to be approximately the amount of sweat in kg., and the adequate intake of salt in g. is about twice the amount of sweat in kg. The usual salt consumption of the Hungarian iron and steel workers thus assures an adequate intake for sweating up to 5 litres, and a minimum intake for about 10 litres. If the salt intake reaches the minimum level, but is below the adequate level day after day, some workers may drink as much water as to cause dilution of the extracellular fluid, with danger of water intoxication. Hence, if the amount of sweat exceeds 5 litres day after day, the worker should drink during working hours aerated water containing 0.1 per cent. NaCl. The usual salt intake outside work will then be adequate to replace salt loss from 7 to 8 litres of sweat; if the amount of sweat is still greater, the salt intake outside work also should be increased.

M. B. Richards.

4027

- DOBOS, F., HAMAR, N., TARJÁN, S. Klassifizierung der Hitzearbeit in der ungarischen Eisen und Stahlindustrie vom Gesichtspunkt des Gesundheitsschutzes, unter besonderer Berücksichtigung des Kochsalzbedarfes der Hitzearbeiter. [Classification of hot work in the Hungarian iron and steel industry from the point of view of protecting health with special reference to salt requirement of workers in heat.] *Acta med. hung.*, 1954, **6**, 463-474. [Staatl. Inst. Arbeitshyg., Budapest.] Russian summary.

From 290 investigations of the most important types of hot work in the Hungarian iron and steel industries workers could be placed in 3 categories. 1. Those exposed to such conditions that the amount of sweat lost during their working hours at all times of the year, except on very cold winter days, exceeds 5 litres daily. For them it is essential that during work throughout the whole year they should drink aerated water with 0.1 per cent. NaCl. 2. Those who from mid-May to mid-September lose more than 5 litres sweat daily during the hours of work; for this period their drinking water during work should contain 0.1 per cent. NaCl. 3. Those working in less severe

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conditions and whose loss of sweat does not exceed 5 litres, except perhaps on occasion. Special measures are not required for them.

The types of work in each category are given.
M. B. Richards.

See also Abst. 4045.

FEEDING OF INFANTS AND CHILDREN

4028

HILL, L. F. *Infant nutrition. Amer. J. Clin. Nutr.*, 1955, 3, 75-83. [Raymond Blank Mem. Hosp. Child., Des Moines, Iowa.]
A review.

4029

NYHAN, W. L. and WESSEL, M. A. *Neonatal growth in weight of normal infants on four different feeding regimens. Pediatrics*, 1954, 14, 442-448. [Dept. Paediat., Sch. Med., Yale Univ., New Haven, Conn.] Spanish summary.

Babies were in 4 groups, each of 100, either breast-fed on a flexible schedule or bottle-fed on a 4-lr. schedule in nursery conditions or in those being studied at Yale whereby they remain with their mothers continuously instead of merely being brought at intervals for feeding. They were weighed daily before the first morning feed during the first week of life. For the milk mixture given to the bottle-fed infants see Nyhan, *Pediatrics*, 1952, 10, 414; after leaving hospital they had a 1:1.5 mixture of evaporated milk and water with 5 per cent. maize syrup. The groups were comparable as regards birthweight and sex, but not colour or parity of mother.

Breast-fed babies lost significantly more weight in the first few days than bottle-fed babies, the effect being more marked with babies fed in the nursery than with those under the other system; with both living arrangements the babies fed to schedule lost more than those fed on a flexible schedule. The differences are ascribed to differences in total food intake, and there was evidence to suggest that the greater losses of the breast-fed babies were due not to differences between human and cow's milk but to the fact that the bottle-fed babies were fed from the first day of life, the breast-fed babies from the onset of lactation.

By 6 weeks the breast-fed nursery group had gained significantly more than the bottle-fed nursery group; other differences were not significant.—W. M. Deans.

4030

SINTOS, A. Vergleichende Untersuchungen über Ernährung mit evaporierter Milch und Sammelfrauenmilch bei jungen Säuglingen. Zugleich ein Beitrag zur kritischen Beurteilung

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ernährungsstatistischer Fragen. [Comparative studies of feeding young infants with evaporated milk and pooled breast milk. The critical assessment of nutritional statistics.] *Ztschr. Kinderheilk.*, 1955, 75, 634-642. [Kinderkrankenhaus Borgfelde, Allg. Krankenhaus St. Georg, Hamburg.]

The difficulties of making feeding tests on infants in such a way that the results can be tested statistically are discussed with reference to the literature. In the present study the subjects were premature infants or full-term infants under 3 months, all under the same care; 50 were fed solely on evaporated homogenised milk, generally diluted to supply 65.3 Cal. per 100 ml., and 49 on heat-sterilised breast milk from a milk bank. Statistical comparisons were also made after exclusion of infants with congenital defects or disorders likely to affect weight gain, and for healthy premature infants only. Though mean daily weight gains were 2 to 3 g. less for homogenised milk and showed greater scatter, the difference was not significant either for the whole groups or for the subgroups. Those on breast milk had fewer infections and digestive disturbances, but again the difference was not statistically significant. It was concluded that evaporated homogenised milk without a second carbohydrate is suitable even for very young infants.

W. M. Deans.

4031

GYÖRGY, P. La leche humana frente a la leche de vaca. [Human milk against cow's milk.] *Rev. española Pediat.*, 1954, 10, 749-760. [Dept. Nutric. Paediat., Univ. Pennsylvania, Philadelphia.]

A general discussion of differences between human and cow's milk in infant feeding, with emphasis on the bifidus factor and related substances.—D. Duncan.

4032

WALKER, A. R. P., FLETCHER, D. C., STRYDOM, E. S. P. and ANDERSSON, M. *Food preparations used in weaning urban Bantu infants. Brit. J. Nutrition*, 1955, 9, 38-41. [Human Biochem. Unit, S. African Inst. Med. Res., Johannesburg.]

Samples of foods given by Bantu mothers to their children under 2 years of age were collected either in their homes or while they waited as out-patients at Baragwanath Hospital, Johannesburg. The 77 samples were of 5 types: thin cereal paps, proprietary mixtures of cereals and dried milk, dried-milk preparations, miscellaneous mixtures and thick cereal paps. In these groups they numbered 13, 14, 12, 26 and 12 and they were analysed for total solids, ash, protein and, with

some exceptions, fat. Standards for comparison were for protein 2.3 g. per 100 ml. as recommended for artificial milk mixtures and for energy 70 Cal. per 100 ml. as given for breast milk, both by Clements (*Infant Nutrition*, Bristol, John Wright and Sons, 1949). The percentages of samples in the groups deficient in protein were 100, 79, 43, 70 and 33 and in energy 100, 86, 75, 92 and 25.

The implications of overdilution, which may occur even when manufacturer's directions are carefully followed, are discussed.—D. Harvey.

4033

VEDRASHKO, V. F. and KATMANOVA, O. N. Vliyaniye kachestvenno razlichnogo pitaniya na fizicheskoe i nervopsicheskoe razvitiye zdorovykh detei doshkol'nogo vozrasta. [Influence of qualitatively different feeding on the physical and neuropsychological development of healthy children of school age.] *Vop. Pitani.*, 1955, 14, No. 1, 8-12.

A series of investigations was made on a group of 30 healthy schoolchildren aged from 6 to 7 years. First, an extensive series of anthropometric and biochemical investigations was used to determine the adequacy of a standard diet containing 3.5 g. protein per kg. bodyweight, with 60 per cent. of animal origin. It was next established that of 2 diets similar in all other respects, that in which animal protein comprised 65 per cent. of the total led to a greater positive N balance than did that in which animal protein formed only 40 per cent. of the total. There was a positive correlation between percentage animal protein and serum complement titre, phagocytic activity of leucocytes and strength of reaction to injurious stimuli. In a further group of children on the diet with 60 per cent. animal protein the time characteristics for the establishment, extinction and re-establishment of conditioned reflexes were within normal limits. It was found also that increasing the amount of eggs in the diet, without alteration in the total amounts of fat, carbohydrate and protein, led to a shortening of the latent period for the establishment and re-establishment of conditioned reflexes, to an increase in strength of reaction, and generally to a toning up of nervous processes.—D. W. Taylor.

4034

GUTELIUS, M. F. Dietary needs and weeds in Louisiana. *Southern Med. J.*, 1954, 47, 1196-1198. [Dept. Paediat., Louisiana State Univ. Sch. Med., New Orleans.]

Questioning of mothers in the Paediatric Clinic of the Charity Hospital showed that the diet of children was usually too high in carbohydrate and, though adequate in energy, was more or less

deficient in most essential nutrients. The cheapest and simplest way to improve the diet would be by adding greens; two-thirds of a cup of cooked collards would suffice. Substitution of 1 pint of skimmed milk for $\frac{1}{2}$ pint of whole milk would be equally good and cheap.—E. H. Hume.

4035

RATNER, B., UNTRACHT, S., CRAWFORD, L. V., MALONE, H. J. and RETSINA, M. Allergenicity of modified and processed foodstuffs. 5. Soybean; influence of heat on its allergenicity; use of soybean preparations as milk substitutes. *Amer. J. Dis. Child.*, 1955, 89, 187-193. [Dept. Paediat., New York Med. Coll.]

Children, passively sensitised in the skin of the arm with serum containing soya bean antibody, were given different soya bean preparations by mouth. If no reaction occurred raw soya flour was given.

A liquid mix of soya flour heated at 165° F. for 20 min., cooled to 60° F. and kept at 260° F. for 60 min. and a similar preparation subsequently spray-dried evoked no reaction in children who later reacted to raw soya flour. An unheated spray-dried preparation and a liquid preparation treated for a short time with or without subsequent spray drying produced reactions, as did 2 commercial infant feeding preparations of unknown method of manufacture. Soya bean oil, soya sauce and a soya bean and maize mixture produced no reaction.

It is concluded that a properly modified soya bean preparation is ideal as a substitute for milk in the feeding of milk-sensitive infants.

F. C. Aitken.

See also Absts. 4045-47.

DIETARY SURVEYS AND INDIVIDUAL STUDIES

4036

READMAN, W. L. Technique and methods of the National Food Survey. *Proc. Nutrition Soc.*, 1955, 14, 60-63. [Statistics and Intelligence Div., Minist. Food, 12-14 Sussex Pl., London.]

4037

TUTTLE, E. A nutritional survey of the geriatric patient. *Geriatrics*, 1954, 9, 579-582.

4038

VAN DEN BERG, A. S. and MAYER, J. Comparison of one-day food record and research dietary history on a group of obese pregnant women. *J. Amer. Dietetic Assoc.*, 1954, 30, 1239-1244. [Dept. Maternal and Child Health, Harvard Sch. Pub. Health, Boston, Mass.]

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In a study of 35 obese pregnant women the high energy intakes obtained by the research dietary history method of Burke (Abst. 1107, Vol. 18) were more in accord with physiological considerations than the lower intakes suggested by the results of a one-day food record submitted by the women.

F. C. Aitken.

4039

HOLLINGSWORTH, D. F. **Nutritional pattern of the diet on the eve of decontrol.** *Proc. Nutrition Soc.*, 1955, **14**, 71-77. [Sci. Adviser's Div., Minist. Food, Gt. Westminster House, Horseferry Rd., London.]

4040

BAINES, A. H. J. and HOLLINGSWORTH, D. F. **The diets of elderly women living alone.** *Proc. Nutrition Soc.*, 1955, **14**, 77-80. [Statistics and Intelligence Div., Minist. Food, 12-14 Sussex Pl., London.]

4041

GIBSON, E. H., READMAN, W. L. and WARNOCK, G. M. **Food and family size.** *Proc. Nutrition Soc.*, 1955, **14**, 80-85. [Statistics and Intelligence Div., Minist. Food, 12-14 Sussex Pl., London.]

4042

LEITCH, I. **Some comments on the National Food Survey and comparison with the prewar Carnegie Survey.** *Proc. Nutrition Soc.*, 1955, **14**, 86-92. [Commonwealth Bur. Animal Nutrit., Rowett Res. Inst., Bucksburn, Aberdeenshire.]

4043

MULDER, T. **Uitkomsten Nationaal Budgetonderzoek 1951. [Results of the National Budget Survey 1951.]** *Voeding*, 1954, **15**, 547-551.

Six new reports on data from the National Budget Survey 1951 deal with expenditure on food by families, classified by type of employment, income, residence and size of family. The report on agricultural labourers is the only one giving the actual amounts consumed, but no figures from it are quoted. Expenditures on vegetables, fruit, meat including bacon, milk, cheese and eggs are listed; these amounts, except for eggs, increase as the size of the family increases. The percentage of the total expenditure on food which is spent on the listed foodstuffs decreases in inverse ratio to the size of the family, except that on milk. Percentage of total income spent on food ranges from 48 per cent. in the lowest to 15 per cent. in the highest group. Labourers with small families spend a much higher percentage on food than do

sedentary workers with only slightly higher incomes. In large families the percentages differ much less. Expenditure on the listed foodstuffs by agricultural labourers is small, because of the use of homegrown produce. (See also Abst. 1083, Vol. 25).—M. Eddison.

4044

COX, M. L., SPENCE, B. D. and SCOLAR, F. I. **The protein, calcium, phosphorus, and magnesium content of nursery school lunches including "seconds".** *Child Development*, 1953, **24**, 181-188. [Texas Agric. and Mech. Coll.]

This continuation of previous work (Abst. 2648, Vol. 19; *Child Development*, 1952, **23**, 83) takes account of the second helpings of food or milk (allowed as desired provided all the original food had been eaten) consumed by the best and poorest eaters in an older and a younger group of nursery school children.

Second helpings made a considerable difference to the average Ca and P intakes of both groups and to the average protein intake of the younger but not of the older group. The poorest eater of the younger group had about one-fifth of the amount of protein recommended by the National Research Council, the best eater one-third. All the children had about one-half of the Ca recommended, and at least half the Mg considered necessary on the basis of Daniels' study (Abst. 3289, Vol. 11) but only $\frac{1}{3}$ g. P. Increased use of protein-rich foods other than milk is recommended.—W. M. Deans.

4045

EPFRIEHT, E. S., SIDWELL, V. D. and SWANSON, P. P. **Nutritive value of the diets of Iowa school children.** *J. Nutrition*, 1954, **54**, 371-388. [Iowa Agric. Exp. Stat., Ames.]

Children of both sexes numbering in all 1188 and between 6 and 18 years of age were chosen from rural communities and from towns with less and cities with more than 50,000 inhabitants (see Abst. 3955, Vol. 25). Data were from 7-day records made in the homes by mothers or by the children themselves and varied so little that all were grouped together. Intakes of energy and of 10 nutrients were calculated.

For girls intakes of energy, protein, Fe, vitamin B₁ and nicotinic acid were similar in that they rose steadily until age 12, remained constant to about 15 years and thereafter declined. Ca intake rose in the same way but fell after 12 years. Many of the girls, especially of those between 13 and 16 years, were getting less than the U.S. National Research Council (N.R.C.) recommended allowance. For boys there was a fairly continuous increase between 7 and 16 years in intakes of energy,

protein, Fe, vitamin B₁, nicotinic acid and riboflavin. Ca intake, unlike that of girls, increased greatly at 17 and was less than N.R.C. allowances only between 10 and 16 and at 18 years. From 6 to 12 years intakes by girls of all nutrients, except vitamins A and C, were about 10 per cent. less than those of boys; beyond 12 years the difference increased.

The ratios between some constituents were found to vary little. For a child population with similar feeding habits, whose mean daily protein intake is known, it is suggested that the following factors may be used to calculate the intakes of the respective nutrients from the protein intake: vitamin B₁, 1.6×10^{-6} for all children; riboflavin, 2.7×10^{-5} for children below 12 and 2.4 or 2.5×10^{-5} for girls and boys, respectively, above 12 years; nicotinic acid, 1.7×10^{-4} for all children.—D. Harvey.

4046

EPFRIGHT, E. S., RODERICK, C., SIDWELL, V. D. and SWANSON, P. P. Relationship of estimated nutrient intakes of Iowa school children to physical and biochemical measurements. *J. Nutrition*, 1954, **54**, 557-570. [Iowa Agric. Exp. Stat., Ames.]

Comparisons are made between 223 school-children whose mean intakes of energy and 8 nutrients were equal to or above U.S. National Research Council recommended allowances and 432 children in whose diets at least one nutrient was less than 67 per cent. of the allowances. The children were representative of public school children of the State of Iowa (see Abst. 3955, Vol. 25).

Children with liberal diets tended to be slightly taller and heavier and to have greater leg girth than those on the poorer diets. No significant difference in Hb or serum alkaline phosphatase was found. The mean amounts of ascorbic acid and carotenoids in serum reflected the intakes, but other influences were evident; changes with age differed for the sexes among the children with liberal intakes of these 2 substances.

The differences in nutritional status of the children in this study were small, but they are thought to indicate trends which require examination in the large groups of children whose diets, though not actually poor, may be suboptimum; their significance should be assessed further by longitudinal studies.—G. F. Garton.

4047

EPFRIGHT, E. S. and SWANSON, P. P. Distribution of calories in diets of Iowa school children. *J. Amer. Dietetic Assoc.*, 1955, **31**, 144-148. [Dept. Food Nutr., Iowa State Coll., Ames.] The data on total and percentage calories from

different food groups are based on the results of 7-day diet studies of 1188 children aged from 6 to over 18 years. Means for boys and for girls in each age group are tabulated. The percentage of calories from milk was about 20, with rather more in the younger and rather less in the older age groups. Milk, fruit and vegetables together provided 30 to 43 per cent. of the daily energy intake and these, with meat and eggs, provided 52 to 60 per cent. of calories in the mean daily diets. In respect of both number of calories and of the proportion of the total actually provided by milk, fruits and vegetables the diets which fully met the recommended dietary allowances were higher than those which failed to do so.

F. C. Aitken.

4048

YOUNG, C. M., STREIB, G. F. and GREER, B. J. Food usage and food habits of older workers. *Arch. Indust. Hyg.*, 1954, **10**, 501-511. [Dept. Med. Nutr., Sch. Nutr., Cornell Univ., Ithaca, N.Y.]

Records of food eaten during 24 hr. were kept by 1439 men and 201 women aged 64 years and employed throughout the United States in 21 important occupational categories. General level of education and weekly income were also recorded. Foods were grouped in 17 classes and the adequacy of intake was judged by the criteria of Trulson *et al.* (Abst. 3893, Vol. 19).

Only 39 per cent. of men and 35 per cent. of women were taking adequate amounts of milk; more than 1/5 of the population took none. Intake of protein was below recommended amounts for 40 per cent. of the men and 51 per cent. of the women. The ranges and means for amounts of protein were, men: 25 to 156 g., 70 g.; women 8 to 94 g., 54 g. The overall intake of food was considered satisfactory for only 10 per cent. of the men and 7 per cent. of the women.

There was a relation between educational standard and the use of some important protective foods, milk, vegetables rich in vitamin C and fruits and vegetables rich in vitamin A; there was none between income and the use of meat, bread, potatoes, fruits and vegetables rich in carotene and soft drinks. Of these 2 variables education was of the greater importance.

There seemed still to be a need for encouragement of the use by industrial workers of milk, citrus fruit, tomatoes and green, leafy and yellow vegetables.—D. Harvey.

4049

COLLAZOS, C. C., WHITE, H. S., HUENEMANN, R. L., REH, E., WHITE, P. L., CASTELLANOS, A., BENITES, R., BRAVO, Y., LOO, A., MOSCOSO, I., CACERES, C. and DISELDORFF, A. Dietary

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surveys in Peru. 3. Chacán and Vicos, rural communities in the Peruvian Andes. *J. Amer. Dietetic Assoc.*, 1954, 30, 1222-1230. [Dept. Nutrit., Minist. Pub. Health, Lima.]

In Chacán 43 families were studied during the rainy season, and the survey was repeated in 39 of these families after the rainy season. In Vicos 40 families were included in the first survey, which was made after the rainy season, and 37 of these were studied again during the rainy season. The methods of study were as used in a previous survey (Abst. 2269, Vol. 24). The diets contained only a small number of foods, mainly vegetable in origin, with seasonal variation in consumption of such foods as ocas (*Oxalis tuberosa* mol), ollucos (*Ollucus tuberosus*) and turnip greens.

No allowance was made for loss of nutrients in cooking. On this basis intake of ascorbic acid was adequate except in the rainy season survey at Chacán. In all surveys intake of iron, vitamin B₁ and nicotinic acid were adequate; all other nutrients were below recommended allowances.

A study of the physical status of 28 children of the families will be the subject of a separate report, but it is stated that there were signs which suggested that intakes of vitamins A and B complex, particularly riboflavin, and of protein and energy, were inadequate. (For parts 1 and 2 see Absts. 2269, Vol. 24; 2574, Vol. 25.)—F. C. Aitken.

4050

BALLETTO, G. M. A nutritional survey in the central province of Tanganyika. *East African Med. J.*, 1954, 31, 459-464. [Med. Serv., Tanganyika.]

The failure of crops after a drought in 1952-53 made it necessary to open famine camps in the Dodoma District, where maize flour and meat were issued free to the Wagogo. In September 1953 a nutritional survey was made in 3 camps where, in all, 1117 of the inmates were examined. Of those examined, the nutritional state of 278 was passed as normal. The number in a state of actual starvation was small, but there were numerous manifestations of deficiency, including pellagra and pellagra-like eruptions but not of classic severity, oedema, abnormal state of the mouth and tongue, keratomalacia and dry and scaly skin.

At the Government African School in Dodoma, 139 children aged from 7 to 12 years and 108 aged from 12 to 15 years were examined. Sixty-five children were classed as normal. A fair number were found with signs of malnutrition but none with any sign of pellagra. The badly nourished were mostly Wagogo coming from some distance outside the town. Children of other Tanganyikan tribes living in the town had a better diet.

E. M. Hume.

GENERAL STUDIES: DIET PLANNING: EDUCATION

4051

ABBOTT, O. D., TOWNSEND, R. O. and FRENCH, R. B. A survey of food preferences of Florida men. *Florida Agric. Exp. Stat. Bull.* No. 500, August 1952, pp. 26. [Gainesville, Fla.]

Information was obtained by interrogation of 192 men in Florida between 17 and 20 and between 45 and 58 years of age, each age group being subdivided according to place of residence, rural or urban. Data are tabulated for their attitude to 160 foods as acceptable, not tried or disliked. Supplementary information was obtained about the method of preparation preferred for 30 commonly used vegetables and patterns of menus preferred on 2 days of the week, Sunday and Wednesday.

Preference was for foods that grew most abundantly in the State, those grown outside it having generally not been tried. Simple methods of preparation were preferred.—D. Harvey.

4052

VINIT, F. (with RACT, G.) Étude sur la consommation des produits laitiers. [The consumption of milk products.] *Bull. Inst. nat. Hyg., Paris*, 1955, 10, 129-179.

Questionnaires on the use of milk and cheese, issued by the *Union nationale des Associations Familiales* in the spring of 1953, are analysed exhaustively. There was a 50 per cent. response and the results are for 1219 families, rural and urban, in 31 departments of France, consisting of 7207 people, of whom 4668 were children.

The mean daily consumption of milk per head was 0.370 litre, in good agreement with amounts suggested as desirable in previous papers (Absts. 2701, Vol. 22; 3419, Vol. 23). Raw milk was used by 82.6 per cent. of families, pasteurised by 24.9 (some used both). Only about one-third of the children regularly drank milk at the afternoon snack. Particulars are given of the distribution of milk over the different meals and of the dishes in which it was used. The percentages disliking milk were: fathers 20.6, mothers 18.3, children 8.2. About one-quarter of the families reported digestive troubles ascribed to milk and in about half of these the doctor had advised against using it. Eighty-three per cent. of the mothers considered the family had enough milk; of those who did not, 88 per cent. said it was too dear.

The respective percentages disliking cheese were only 3.4, 4.4 and 2.4. Half the children had cheese daily and another 45 per cent. several times a week. Over 80 per cent. of mothers thought the family had enough cheese; nearly a quarter of all mothers said it was too dear. [The quantities consumed do not seem to be stated.] Preferences

for some 25 cheeses are given and methods of using cheese are analysed.

The results for both milk and cheese are further analysed according to geographical region, degree of urbanisation, occupation of father, occupation of mother, age of father and age of mother. There were great regional variations. The highest consumption of both was in Alsace, whereas in the South milk was used relatively little but much use was made of cheese. Liking for milk tended to diminish as urbanisation increased. The percentage of parents liking milk was slightly higher in those under 30 than in those between 30 and 50, after which it rose again.

Since the attitude of the family is much influenced by that of the mother, the importance of propaganda on the advantages of increased consumption of milk products and on methods of using them cannot be overrated.—W. M. Deans.

4053

MANN, I. High protein human food from de-stocking scrub animals. *Brit. Vet. J.*, 1954, 110, 491-499. [Dept. Vet. Serv., Kabete, Kenya.]

Scrub cattle in an overstocked area, Samburu, were slaughtered and provided dried meat and edible fat; the by-products were bone, liver, meat-, blood-, carcase-, and hoof-and-horn meals, dried rumen contents and hides. A more concentrated beef powder was made from the whole animal less bone, horn, hoof and intestines. The dried beef and beef powder are cheap and completely edible, keep well and are easily transported. As additions with bonemeal to maize flour they would supply animal protein and Ca, the nutrients likely to be deficient in African dietaries. Beef powder was found acceptable by patients with kwashiorkor.—A. Hepburn.

4054

MOHANTY, G. B. and ROY, A. B. Hydrolyzed fish protein from the flesh of waste fish. *Science*, 1955, 121, 41-42. [Dept. Fish., Orissa, India.]

A plea is made for the better use of waste fish, e.g., shark and ray, for the production of hydrolysed protein for use in countries where the supply of protein is inadequate. Preliminary work has shown that the preparation is inexpensive and palatable, that it contains all the essential amino-acids and that it keeps well.—J. S. Thomson.

4055

DE OLIVEIRA LEITE, J. Aproveitamento do melaço como fonte de proteínas no Brasil. [Use of yeast as a source of protein in Brazil.] *Arg. brasil. Nutrição*, 1953, 9, 101-122.

In Brazil it would cost about a third of the income of the average middle-class industrial or

commercial worker to purchase 70 g. protein daily from animal sources. The average diet in the country is one of the poorest in the world. The literature on food yeast is briefly reviewed, and it is concluded that 70 g. protein from this source could be retailed for Cruz. 1.90 against 20.00 for egg protein and 7.40 for milk (18.72 Cruz. = 1 \$). Yeast protein is an ideal supplement to diets rich in cereals. Sufficient to supply the needs of 25 million people could be produced by diverting raw materials at present used for alcohol production.—D. Dumeau.

4056

GOVIL, K. K. Consumers' trials with food yeast in Uttar Pradesh. *J. Indian Med. Assoc.*, 1954, 24, 220-223. [Provincial Hyg. Inst., Lucknow.]

Two trials of food yeast (*Torula utilis*) supplied by FAO are reported. In the first, 18 women training as midwives or health visitors had food yeast kneaded with the flour in the making of chapatis, or added to dal or vegetables after cooking. Half an ounce daily, divided between the morning and evening meals, did not affect the flavour of the food or cause digestive upset; more was unacceptable.

In the second, 21 village men were given 11 g. food yeast daily to mix with their food. Three gave it up owing to digestive upsets, the others continued it for some months. They did not gain weight, but reported better appetite and sleep. They would not have been willing to pay for it and it is considered that to create a demand, wide publicity and free supply will be necessary and that meanwhile food yeast should be incorporated into the diet of institutions, hotels and cafés.—W. M. Deans.

4057

DE SIQUEIRA, R., PECHNIK, E. and GUERNELLI, O. Pesquisas de bioquímica aplicada. [Results of applied biochemistry.] *Univ. Brasil Inst. Nutrição Trab. e Pesq.*, 1952, 5, 41-71. English summary.

The use of some oleaginous plants, wild peanuts (*Arachis nambiquarae*, L.), seeds of the rubber plant (*Hevea brasiliensis*, Mart.) and oil from these seeds as foods is discussed. (From summary.)

A. Hepburn.

4058

PLATT, B. S. Human nutrition and the sophistication of foods and feeding habits. Some observations, implications and speculations. *Brit. Med. J.*, 1955, i, 179-185. [Human Nutrit. Res. Unit, Med. Res. Council Labs., London, N.W.3.]

The observations in this paper are based on a review of the literature given at the 1954 Annual

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Meeting of the British Medical Association. Treatments which may be given at different stages in food production and technology are tabulated, with indications of some possible hazards to health. The implications of sophistication considered in greatest detail are those involved in the feeding of infants on some form of cow's milk, and the speculations are on how far a reduced intake of galactose may adversely affect the process of myelination of nerves and on whether an abnormality in composition of the myelin may be the cause of disseminated sclerosis.—D. Harvey.

4059

GUERNELLI, O. Estudo sobre as possibilidades de enriquecimento da farinha de mandioca. [Possibilities of enriching manioc flour.] *Arg. brasil. Nutrição*, 1953, 9, 205-240. [Inst. Nutric., Rio de Janeiro.]

Manioc is one of the staple foods in Brazil; in 1949 12.6 million tons were grown, as against 5 million tons of maize. Production is described and tables of composition and vitamin content from the literature are reproduced. In order to bring the usual poor diet up to estimated requirements for vitamins and minerals manioc flour should be enriched with vitamin B₁, riboflavin, nicotinic acid, Fe and Ca. The costs and technical aspects of enrichment are discussed.

D. Duncan.

4060

GUERNELLI, O. Estudo sobre as possibilidades de enriquecimento da farinha de mandioca. [Possibilities of enriching manioc flour.] *Univ. Brasil Inst. Nutrição Trab. e Pesq.*, 1952, 5, 73-107. [Inst. Nutriç., Univ. Brazil.] English summary.

See preceding Abst.

4061

VAN SICKLE, A. W. and HOGAN, R. J. In-flight feeding during sustained flight of single-place jet aircraft. *J. Aviation Med.*, 1954, 25, 523-529; 555. [Turner Air Force Base, Albany, Ga.]

The problem is that of installing in the cockpit, in such manner as not to interfere with the pilot's efficiency, a readily available supply of drinking water and acceptable foods. The devices employed are described.—F. C. Aitken.

4062

SANTOS, W. J. O problema da educação alimentar no Brasil. [The problem of food education in Brazil.] *Univ. Brasil Inst. Nutrição Trab. e Pesq.*, 1952, 5, 141-186.

The difficulties of planning a campaign of nutritional education in Brazil are manifold because of the poverty, ignorance and prejudices of the people. An increase in income alone is insufficient to ensure better nutrition. Education in nutrition must be accompanied by attention to other problems of public health and of government, such as distribution and price control. Continuous action is necessary and isolated propaganda drives are of little value. National survival demands a planned policy to prevent permanent and progressive under-nutrition in the population. A National Food Organisation is called for, which can plan a wide policy and use every means to carry it through by employing a large body of workers including those in research, medicine, nursing, public health, agronomic, economic and other fields. Possible lines of attack are discussed, including those appropriate in urban and rural communities, in infant nutrition and in technical education.

D. Duncan.

See also Abst. 4034.

FOOD ECONOMICS AND STATISTICS

4063

BROWN, J. A. C. Economics, nutrition and family budgets. *Proc. Nutrition Soc.*, 1955, 14, 63-70. [Dept. Appl. Econ., Univ. Cambridge.]

4064

WELLS, O. V. Outlook for food supplies, surplus commodities, and food habits. *J. Amer. Dietetic Assoc.*, 1955, 31, 13-17. [Agric. Marketing Serv., U.S. Dept. Agric., Washington, D.C.]

4065

PICKREL, L. and WITT, L. An exploration of possible increases in food consumption. *Quart.*

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Bull. Michigan Agric. Exp. Stat., 1954, 37, 27-34. [Dept. Agric. Econ.]

The emergence of food surpluses in the United States prompted this calculation of the effect on consumption of different foods if each low-income group could be induced to adopt the consumption habits of the next higher income group. The basic data are from the 1950 census and "Food consumption of urban families in the U.S., spring 1948" (Bureau of Human Nutrition). People with incomes of \$7500 or more are ignored. The changes imagined would affect some 150 million people.

The percentage increases would be: tomatoes and citrus fruits 11.5, "other vegetables and fruit" 10.1, dairy products except butter 6.6,

meats, poultry and fish 6.2, eggs 5.1, green and yellow vegetables 4.8. The percentage decreases would be: sugar and syrups 0.6, potatoes and sweet potatoes 1.6, butter, fats and oils 3.6 (owing, apparently, to a drop in use of fat pork), flour and cereal products 4.3, beans, peas and nuts 7.6. For most foods, more than half the above increases, as well as increases in potato and sugar consumption, would be achieved by concentrating on income groups below \$3000. Some of the changes, e.g., greater use of fruit and vegetables and dairy products, might lead to improved nutrition. They would not solve the problem of surpluses immediately, except for dairy products. If, however, prices and policies were such as to encourage the use of grains to feed livestock and the growing of fruit, vegetables and feedingstuffs in place of cotton, tobacco and wheat, other surpluses would be reduced.—W. M. Deans.

4066

SCHULZ, T. A 'human needs' diet: autumn 1954. SCHULZ, T. and FIELD, D. E. 'Human needs' diets in Northern Ireland. *Bull. Inst. Statistics Oxford*, 1954, 16, 363-369; 370-371.

The cost of a "human needs" diet in the autumn of 1954 was 62s. 6d. compared with 63s. 7d. in the spring (Abst. 1124, Vol. 25), but the diets were not identical, eggs and fish having been largely replaced by boiling bacon and cheese. A diagram shows the trends of the index of retail prices of food of the London and Cambridge Economic Bulletin and of the cost of the "human needs" diets since 1941; the latter was always higher but the difference between them is tending to level out.

The cost of a "human needs" diet in Belfast, modified to suit local habits, e.g., including more potatoes and bread ["vegetables" in line 3 seems to be a misprint] than in the English diets, was 62s. 2½d. in spring and 59s. 6d. in autumn 1954.

W. M. Deans.

4067

MULDER, T. Het vetverbruik in Nederland. [Fat consumption in the Netherlands.] *Voeding*, 1954, 15, 542-544.

The annual report for the Ministry of Agriculture, Fishery and Food gives data for fat consumption in the Netherlands. From it the following conclusions are drawn:

1. There is a tendency to higher fat consumption, chiefly from increased amounts of "visible" fats, as butter or margarine.

2. Visible fats constitute roughly 60 per cent. of total fat consumed. Before the war this proportion was somewhat less.

3. Milk and cheese, providing about 17 per cent. of total fat, supply the greater part of the invisible fats consumed.

4. Before the war butter accounted for 12 or 13 per cent. of total fat; now it provides only 5 per cent. The figures for margarine are 15 per cent. before the war and 35 per cent. now.

M. Eddison.

4068

FOX, F. W. Agricultural foundations of nutrition. 11. Native reserves and locations. *S. African Med. J.*, 1953, 29, 63-66. [*S. African Inst. Med. Res.*, Johannesburg.]

For parts 8, 9 and 10 see Abst. 2612, Vol. 25. Some basic data are tabulated showing that the people in the Reserves depend for about half their cereal requirements on purchases from European farmers. These Reserves, 5 in number with 4 million inhabitants, occupy only 13 per cent. of the total area of the Union, which has an average annual rainfall of 17½ in., but only 2 of the Reserves have an average rainfall less than 25 in. and 2 have more than 30 in. Work by the Department of Native Affairs and by the African National Soil Conservation Association is mentioned in attempts to relieve the serious mismanagement of the soil.

D. Harvey.

See also Absts. 4052, 4053, 4067.

DIET IN ETIOLOGY OF DISEASE

METHODS OF ASSESSING STATE OF HEALTH

4069

DEAN, R. F. A. Standards for African children and the influence of nutrition. *J. Trop. Med. Hyg.*, 1954, 57, 283-289. [*Med. Res. Group Res. Infant. Malnutrit.*, Mulago Hosp., Kampala, Uganda.]

A version of a paper read at a Conference on the African Child held in Nairobi. The dangers of applying to African children standards which have been obtained under very different conditions in countries outside Africa are discussed.—D. Harvey.

GENERAL STUDIES

4070

TOMPKINS, W. T., WIEHL, D. G. and MITCHELL, R. M. The underweight patient as an increased obstetric hazard. *Amer. J. Obstet. Gynecol.*, 1955, 69, 114-123. [*Nutrit. Res. Clin.*, Pennsylvania Hosp. (Philadelphia Lying-In Hosp.)]

Hospital patients whose reported pre-gravid weight-for-height ratio was considerably below or considerably above medico-actuarial standards had an increased chance of developing toxæmia. The risk of prematurity, with birthweight 5½ lb.

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or less, decreased as pre-gravid weight-for-height increased. A curve shows the average cumulative gain in weight during pregnancy of clinically normal patients whose pre-gravid weight-for-height was within 10 per cent. of the standard. The incidence of toxæmia or of toxic signs appeared to increase if the weight gain in pregnancy deviated much above or below the "normal" gain during the second trimester, or if there was an excessive gain during the third trimester. Smaller weight gains during pregnancy were associated with increased incidence of prematurity. Babies of underweight mothers were lighter and shorter than babies of mothers of approximately standard weight at the beginning of pregnancy. But consideration of "net gains" by mothers of differing pre-gravid weights suggested that although failure to gain an average amount, especially in the first two trimesters, increases the likelihood of prematurity, greater gains have little effect, if any, on the size of the baby.—A. M. Thomson.

4071

NELSON, T. R. A clinical study of pre-eclampsia. 1. 2. *J. Obstet. Gynaecol. Brit. Empire*, 1955, 62, 48-57; 58-66. [Maternity Hosp., Aberdeen.]

1. The difficulties of precise description are discussed and a definition based primarily on an increase in diastolic blood pressure to 90 mm. or more after the 26th week of pregnancy is adopted. It is regarded as severe when albuminuria is appreciable, $\frac{1}{2}$ part per 1000 by Esbach's scale. Among booked primigravidae at Aberdeen Maternity Hospital the incidence of severe pre-eclampsia did not increase very much with age, but after the age of 30 that of mild pre-eclampsia increased greatly. This may be due to a tendency to hypertension latent in older women. No gradient by maternal social class or by height was found. Excessive weight gain between 20 and 30 weeks was associated with a higher risk of both mild and severe pre-eclampsia, but not of severe pre-eclampsia in mothers aged over 30 years. It is concluded that the relation between gain in weight and pre-eclampsia, particularly the severe grade, is too indefinite to be of real value in predicting the development of pre-eclampsia and that dietary control is, in fact, unlikely to benefit those who most require help.

2. The incidence of and mortality from eclampsia in primigravidae booked at hospital are discussed. In 69 cases of eclampsia among booked patients there were 10 stillbirths and 5 neonatal deaths in the first week; in all cases of death the previous pre-eclampsia had been severe. In severe pre-eclampsia without fits the foetal mortality rose with maternal age and with declining social status, but the effect of these on the incidence of severe

pre-eclampsia was small. The stillbirth rate per 1000 births in severe pre-eclampsia in booked primiparae fell from about 150 in 1938 to 1942 to under 30 in 1951 to 1953. This was due probably to better antenatal care and better treatment of pre-eclampsia, as well as general improvement in maternal health resulting from higher standards of living and better nutrition. The prognosis for the foetus is unlikely to be further improved by present lines of medical treatment; it might be improved by better maternal health and physique and by a decrease in the proportion of primigravidae over 30 years of age.—A. M. Thomson.

4072

GLEISS, J. Ist die Säuglingstoxikose eine aussterbende Krankheit? Ein Bericht über 365 Erkrankungsfälle der Jahre 1930 bis 1953. [Is toxicosis in infants a disappearing disease? Report of 365 cases in the years 1930 to 1953.] *Ztschr. Kinderheilk.*, 1955, 75, 587-595. [Kinderklin., Med. Akad., Düsseldorf.]

4073

EVA-DI GIACOMO, B. and ROTTINI, G. Morbilità e mortalità nella Clinica per le malattie dei bambini di Trieste nel decennio 1944-1953. [Morbidity and mortality at the Clinic for children's diseases in Trieste in the ten years 1944-53.] *Lattante*, 1954, 25, 454-465. [Clin. Malatie Bambini, Osp. Riuniti, Trieste.] English summary.

The Clinic deals only with children under 2 years of age.

Very little information is given about nutritional disease. Of 5826 children received at the Clinic between 1944 and 1953, 1287 were suffering from acute nutritional disturbance, whether infective or not, and 601 from dystrophy. The annual number of cases has remained fairly constant with a maximum in 1944, when food conditions were worst, but the proportion of deaths has steadily declined.

E. M. Hume.

4074

MORRIS, J. N. and HEADY, J. A. Social and biological factors in infant mortality. 1. Objects and methods.

HEADY, J. A., DALY, C. and MORRIS, J. N. 2. Variation of mortality with mother's age and parity.

DALY, C., HEADY, J. A. and MORRIS, J. N. 3. The effect of mother's age and parity on social-class differences in infant mortality. *Lancet*, 1955, 268, 343-349; 395-397; 445-448.

4075

POTTER, E. L. The trend of changes in causes of perinatal mortality. *J. Amer. Med. Assoc.*,

1954, 156, 1471-1474. [Dept. Obstet. Gynaecol., Univ. Chicago, Ill.]

4076

KENT PAEDIATRIC SOCIETY. A study in the epidemiology of health. An investigation into the incidence and causation of health among 10-11 year old schoolchildren in the Borough of Bexley, Kent. Health Dept., Bexleyheath, Kent, pp. xv + 88.

4077

CHUTTANI, P. N. Vegetarians and malnutrition. *Indian Med. Gaz.*, 1954, 89, 289-292. [Dept. Clin. Med., Mod. Coll., Amritsar.]

4078

RUSO, G. Alcune considerazioni sulle cause di morte prima e dopo 50 anni di età. [Causes of death before and after 50 years of age.] *Rend. Ist. Super. Sanità, Rome*, 1954, 17, 302-325. French, English and German summaries.

Mortality in Italy fell from 14.5 per thousand in 1931-33 to 10.7 per thousand in 1947-49. Deaths before 50 years of age fell by 41 per cent., those after 50 by 18 per cent. The only causes of death which increased in frequency were tumours and diseases of the circulatory system, at all ages, and diseases of the blood and blood-forming organs in the older group.

Causes of death before 50, in order of incidence, were infective and parasitic diseases, diseases of the digestive system, diseases of the respiratory system, diseases of infancy, and violent or accidental deaths; the percentage from other causes was negligible. In the older group the most significant causes were diseases of the circulatory system, diseases of the nervous system and sense organs, tumours, senility and old age, and diseases of the respiratory system.—D. Duncan.

4079

DAVIDSON, C. S. Disturbances in nutrition relating to liver disease in man. *Vitamins and Hormones*, 1954, 12, 137-156. [Thorndike Mem. Lab., Second and Fourth Med. Serv. (Harvard), Boston City Hosp., Mass.]

4080

GYRGY, P. Facteurs nutritionnels et troubles hépatiques. [Nutritional factors and liver disease.] *Bull. Soc. sci. Hyg. aliment.*, 1954, 42, 152-164. [Dept. Nutrit., Sch. Med., Univ. Pennsylvania, Philadelphia.]

4081

JELLIFFE, D. B., BRAS, G. and STUART, K. L. The clinical picture of veno-occlusive disease

of the liver in Jamaican children. *Ann. Trop. Med. Parasitol.*, 1954, 48, 386-396. [Dept. Med., Univ. Coll. W. Indies, Jamaica.]

From a study of 11 children who had the disease clinical details are given for the acute form, 5 cases, and for the sub-acute form, 2 cases; in the remaining 4 the disease was chronic, in which form it can be diagnosed only by liver biopsy or at post mortem. Histological changes have already been described (Abst. 1134, Vol. 25), and the present cases are discussed in their relation to scrous hepatosis, Chiari's syndrome, Senecio poisoning and Indian infantile cirrhosis. The etiology is thought not to be primarily nutritional. It may result from the action of a bacterial toxin, and reference is again made to its possible association with the use of "bush teas" (see Title 5146, Vol. 24).—D. Harvey.

4082

LIE KIAN JOE and SUTOMO TJOKRONEGORO. Hepatic fibrosis or cirrhosis in children in Djakarta. *Doc. Med. geogr. trop.*, 1954, 6, 193-207. [Inst. Pathol., Sch. Med., Univ. Indonesia, Djakarta.]

Needle biopsies were made on the livers of children in the Paediatric Department of the Central Hospital in Djakarta. Of the children examined, from 2 months to 10 years of age and with malnutrition and signs of protein deficiency, 100 were Indonesians and 4 Chinese. The most important anomalies found were fatty liver, cellular infiltration of the portal spaces, and proliferation of connective tissue. Biopsies were made also on 45 Indonesian and 12 Chinese children from 17 days to 13 years of age and without signs of malnutrition. The same changes in the liver were found as in the children with malnutrition, fibrosis being not infrequent. Case histories are given. It is suggested that viral hepatitis may be a contributory cause of liver fibrosis.

E. M. Hume.

See also Abst. 4214.

DEFICIENCY DISEASES

General

4083

GIRDWOOD, R. H. The absorption of vitamins in disorders of the alimentary tract. *Proc. Nutrition Soc.*, 1955, 14, 41-50. [Dept. Med., Univ. Edinburgh.]

4084

ROBEY, M. and SIMONNET, H. Réflexions sur le rôle des vitamines au cours de la grossesse. [Consideration of the role of vitamins in pregnancy.] *Bull. Soc. sci. Hyg. aliment.*, 1954, 42, 165-175.

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4085

VAN BEUKERING, J. A. The origin of the word 'kwashiorkor'. *Doc. Med. geogr. trop.*, 1954, 6, 287. [Kade, Gold Coast.]

Information was obtained from the Vernacular Bureau in Accra, Gold Coast, that kwashiorkor is the name for a disease in a child whose mother is pregnant or suckling another child. The name expresses the complex of signs as well as indicating the etiology. "Red boy" is not a correct translation. [The inaccuracy of that translation was referred to by Autret and Behar in FAO Nutritional Studies No. 13 (see p. 306, Vol. 25) and by Trowell *et al.* in "Kwashiorkor" (see Abst. 3155, Vol. 25).]—E. M. Hume.

4086

BROCK, J. F. Progress in kwashiorkor. *Voeding*, 1955, 16, 169-183 (with discussion 183-184). [Univ. Cape Town.]

A lecture delivered at the 3rd International Congress of Nutrition in Amsterdam, 1954.

4087

AUTRET, M. and BEHAR, M. Le syndrome de polycarence de l'enfance en Amérique centrale (kwashiorkor). [The syndrome of multiple deficiency in infants of Central America (kwashiorkor).] *Bull. World Health Organiz.*, 1954, 11, 891-966. [Div. Nutrit., FAO.]

The version in French of FAO Nutritional Studies No. 13. See Vol. 25, p. 306.

4088

VENKATACHALAM, P. S., SRIKANTIA, S. G. and GOPALAN, C. Clinical features of nutritional oedema syndrome in children. *Indian J. Med. Res.*, 1954, 42, 555-568. [Nutrit. Res. Labs., Indian Council Med. Res., Coonoor, S. India.]

The descriptions are based on 207 cases seen over 4 years. The age incidence differs from findings reported from elsewhere, nearly half of the patients having been over 3 years of age when first seen. They came from very poor surroundings, for their "average daily family income was one rupee" and a dietary survey of 30 patients showed that daily intakes of energy, about 105 Cal., and of protein, about 2.2 g., each per kg. bodyweight, were low. The peak period of seasonal incidence was in April and May, the "fly season", when the incidence of infective diarrhoea is also at its maximum.

The clinical findings are described under the headings; growth, oedema, facies, skin changes, hair changes, gastro-intestinal disturbances, liver enlargement, signs of vitamin deficiency, haematology and plasma protein levels. The minimum diagnostic criteria are failure of growth and decrease of blood plasma proteins. These are

often accompanied by one or more of the other signs, from diarrhoea present in 61 per cent. and skin lesions in 39 per cent. to liver enlargement, moderate in 10 and gross in 5 per cent. of all cases. Treatment was with reconstituted skimmed milk.

In prognosis the fatal cases were usually those in which apathy was most intense. The mortality rate was about 10 per cent. Relapses occurred in 8.5 per cent. of the patients and were not related to the intensity of the earlier attacks.

Surprisingly, in some children who went back to the same diet no relapse occurred.—D. Harvey.

4089

BRAS, G. and CLEARKIN, K. P. Histopathology of the pancreas in Jamaican infants and children. *Doc. Med. geogr. trop.*, 1954, 6, 327-330. [Dept. Pathol., Univ. Coll. West Indies, Jamaica.]

The state of the pancreas in Jamaican children with signs of protein malnutrition was investigated. Material was obtained from 49 children under 11 years of age. The changes were listed as atrophy, degeneration of acinar cells, dilatation of ducts, apparent increase in intercalated ducts, diffuse fibrosis and delayed development. Of 2 groups of children, 10 with kwashiorkor and 5 with marasmus, only 1 in each group showed no pancreatic change. Of 33 miscellaneous cases, 22 had fatty liver and of those 15 had pancreatic changes also. Eleven of the miscellaneous cases were without fatty liver, and only 2 of them had slight pancreatic changes. The fat in the liver of the miscellaneous cases was not distributed in quite the same way as in kwashiorkor, but the correlation between the presence of fatty liver and of pancreatic changes was high. The children with kwashiorkor or marasmus were more severely undernourished and underweight than the miscellaneous group, but the findings are not considered as support for the view that the miscellaneous cases with fatty changes in the liver represent a pre-clinical stage of kwashiorkor.

E. M. Hume.

4090

WILCOX, E. B., GALLOWAY, L. S., WOOD, P. and MANGELSON, F. L. Children with and without rheumatic fever. 3. Blood serum vitamins and phosphatase data. *J. Amer. Dietetic Assoc.*, 1954, 30, 1231-1238. [Dept. Foods Nutrit., Utah State Agric. Coll., Logan.]

The children, 131 with a history of rheumatic fever and 131 without, had been the subjects of previous studies (Abst. 5090, Vol. 24).⁸ vitamin A, carotene, ascorbic acid, riboflavin, phosphatase and cholesterol were estimated. Differences between the groups appear of little nutritional significance.—F. C. A.

4091

GOPALAN, C., SRIKANTIAH, S. G. and VENKATACHALAM, P. S. **Electrocardiographic changes in severe malnutrition.** *Indian J. Med. Res.*, 1955, 43, 15-21. [Nutrit. Res. Labs., Indian Council. Med. Res., Coonoor.]

On admission the 31 children had heart rates of 75 to 172 per min., and bradycardia was present in 4; this sign has not been described in kwashiorkor. Tachycardia, which has been described in kwashiorkor, was present in 7.

Two subjects showed sinus arrhythmia. A child which died the day after admission showed sinus arrest for one cardiac cycle in every 3 or 4. An adult showed an irregular rate of 50 with "wandering" of the pacemaker and another showed an inverted P wave but a normal PR interval. All the irregularities disappeared after treatment.

In 15 out of 16 adults and 3 out of 10 children more fully studied the QT interval was prolonged, and it remained so in those studied after treatment. The children affected had bradycardia or normal heart rates.

In all there were 36 adults with severe malnutrition, including 16 with oedema, and 31 children aged 1 to 5 years, including 10 with nutritional oedema syndrome, which in 2 resembled kwashiorkor. Electrocardiograms were taken on admission to hospital, and in 6 adults and 6 children were repeated about 40 days later, when recovery was still incomplete.

In the 36 adults, heart rates on admission varied from 44 to 92 per min., with 12 below 60, and there was no correlation with clinical severity of the low blood pressure or degree of anaemia. Of the 6 subjects re-examined later 5 showed an average increase in heart rate of 30 per cent.; the other was unchanged at 75.

In all the subjects there was reduced amplitude of P waves, QRS complexes and T waves; all amplitudes increased after treatment.

The causes of the changes are discussed.

D. Duncan.

4092

REH, E., CASTELLANOS, A. and DE RUEDA, Y. B. **Estudio de la dieta y de las condiciones de vida existentes entre los trabajadores de una plantacion azucarera de Guatemala.** [Study of the diet and living conditions of workers on a sugar plantation in Guatemala.] *Bol. Ofic. sanit. panamer.*, 1954, 37, 32-52. [Inst. Nutric. Centro America y Panama, Guatemala.] English summary.

A study of 91 sugar-plantation workers and their families showed that they had a low wage and a very low standard of living for food, clothing and other primary needs. Mortality rates for infants and young children were high. Most children and young adults were underweight even when their

small stature was allowed for. Expenditure on food was low and the diet consisted mainly of maize with a little wheat and rice, some fruit and vegetables and very little meat, fish or milk. The chief deficiencies appeared to be of animal protein, vitamin A and riboflavin. Although the intake of vitamin C seemed low, the serum ascorbic acid values showed that there was no lack of the vitamin. Clinical examination revealed many people with dry skin and follicular hyperkeratosis, occasional angular stomatitis and vascularisation of the conjunctiva. Dental caries, goitre, anaemia and malaria were fairly common, and most of the subjects had intestinal parasites.

Some general suggestions for improving the economic situation, living conditions and diet are made.—A. M. Copping.

4093

BIERDRAGER, J. and DE ROOK, H. **Health conditions in Netherlands New Guinea.** *Doc. Med. geogr. trop.*, 1954, 6, 252-266. [Health Dept., Netherlands New Guinea Petroleum Co.]

Only a small part of the report is concerned with dietary disease. The staple foods of the Papuans are sago, taro, ketella (manioc, *Manihot utilissima*), sweet potatoes and yams, with the products of hunting, shellfish, molluscs, and fruits. It was found in 1947 that the diet contained 0.7 mg. vitamin B₁ per 1000 Cal., but in artificial communities beriberi is frequent. On the estates polished rice is the staple diet. Katjang idju beans are used to supplement it, but they are not popular, so $\frac{1}{2}$ kg. rice (Roche mix, Hofmann-La Roche, Basle) fortified to contain 200 times the normal content of vitamin B₁ has been added to 100 kg. polished rice. Where this has been done beriberi has not occurred. Scurvy is not found among the Papuans. New Guinea sore mouth has been observed on estates and in villages in Australian New Guinea. It is characterised by bleeding and ulceration of the gums, cheeks and palate. It heals when fresh vegetables are used. Goitre is endemic in certain parts of the highlands in Australian and Netherlands New Guinea.

E. M. Hume.

Vitamin A

4094

MOSCHETTE, D. S. **Metabolic studies with pre-adolescent girls. 1. Utilization of carotene.** *J. Amer. Dietetic Assoc.*, 1955, 31, 37-44. [Dept. Home Econ., Louisiana Agric. Exp. Stat., Louisiana State Univ., Baton Rouge.]

The utilisation of carotene from boiled, mashed sweet potatoes in diets with and without the addition of fat-free milk was studied in 6 girls aged from 8 to 11 years. During a preliminary period of 6 weeks on unrestricted diet, Hb values and carotene,

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vitamin A and ascorbic acid in the serum were estimated. For the ensuing 9 weeks the girls were given a basal diet providing all the U.S. National Research Council's recommended allowances except for vitamin A. The diet was supplemented during two fortnights of the period with sweet potatoes calculated to provide 3600 μg . β -carotene daily. The amount of carotene excreted daily in the faeces ranged from 61 to 78, with mean 71.1, per cent. of the dose. Variation was considerable in individual subjects, but was less in a later experimental period after a second basal period. The average value for carotene in the serum during the preliminary period was 162 μg . per 100 ml. There was a decided fall to an average value of 94.0 during the first basal period when no carotene was given, and a rise, which was not statistically significant, to 105.6 when sweet potatoes were added to the basal diet. The average serum value for vitamin A during the first basal period was 44.1 μg . per 100 ml., which was higher than the value of 28.8 during the preliminary period. Addition of sweet potatoes did not increase the value. The observations made during the second basal and experimental periods showed the trends to be similar. Addition of fat-free milk to the diets did not significantly influence the serum values for carotene or vitamin A.

I. M. Sharman.

4095

CIUSA, W. and NEBBIA, G. Il problema dell'utilizzazione dei carotinoidi come provitamine A da parte dell'uomo. [The problem of utilisation of carotenoids as provitamin A by man.] *Acta vitaminol.*, 1954, 8, 257-262. [Ist. Merceol., Univ. Bologna.] French, English, German and Spanish summaries.

A review.

4096

ALVAREZ SÁINZ DE AJA, E. El axeroftol en dermatología. [Vitamin A in dermatology.] *Medicamenta*, 1954, 22, 391-393. [Hosp. San Juan de Dios, Madrid.]

A short review.

4097

ASCHER, K. W. Study of 22 malnourished patients with Bitot's spots. *Amer. J. Ophthalmol.*, 1954, 38, 367-373. [5 West Fourth St. (2), Cincinnati, Ohio.]

Of 642 patients with definite or suspected vitamin deficiency, examined in the Nutrition Clinic of Hillman Hospital, Birmingham, Ala., 22 had Bitot's spots, and were studied for periods ranging from a few days to 58 weeks in 1940 and 1941. Only 3 complained of hemeralopia and there was no other sign of vitamin A deficiency. The diet

had been very inadequate. The diagnosis of deficiency given was vitamin B, once, riboflavin 8 times, nicotinic acid 11 times, subclinical 4 cases, and doubtful 4 cases. The Bitot's spots are described in detail. Administration of riboflavin or of a mixture of B vitamins had no effect on them. The proportionate distribution of deficiencies, as diagnosed above, was much the same among the whole group of 642 patients as among the 22 with Bitot's spots. It is considered that dietary deficiency predisposes to formation of Bitot's spots but that the nature of the deficiency is uncertain.—E. M. Hume.

4098

HOOF, C. Acute hypervitaminose-A. [Acute vitamin A excess.] *Maandschr. Kindergeneesk.*, 1954, 22, 271-279. French and English summaries.

Bulging of the anterior fontanelle was observed in 4 breast-fed infants, from 4 to 5½ months old, within a day or so after administration of a single dose of 100,000 or 200,000 I.U. vitamin A accompanied by a large dose of vitamin D. There was no other sign of abnormality and the appearance of the fontanelle was normal again within 48 hr.

In a search of the literature reports were found of 24 other cases.—E. M. Hume.

Vitamin D

4099

SWOBODA, W. Aktuelle Rachitisprobleme. [The state of the rickets problem to-day.] *Wien. klin. Wochenschr.*, 1954, 66, 879-881. [Kinderklin., Univ. Vienna.]

A review.

4100

HERR, M. Über die Häufigkeit von Kraniotabes in Bruck a.d. Mur und Umgebung. [Incidence of craniotabes in Bruck a.d. Mur and its neighbourhood.] *Öst. Ztschr. Kinderheilk.*, 1954, 10, 251-254. [Bruck a.d. Mur.]

The suggestion to fortify milk with vitamin D received support from the discovery in Bruck of a child with severe rachitic deformities. Scrutiny of the records for 380 infants from 2 to 7 months old, examined between October 1951 and September 1952, showed 151 (39.7 per cent.) free from craniotabes. The percentage with slight craniotabes was 31.2, moderate 24, and severe 5.1. The incidence was highest at the age of from 4 to 6 months, and in the months December to February, but even in summer over 40 per cent. were affected. Fortification of the whole milk supply with vitamin D is recommended with the use of large doses of the vitamin for newborn infants, the risk of injury being borne in mind.

E. M. Hume.

4101

SNAPPER, I., SEELY, R., FALK, S. and FEDER, I.
Osteomalacia in New York. *Ann. Int. Med.*,
 1954, **41**, 893-909. [Brooklyn, N.Y.]

Four cases of osteomalacia are described in patients attending hospitals in New York. All the patients suffered from some form of fatty diarrhoea which prevented the absorption of vitamin D. The bone lesions were treated by intramuscular injection of vitamin D with or without ultraviolet light.—E. M. Hume.

4102

HANSEN, F. and RÖSSIGER, S. Phosphataseaktivität und Rachitis bei Keuchhusten. [**Phosphatase activity and rickets in whooping-cough.**] *Ztschr. Kinderheilk.*, 1954, **75**, 565-570. [Kinderklin., Med. Akad., Düsseldorf.]

Since whooping-cough is complicated by the presence of rickets, it was desired to find an objective means of appraising changes in the rachitic state in the course of whooping-cough. The behaviour of the alkaline phosphatase of the blood was therefore investigated. It was estimated by the method of Jenner and Kay (Abst. 17, Vol. 2) at intervals of 14 days in 7 patients with whooping-cough 4 times, in 17 three times, in 4 twice, and in 3 once. For the ages from 1 month to 15 years values from 8.1 to 9.7 units of Jenner and Kay were taken as normal. The range of values in the patients was very great. When all the values were plotted against the duration of the disease in weeks, the curve representing the mean for each week fell slightly at first, from 10.1 to 9.5 after 4 weeks, then rose to 11.3 after 6 weeks, and to nearly 12 after 9 weeks. The values were lower in the older children. In uncomplicated whooping-cough without rickets, the phosphatase value fell steadily for the first 4 weeks; the severity of the cough then began to decrease, and the phosphatase value began to rise and continued to do so. In whooping-cough with rickets the values were all higher than without it, but the lowest values occurred in the same way after 4 weeks.

Since the phosphatase value was affected by whooping-cough, it could not be used as a criterion for the presence of rickets in whooping-cough. It is suggested that the unfavourable effect of whooping-cough on rickets is due to its unfavourable effect on serum alkaline phosphatase.

E. M. Hume.

4103

ZETTERSTRÖM, R. and WINBERG, J. **Primary vitamin D refractory rickets. 2. Metabolic studies during treatment with massive doses of vitamin D.** *Acta paedint.*, 1955, **44**, 45-61. [P. edist. Clin., Karolinska Sjukhuset, Stock-

holm.] French, German and Spanish summaries.

Metabolic studies are reported on 2 patients with rickets refractory to vitamin D (Abst. 1175, Vol. 25). The children were maintained for most of the studies on a diet supplying daily 2 g. Ca and 2 g. P, or occasionally 0.1 g. Ca and 0.9 g. P. Vitamin D₂ or occasionally vitamin D₃ was given orally in oil. Ca and P were estimated in the blood serum, urine and faeces for periods of 6 days. Before any treatment was given the serum P value tended to be low but fluctuated rather widely. The absorption of P from the gut was satisfactory but the bulk of it was excreted in the urine despite the low serum value. The phenomenon could not have been due to failure of re-absorption by the kidney tubules, since a decrease in absorption was followed by a decrease in urinary excretion though the serum value was unchanged. The serum Ca value was normal or low; absorption from the gut and urinary excretion were very low. No vitamin D had been given previously for from 4 to 6 months.

Vitamin D was given at first in small doses [amounts not stated], increasing progressively. There was an immediate fall in serum P but urinary P remained fairly constant. There was a fall also in serum Ca. Absorption of Ca increased in one patient but not in the other. With continued treatment and larger doses of vitamin D, the serum P value rose above the normal but the amount excreted in the urine was scarcely increased, suggesting that renal tubular re-absorption had increased. There was increased retention of P in one child but not in the other. The serum Ca value rose in both children but retention was increased only in the same child as for P.

With doses of from 3 million to 5 million I.U. vitamin D daily for more than a month, no sign of toxicity appeared in 1 child though the serum Ca value rose above the normal, but the output of Ca in the urine was very small. In the second child the value for serum P rose above normal and for serum Ca far above normal, and the urinary output of Ca was very large, beginning to increase before the increase in the serum.

With intravenously injected, labelled P, in one child, the serum value for P decreased much more slowly, and the amount in the urine was less, after treatment with vitamin D than before.

Measurement of alkaline phosphatase seemed the most delicate method of assessing the efficacy of treatment.

In these metabolic studies it was not possible to demonstrate that the response to massive doses of vitamin D in refractory rickets differed significantly from the response to physiological doses in ordinary rickets, except that there was an initial fall in the serum P value. The studies of

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P metabolism did not yield evidence of a primary defect in renal tubular re-absorption. Some defect is presumed in the physiological processes regulating mineralisation, but its nature remains conjectural.—E. M. Hume.

4104

YENDT, E. R., CONNOR, T. B. and HOWARD, J. E. **In vitro calcification of rachitic rat cartilage in normal and pathological human sera with some observations on the pathogenesis of renal rickets.** *Bull. Johns Hopkins Hosp.*, 1955, **96**, 1-19. [Dept. Med., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

Young rats from 3 to 4 weeks old were fed for from 20 to 30 days on a rachitogenic diet low in P, after which they were killed and longitudinal slices were cut from the head of the tibia to include the epiphysis and a small part of the shaft. Slices were tested with silver nitrate, and bones showing healing or too little rickets were rejected. Slices from suitable bones were placed in flasks in the samples of human serum to be tested or in a mixture of inorganic salts; pH was adjusted to between 7.30 and 7.50 by shaking in 5 per cent. CO₂ and 95 per cent. O₂. The flasks were incubated with shaking for 24 hr. at 37.5° C. The slices were then fixed in alcohol and stained with silver nitrate. Calcification was assessed by an arbitrary scale having 5 degrees. Estimations were made of Ca, P, Mg and alkaline phosphatase, and of ultrafiltrable Ca and P, on the same samples of serum. In the latter half of the investigation, the lowest value for the product of Ca and P which would promote calcification of the bone slices in inorganic salt mixtures was determined.

For 30 patients without renal insufficiency, the product of the values for ultrafiltrable Ca and P was 33 or less in 11, and rachitic cartilage did not calcify in any of the samples. In the remainder the product was 34 or more, and calcification occurred in all but 2 which had products of 36 and 37. In 19 patients with chronic renal insufficiency, the product was 35 or more in all but 2, but calcification occurred in only 8, and did not usually do so unless the product was over 55. The ability to calcify did not seem to be related to the severity of renal insufficiency. Ten patients had milder renal insufficiency often accompanied by hypercalcaemia. The product was over 35 in all but one serum, which calcified with a product of 17; 6 others calcified and 3 failed to do so. Control experiments, in which the concentration of Ca and P was determined at which companion slices of cartilage would calcify in an inorganic salt solution, failed to show any inherent defect in capacity to calcify.

The value for Mg in the serum of 23 patients without renal insufficiency was at or below 2.8

mg. per 100 ml.; in 18 with chronic renal disease it was over 2.8 in all but 6. Mg is known to have an inhibiting effect on calcification. Serum from some subjects suffering from the effects of excess of vitamin D or dihydrotachysterol did not fail to calcify cartilage. The various known abnormalities in the serum composition of patients with renal insufficiency are discussed as possible influences inhibiting calcification, and all are rejected except the raised Mg value which is considered as possibly contributory. The failure to calcify in renal insufficiency is accepted as proved but the mechanism is held to be still unknown.—E. M. Hume.

4105

HUISMAN, T. H. J. **Amino-zuurscheiding en vitamine-deficiënties. [Excretion of amino-acids in vitamin deficiency.]** *Voeding*, 1954, **15**, 527-542. [Kinderklin., Alg. Prov. Ziekenhuis, Groningen.]

Improved methods for separating amino-acids in urine are discussed; total amounts of amino-acids in normal adults vary between 750 and 2000 mg. per 24 hr., approximately 1 per cent. of total N output. The same amounts were found in normal children on normal diet, whose ages ranged from $\frac{1}{2}$ to 13 years, and who were under observation in hospital for an unspecified period. The effect on amino-acid output of variations in the intake of protein and fluid were negligible. In 4 children with signs of scurvy the loss of amino-acids was higher than in normal children in both quantity and percentage of total N output, the latter being 1.65 instead of 1.05 per cent. Blood plasma values were normal. It was concluded that in scurvy re-absorption of amino-acids by the renal tubules is reduced. The same defect causes amino-aciduria in rickets, which has been fully described in a previous report (Abst. 2280, Vol. 23).

It is considered that other vitamin deficiencies probably cause loss of amino-acids, and that further tests are needed to prove the renal origin. In vitamin D deficiency increased loss was found of threonine, serine, glycine, histidine, lysine and glutamic acid in bound form; in vitamin C deficiency there was increased output of tyrosine and possibly of phenylalanine also.—M. Eddison.

4106

JONXIS, J. H. P. **Amino-aciduria in scurvy and rickets.** *Maandschr. Kindergeenesk.*, 1954, **22**, 303-304. *Proc.*

4107

MARCUSSEN, P. V. **Tuberculous and tuberculous complications during treatment of lupus vulgaris with calciferol.** *Danish Med. Bull.*, 1954, **1**, 165-171. [Dermatol. Dept., Finsen Inst.]

It was sought to check the impression that

activation of other tubercular foci is liable to occur during treatment of lupus with vitamin D.

Of 248 patients under treatment for lupus with vitamin D, there was re-activation of old tubercular foci, including the lungs, in 6 and appearance of fresh tuberculoid processes in 37. Activation tended to occur as the lupus was healing, but did not seem to depend on the total dose of vitamin D. The complications usually disappeared again spontaneously, but a warning is uttered that preventive treatment with drugs and antibiotics should be given during the vitamin D treatment.

E. M. Hume.

4108

RUSSELL, B. The history of lupus vulgaris: its recognition, nature, treatment and prevention. *Proc. Roy. Soc. Med.*, 1955, 48, 127-132. [Skin Dept., London Hosp.]

A short article, with references, deals mainly with treatments which have been suggested for lupus vulgaris. They include, for external use, strongly caustic substances, Finsen's ultraviolet lamp and X-rays, and, for internal use, large doses of cod liver oil, calciferol and isoniazid. The incidence of lupus is stated to be only about a tenth of what it was 30 years ago, a change attributed to pasteurisation of milk and better general nutrition and hygiene.—W. M. Deans.

4109

SCHUCHARD, W. Die Behandlung der Alopecia areata und des dyshidrotischen Ekzems mit milchweißgebundenem Vitamin D₂. [Treatment of alopecia areata and dry eczema with vitamin D₂ combined with milk protein.] *Deutsch. med. Wochenschr.*, 1955, 80, 417-418. [Marburg a.d. Lahn.]

Alopecia areata was successfully treated in 35 adults by administering twice daily a tablet containing 1 mg. vitamin D₂ combined with milk protein. Hair began to grow after from 40 to 60 tablets had been taken, and the dose was then reduced to 1 tablet daily till the hair growth was normal again.

The same result was achieved with 2 children of 7 and 8 years old, and the same treatment gave promising results with dry eczema of the hands in 10 patients.

No effect of overdosage was seen.—E. M. Hume.

4110

GRUNDLER, E. Zur Vitamin-D-Überdosierung im Säuglings- und Kleinkindesalter. [Vitamin D excess in infancy and childhood.] *Deutsch. med. Wochenschr.*, 1955, 80, 285-288. [Kinderklinik, Univ. Tübingen.]

The author describes his experience in 10 cases.

E. M. Hume.

See also Abst. 4237.

Vitamin E

4111

FERGUSON, M. E., BRIDGEFORTH, E. B., QUAIFF, M. L., MARTIN, M. P., CANNON, R. O., MCGANITY, W. J., NEWBILL, J. A. and DABRY, W. J. The Vanderbilt cooperative study of maternal and infant nutrition. 7. Tocopherol in relation to pregnancy. *J. Nutrition*, 1955, 55, 305-321. [Div. Nutrit., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

For Parts 5 and 6 see Abst. 5103, Vol. 24.

Single estimations were made of the tocopherol content of the plasma of 1575 women. A separate group of 39 women had serial estimations of plasma tocopherol made during pregnancy and 6 weeks after. The average tocopherol content rose from 0.89 mg. per 100 ml. during the first trimester of pregnancy to 1.40 after 33 weeks. Calculations of the dietary intake of 197 pregnant women gave an average of 10 mg. daily, individual values ranging from 2.9 to 33.3 mg. Tocopherol levels in the blood generally rose with increasing age of the subject. Higher levels were found also in the few cases of diabetes examined. Levels tended to be lower in the plasma when the calculated intakes were less than 8.0 mg. tocopherol daily; in the first trimester an average of 1.06 mg. per 100 ml. was obtained with subjects receiving over 8.0 mg. but only 0.97 with those whose daily intake was less than this amount. Corresponding values for the second trimester were 1.10 and 1.02 mg., respectively, and for the third trimester 1.28 and 1.18 mg. Some association was also found between the levels of carotene in the blood and the corresponding tocopherol values. It is concluded that variation of the tocopherol content of the plasma cannot account for the complications of pregnancy which were encountered in the "normal" obstetrical population investigated.

I. M. Sharman.

4112

HURLEY, K. E. and WILLIAMS, R. J. Urinary amino acids, creatinine and phosphate in muscular dystrophy. *Arch. Biochem. Biophys.*, 1955, 54, 384-391. [Biochem. Inst., Univ. Texas, Austin.]

Urine was collected on four consecutive mornings from 20 normal male subjects and 18 male subjects suffering from muscular dystrophy. The urine was analysed for creatinine, phosphate, glycine, alanine, serine, threonine, valine, leucine, citrulline and taurine; amounts are expressed as μg . per ml. urine divided by the figure formed by the second and third decimals of the sp. gr. of the urine. Creatinine and phosphate values in the normal group were 119 and 65.9, compared with 38 and 37.6 for those with muscular dystrophy. Values for leucine and valine were 1.63 and 1.97 for the normal and 2.5 and 3.4 for the dystrophic

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subjects. Threonine and valine excretion appeared to be slightly raised in the dystrophic group but the differences were significant only at the 10 per cent. level. There appeared to be no significance in the differences in excretion of the other amino-acids. With increasing age the excretion of leucine, valine and taurine tended to increase in dystrophic and to decrease in normal subjects. Arginine was found in the urine of 7 of the normal and 14 of the dystrophic subjects.

R. J. Ward.

Vitamin B Complex

4113

HRUBÁ, F. Saturační testy k určování vitaminů v klinice i v terénu. [Saturation tests for estimating vitamin status in the clinic and in the field.] *Sborn. pathofysiol. tráv.*, 1954, 8, 154-159. [Human Nutrit. Res. Inst., Prague.] English and Russian summaries.

A report is made of studies of nutritional status in some Czech regions with regard to vitamins C and B₁ and riboflavin. Four-hr. saturation tests, which could be made simultaneously, are proposed for work in the field.

M. Prokšová (Czechoslovakia).

4114

ORSINI, M. and CAMPEA, L. La cocarbossilasi nelle sindromi chetonemiche dell'infanzia spontanea e provocate. [Cocarboxylase in spontaneous and induced ketonaemia of children.] *Arch. ital. Pediat. Puericoll.*, 1955, 17, 3-33. [Int. Clin. Pediat., Univ. Rome.] French, English and German summaries.

Ketone bodies were estimated by the method of Krainick (Abst. 28, Vol. 8) in the blood of 18 patients aged from 9 months to 13 years before, and for up to 5 hr. after, a single intravenous injection of from 20 to 100 mg. cocarboxylase. The children fasted for from 10 to 12 hr. before and during the experiment. Ketones were estimated also in the urine. Blood values for 10 normal subjects ranged from 0.70 to 2.30 mg. per cent. The values for the patients before injection of cocarboxylase ranged from 4.4 to 32.4 mg. per cent.; 3 of them had cyclical vomiting, 2 had diabetic ketosis, 2 had ketosis induced experimentally by dietary means, and 11 had ketosis secondary to other conditions. After injection of cocarboxylase, there was a definite decrease of the blood ketone values in 11 of the patients and a slight decrease in 20 others, but the reduction lasted only an hour or two, and no group was consistently affected except the two diabetics, who showed no reduction but a rise. It is concluded that cocarboxylase is likely to be of lasting use in ketosis only when there is a specific deficiency of vitamin B₁.—E. M. Hume.

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4115

DE, H. N. Studies on cholinesterase. Effect of thiamine on the serum cholinesterase activity of human blood. *Indian J. Med. Res.*, 1955, 43, 71-78. [Dept. Biochem., Mahatma Gandhi Mem. Med. Coll., Indore.]

Vitamin B₁ hydrochloride at a concentration of $7.6 \times 10^{-3} M$ completely inhibited cholinesterase in human serum. The degree of inhibition was linearly related to the concentration between $7.5 \times 10^{-4} M$ and $7.5 \times 10^{-3} M$. The enzyme was directly inhibited and the substrate was unaffected.—A. Hepburn.

4116

POSTIGLIONE, F. and DELLA CORTE, L. Influenza della vitamina B₁ sulla sierodiagnosi di Wassermann e sulle flocculazioni per la luc. [Influence of vitamin B₁ on the Wassermann reaction and flocculation test in syphilis.] *Bol. Soc. ital. Biol. sper.*, 1954, 30, 189-191. [Ist. Semeiotica Med., Univ. Naples.]

Vitamin B₁ hydrochloride was given by intramuscular injection in a daily dose of 100 mg. for 10 days to 4 patients with confirmed syphilis, and for 30 days to 2. Six others received 500 mg. orally for from 10 to 40 days. In one patient only, whose reaction was in any case slight, was there any reduction on treatment with vitamin B₁ in the intensity of the Wassermann or Kahn reaction. There was slight increase in the sedimentation rate and no consistent effect on the concentration of albumin and globulin in the blood (cf. Abst. 5001, Vol. 23).—E. M. Hume.

4117

BARAZZONE, J. and LAMBELET, F. Accidents mortels après injection de thiamine (vitamin B₁). [Fatalities after injection of thiamine (vitamin B₁).] *Presse méd.*, 1954, 62, 1867-1868. [Clin. Thérap., Univ. Geneva.]

Cases reported in the literature of death after treatment with vitamin B₁ are reviewed and 2 such fatalities, one after intramuscular, the other after intravenous, injection of 100 mg. vitamin B₁ hydrochloride, are described. Possible causes are considered but none is thought to provide a satisfactory explanation. The giving of the vitamin in increasing doses by mouth and only later by the intramuscular or, in exceptional cases, by the intravenous route, is recommended.—D. Harvey.

4118

HAYES, M. A. Water-soluble vitamin requirements in surgical convalescence. *Ann. Surg.*, 1954, 140, 661-667. [Samuel C. Harvey Metabolic Unit, Dept. Surg., Sch. Med., Yale Univ., New Haven, Conn.]

Two patients in whom clinical signs of deficiency of vitamin B₁ and other members of the vitamin B complex were associated with defective carbohydrate metabolism, hepatic cellular dysfunction, delayed Hb synthesis and negative N balance responded in all these respects to intensive treatment with water-soluble vitamins.—F. C. Aitken.

4119

WINKEL, W. E. F. Irreparable changes of the spinal cord after pellagra. *Doc. Med. geogr. trop.*, 1954, 6, 296-302.

A patient who had been a prisoner of war in the Dutch East Indies was admitted to the university hospital in Leyden in 1946. He was reputed to have had typical pellagra and other "camp anomalies". On admission to hospital he complained of stiff and insensitive hands and legs, with tingling of hands and feet, unmanageable arms and legs, loss of muscle power and a swollen feeling in the lips, gums and tongue. Six months later he died of bronchopneumonia and endocarditis. There were degenerative changes in the spinal cord which are described in detail.—E. M. Hume.

4120

ALTSCHUL, R., HOFFER, A. and STEPHEN, J. D. Influence of nicotinic acid on serum cholesterol in man. *Arch. Biochem. Biophys.*, 1955, 54, 558-559. [Lab. Gerontol., Univ. Saskatchewan, Saskatoon.]

In trials to find out whether direct stimulation of respiratory enzyme activity would influence serum cholesterol, nicotinic acid, which is a component of the respiratory coenzyme system, was given to rabbits by mouth 3 times daily in doses of from 0.18 to 0.045 g.; it was usually followed by a decrease in serum cholesterol.

In 11 healthy medical students, 4 g. nicotinic acid given by mouth in 4 spaced doses of 1 g. during 24 hr. was followed by an average decrease of 8.4 per cent. in serum cholesterol of which the previous average value had been 204 mg. per 100 ml. In a series of 57 patients who received a single dose of 1 g. nicotinic acid, a decrease in serum cholesterol occurred also, the amount of the decrease depending on the initial value. If the total of 68 subjects was divided into 2 groups with serum cholesterol values under and over 250 mg. per 100 ml., the average percentage decrease in the first group was 6.4, and in the second 21.7.

Since all the students reacted to the nicotinic acid with flushing and burning skin sensations, it is considered possible that this stress reaction may have been a cause contributing to the decrease in serum cholesterol.

In parallel tests with 20 healthy medical students who received nicotinamide there was no effect on serum cholesterol.

The studies just described are connected with attempts to prevent experimental arteriosclerosis in rabbits and to reduce serum cholesterol in patients with degenerative vascular disease.

H. Chick.

4121

BIEHL, J. P. and VILTER, R. W. Effects of isoniazid on pyridoxine metabolism. *J. Amer. Med. Assoc.*, 1954, 156, 1549-1552. [Dept. Int. Med., Coll. Med., Univ. Cincinnati, Ohio.]

Of 74 previously untreated patients treated with the drug isoniazid in doses from 6 to 24 mg. per kg. bodyweight some developed symptoms of neuritis in from 5 weeks to 6 months. The incidence was greater, 14 of 32, in patients receiving the highest dose. The excretion of vitamin B₆ increased up to 4 times normal in some after administration of isoniazid and fell on its withdrawal. When vitamin B₆ was given with isoniazid neuritis did not develop. The isonicotinyl hydrazone of pyridoxal was formed *in vitro* by the coupling of pyridoxal and isoniazid. The hypothesis that this compound is excreted is advanced to explain the depletion of vitamin B₆ by isoniazid.—A. Hepburn.

4122

KERPOLA, W. and PÄTÄLÄ, J. Pyridinenucleotides (coenzyme I and II) of blood in normal subjects and in various diseases, especially tuberculosis. *Ann. Med. exp. Biol. Fenn.*, 1954, 32, Suppl. 7, pp. 30. [I. Med. Dept., Univ. Helsinki.]

Pyridine nucleotides were estimated by the fluorimetric method of Levitas *et al.* (Abst. 433, Vol. 17) in blood from 41 healthy subjects and 253 patients with various diseases. The content of total pyridine nucleotides in $\mu\text{g. per ml.}$ was 28.1 ± 0.69 in normal whole blood and 67.1 ± 1.49 in normal red cells; in 92 patients with tuberculosis of different degrees of severity the corresponding values were 24.0 ± 0.34 and 54.0 ± 0.60 . Low values for pyridine nucleotides were found also in the blood of schizophrenic patients and those with asthenia associated with neurocirculatory disturbances. In digestive, rheumatic and circulatory disorders the pyridine nucleotides of the blood were within normal limits. In some endocrine disorders and some patients with leucæmia the values were raised. The relation of the pyridine nucleotide content of the blood to general metabolic disturbance is discussed.—A. M. Copping.

4123

DEB, A. K. Modified insulin and vitamin B-complex treatment in some common mental ailments. *Calcutta Med. J.*, 1954, 51, 375-377. [Lumbini Park, Calcutta.]

The cases of 5 patients with mental disorders, schizophrenia, hysteria or anxiety states are discussed; all of them showed improvement after combined treatment with insulin and injections of vitamin B complex, and with powder of the plant *Rauwolfia serpentina* and light psychotherapy. J. S. Thomson.

4124

ŠPAČEK, M. Physiological investigations on the excretion of kynurenine in humans. *Canad. J. Biochem. Physiol.*, 1955, **33**, 14-20. [Dept. Health and Welfare, Charlottetown, Prince Edward Island.]

Kynurenine was estimated by a method which has previously been described (Abst. 1620, Vol. 25) in urine from healthy adults and from inmates of an institution for old people. In specimens obtained at different times of the day or night, and in total urine for different days from the same subjects, variations of from 13 to 16 per cent. were found. Subjects with high values for kynurenine excretion showed decreased values when tryptophan was eliminated from the diet by institution of a vegetarian regime without milk, cheese or eggs. Doses of 2 or 3 g. tryptophan caused a rise in kynurenine excretion, but smaller doses had little or no effect. Administration of nicotinamide caused a decrease in kynurenine excretion, but pyridoxine had no consistent effect.

There appeared to be a relation between age and extent of kynurenine excretion. Young adults excreted on the average 0.1 mg. per 100 ml. urine, older persons of average age 47 years 0.21 mg. per 100 ml., and averages were even higher in subjects over 70 years. No marked difference was found between male and female subjects.

A. M. Copping.

4125

GRÜBER, H. L. E. Mitteilung über die Wirksamkeit von Vitamin B₆ bei Alkoholrausch. [Activity of vitamin B₆ in alcoholic intoxication.] *Münch. med. Wochenschr.*, 1954, **96**, 1445. [Pathol. Inst., Jung - Stilling - Krankenhaus, Siegen i.W.]

In mice the toxic effect of the DL50 dose of alcohol was appreciably decreased when pyridoxine hydrochloride was injected also.

Human subjects were set to make a simple calculation before and after taking the equivalent of from 1 to 2 ml. absolute alcohol per kg. body-weight, and again, a little later, after injection of 0.05 g. pyridoxine hydrochloride. Neither subjective nor objective benefit was obtained from giving vitamin B₆ in 9 subjects. The findings did not support the theory that vitamin B₆ might be used to counteract the effects of alcohol in man.

A. M. Copping.

4126

CHOWDHURY, S. R., RAJAGOPAL, K. and CHAKRABORTY, A. N. Influence of pyridoxine on fat metabolism in phrynoderma. *Indian Med. Gaz.*, 1954, **89**, 283-287. [Sect. Biochem. Nutr., All India Inst. Hyg. Pub. Health, Calcutta.]

The possible role of vitamin B₆ in phrynoderma is reviewed with reference to fat metabolism. In a study of 24 patients with phrynoderma, 4 received 10 mg. pyridoxine daily by mouth, 4 had 50 mg. pyridoxine twice weekly by injection, and the others had raw linseed oil alone or with pyridoxine by mouth or by injection. Pyridoxine alone had no effect on the skin but injection of pyridoxine while linseed oil was being given enhanced the curative effect of the oil. The cholesterol and fatty acid contents of the blood serum were estimated. There was a significant increase in the iodine number of the fatty acids and in the blood cholesterol of patients given linseed oil with pyridoxine by injection.—A. M. Copping.

4127

ZUMOFF, B. Failure of folic acid to affect uric acid metabolism in a case of gout. *Metabolism*, 1955, **4**, 80-81. [Lab. Med. Serv., Veterans Admin. Hosp., Brooklyn, N.Y.]

In view of the relation between folic acid and xanthine oxidase in chicks, and the beneficial effect of folic acid on serum uric acid in a case of sprue (Abst. 1106, Vol. 24), an attempt was made to treat a patient with gout by intramuscular and oral doses of folic acid. No benefit was obtained.

A. M. Copping.

4128

COLSKY, J., GREENSPAN, E. M. and WARREN, T. N. Hepatic fibrosis in children with acute leukemia after therapy with folic acid antagonists. *Arch. Pathol.*, 1955, **59**, 198-206. [Clin. Res. Unit, Nat. Cancer Inst., U.S. Pub. Health Serv., Dept. Health, Baltimore, Md.]

Detailed clinical reports are given of the results in 5 children of treating acute leucemia with A-methopterin or aminopterin. Doses of up to 10 mg. A-methopterin or 2 mg. aminopterin were given daily for several months; remission of the disease occurred but could not be maintained even with continued treatment. Clinical and laboratory signs of hepatic fibrosis appeared in all the subjects and at autopsy there was extensive fibrosis. The problem of the effect on the liver of folic acid antagonists is discussed.—A. M. Copping.

4129

WATSON, R. J., LICHTMAN, H. C., MESSITE, J., ELLISON, R. R., CONRAD, H. and GINSBERG, V. Clinical studies with the citrovorum factor

in megaloblastic anemia. *Amer. J. Med.*, 1954, 17, 17-28. [Dept. Med., Coll. Med., State Univ. New York.]

A woman with pernicious anaemia in relapse given 5 mg. citrovorum factor by mouth daily had normal blood values within 2 months, but 2 months later she developed for the first time neurological signs which responded to vitamin B₁₂ given parenterally.

Five patients with megaloblastic anaemia of nutritional origin gave a haematological response to citrovorum factor; 4 of them had failed to respond to vitamin B₁₂. Two were thought to have a deficiency of both vitamin B₁₂ and citrovorum factor.

It is concluded that citrovorum factor is contraindicated in pernicious anaemia but is equal in value to folic acid for treatment of nutritional megaloblastic anaemia.—D. Duncan.

4130

SCHWARTZ, S. O., FRIEDMAN, I. A. and GANT, H. L. Long-term evaluation of vitamin B₁₂ in treatment of pernicious anemia. 1. Incidental report on use of combined oral therapy with vitamin B₁₂ and folic acid. *J. Amer. Med. Assoc.*, 1955, 157, 229-231. [Lab. Haematol., Cook County Hosp., Ill.]

Clinical, haematological and neurological evaluation of treatment extended to over 4 years in 34 of 63 patients given injections of liver extract and in 32 of 51 given injections of vitamin B₁₂. The amounts given were generally 30 U.S.P.U. liver extract or 30 µg. vitamin B₁₂ every 4 weeks, more to patients with neurological symptoms. In the group given liver extract 3 patients had slight recurrence of paraesthesiae, and in the group given vitamin B₁₂ there were 4 neurological relapses, which were reversed by higher doses of vitamin B₁₂ or by adequate liver therapy. In a group of 36 patients given orally 25 µg. vitamin B₁₂ and 1.67 mg. folic acid daily, the incidence of neurological relapse was high, and this form of treatment is not recommended.—F. C. Aitken.

4131

SCHWARTZ, S. O., FRIEDMAN, I. A. and GANT, H. L. The long-term evaluation of parenteral vitamin B₁₂ and oral vitamin B₁₂ with folic acid in the treatment of pernicious anemia. *J. Lab. Clin. Med.*, 1954, 44, 928. *Proc.* [Chicago, Ill.]

4132

MUELLER, J. F. and WILL, J. J. Interrelationship of folic acid, vitamin B₁₂ and ascorbic acid in patients with megaloblastic anemia. *Amer. J. Clin. Nutr.*, 1955, 3, 30-44. [Dept. Int. Med., Coll. Med., Univ. Cincinnati, Ohio.]

Studies during the past 8 years are discussed in relation to the effect of folic acid and vitamin B₁₂ on different types of megaloblastic anaemia in man. The probable role of ascorbic acid in human anaemia is reviewed. The present knowledge of nucleoprotein metabolism is considered in connection with pernicious anaemia and other macrocytic anaemias. A schematic representation of the present knowledge of metabolic interrelationships of the three vitamins is suggested.

A. M. Copping.

4133

COMINSKY, B. and HOLAVKO, C. I. Normal bone marrow in untreated pernicious anemia. *Amer. J. Med.*, 1954, 17, 744-746. [Dept. Med., Coll. Phys. Surg., Columbia Univ., New York.]

Pernicious anaemia was diagnosed in 4 patients despite the absence of megaloblasts from the bone marrow. The anaemia was slight, but 3 of the patients had nerve signs. All responded with a reticulocyte crisis and clinical improvement after parenteral treatment with vitamin B₁₂.
D. Duncan.

4134

MONTO, R. W., REBUCK, J. W. and HOWELL, J. T. The single intranasal application of vitamin B₁₂ crystals in pernicious anaemia: a clinical and laboratory appraisal of two patients. *J. Lab. Clin. Med.*, 1954, 44, 900. *Proc.* [Detroit, Mich.]

4135

GILLIESPY, R. O. The treatment of pernicious anaemia with vitamin B₁₂ insufflation. *Practitioner*, 1955, 174, 177-179. [Haematol. Clin., Dudley Road Hosp., Birmingham.]

Twenty-six patients with pernicious anaemia satisfactorily controlled with liver extract or cyanocobalamin given parenterally suffered no setback over a period of from 12 to 18 months when treated by cyanocobalamin insufflation, the vitamin being taken directly from the back of the hand in doses of 100 µg. a week. New cases of pernicious anaemia in relapse, 19 in all, responded satisfactorily to cyanocobalamin taken by insufflation, 100 µg. daily for 14 days, and then 100 µg. weekly.

The method of treatment is not recommended in cases of chronic nasal catarrh or for patients incapable of carrying out, effectively, the simple instructions.—F. C. Aitken.

4136

BOETTGE, K. Vitamin B₁₂ and "intrinsic factor". [Vitamin B₁₂ and intrinsic factor.] *Deutsch. med. Wochenschr.*, 1955, 80, 389-390.

A review.

4137

KREBS, A. Die orale Therapie der perniziösen Anämie mit Vitamin B₁₂ und Magenschleimhautextrakt. [Oral treatment of pernicious anaemia with vitamin B₁₂ and an extract of gastric mucosa.] *Münch. med. Wochenschr.*, 1954, 96, 1451-1453. [Innere Abt., Städt. Krankenhaus, Siegburg.]

Reports are given of the response of 8 patients with untreated pernicious anaemia to capsules containing 2.5 or 5.0 µg. crystalline vitamin B₁₂ and a dried preparation of pig's gastric mucosa equivalent to at least 3 units of apoerythrin. The reticulocyte response to from 3 to 5 of the capsules daily given by mouth was very little slower than to injected vitamin B₁₂, and the blood picture returned to normal in from 9 to 13 days. It was maintained with a dose of one capsule daily.

A. Copping.

4138

HÖRLIN, W. Die perorale Behandlung der perniziösen Anämie mit konzentriertem Intrinsic Factor und Vitamin B₁₂. [Oral treatment of pernicious anaemia with concentrated intrinsic factor and vitamin B₁₂.] *Münch. med. Wochenschr.*, 1954, 96, 1513-1516. [Med. Klin., Stadtkrankenhaus, Hof a.d. Saale.]

Tablets containing 10 µg. vitamin B₁₂ and 0.5 U.S.P. unit of intrinsic factor were given to 17 patients with pernicious anaemia. A reticulocyte response was obtained in most patients after 15 tablets had been given in 5 days, though a longer period of treatment was needed for some patients. When the blood picture was restored and the other signs and symptoms had disappeared, a satisfactory maintenance dose was 3 tablets a week.

A. M. Copping.

4139

WILLIAMS, W. L., ELLENBOGEN, L. and ESPOSITO, R. G. Preparation of highly purified intrinsic factor. *Proc. Soc. Exp. Biol. Med.*, 1954, 87, 400-405. [Nutrit. Physiol. Sect., American Cyanamid Co., Res. Div., Lederle Labs., Pearl River, N.Y.]

Intrinsic factor prepared from pig's stomach dried and defatted at low temperature was purified by fractionation with ammonium sulphate, followed by proteolytic digestion and alcohol fractionation. The final fraction was further purified by ultrafiltration and the preparation was active for pernicious anaemia patients in doses of 1 or 2 mg. with vitamin B₁₂. Analysis by electrophoresis and ultracentrifuging indicated that the active component had a molecular weight of about 5000, contained hexosamine and was probably a mucopolypeptide. The hexosamine portion of the molecule was shown by a differential colorimetric method to contain glucosamine and presumably chondrosamine hydrochloride.—A. M. Copping.

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4140

DI RAIMONDO, F., ANGARANO, D. and MANNINO, N. Aspetti e limiti della disvitaminosi da antibiotici: osservazioni e ricerche in soggetti sani. [Some aspects and limits of vitamin deficiency induced by antibiotics: observations and studies on healthy subjects.]

DI RAIMONDO, F., MANNINO, N., ANGARANO, D. and SCHIRALDI, O. Prevenzione della disvitaminosi da antibiotici: ricerche sperimentali in soggetti sani e osservazioni cliniche in malati. [Prevention of vitamin deficiency induced by antibiotics: experimental studies on healthy subjects and clinical observations on patients.] *Internat. Ztschr. Vitaminforsch.*, 1955, 25, 407-426; 427-433. [Ist. Clin. Med., Univ. Bari.] English summary.

Thirteen healthy subjects aged from 20 to 35 years were maintained on a constant diet of convalescent-hospital type. In the 24-hr. urine, vitamin B₁, riboflavin and nicotinic acid were estimated chemically, and vitamin B₆, vitamin B₁₂ and folic acid microbiologically. All the subjects except one were given chloramphenicol daily for 7 days. [The amount is sometimes stated as 2.5 g. daily and sometimes as 2.5 mg.] The thirteenth was given terramycin and aureomycin. Test intramuscular injections of a single B vitamin in moderate or large doses were given before the course of antibiotic and again at the end of it. [Detailed protocols are set out for every subject but there is no table summarising results.] Under the influence of the antibiotic the amount of all the 6 vitamins in the urine fell steadily, the fall being greatest with nicotinic acid, folic acid and vitamin B₁₂. The retention of more of the test dose after antibiotic treatment than before was taken as evidence of the state of deficiency induced by the antibiotic.

B vitamins in the urine of 6 healthy subjects were estimated as in the preceding experiment before, and daily during, treatment with 10 tablets of a preparation containing 250 mg. chloramphenicol and physiological doses of vitamin C, nucleic acid and 8 B vitamins. The fall in excretion of B vitamins in the urine caused by chloramphenicol was completely prevented and sometimes reversed. The same preparation was given to 11 patients with infectious diseases requiring antibiotic treatment. The inclusion of the vitamins had no undesirable effect on the action of the antibiotic, and prevented signs of deficiency, such as occasionally occur.—E. M. Hume.

4141

BAKER, S. J. and MOLLIN, D. L. The relationship between intrinsic factor and the intestinal absorption of vitamin B₁₂. *Brit. J. Haematol.*,

1955, 1, 46-51. [Dept. Pathol. (Haematol.), Postgrad. Med. Sch., London.]

The absorption of small doses of vitamin B₁₂ labelled with ⁵⁸Co and given with varying amounts of intrinsic factor from pig's stomach was studied in patients with pernicious anaemia in remission after treatment with vitamin B₁₂. The amount of radio-activity in the faeces showed that, over a limited range, there was a stoichiometric relationship between the amount of vitamin B₁₂ absorbed and the amount of intrinsic factor administered. Beyond that range increase in the amount of intrinsic factor did not increase the absorption of vitamin B₁₂. The ability to absorb vitamin B₁₂ showed individual variation in the 6 patients studied. If large amounts of unlabelled vitamin B₁₂ were injected some hours before or shortly after the oral test dose the intestinal absorption of the radio-active vitamin B₁₂ decreased.

A. M. Copping.

4142

SCHILLING, R. F. The absorption and utilization of vitamin B₁₂. *Amer. J. Clin. Nutr.*, 1955, 3, 45-49 (with discussion 49-51). [Dept. Med., Med. Sch., Univ. Wisconsin, Madison.]

The importance of intrinsic factor in absorption of vitamin B₁₂ from the intestine is discussed. Gastric mucosa is apparently the only source of intrinsic factor in man; in its presence the requirement of vitamin B₁₂ is about 1 µg. daily. The very slow breakdown of absorbed vitamin B₁₂ is discussed with reference to the length of the remissions in pernicious anaemia induced by treatment with vitamin B₁₂, and also to the persistence of radio-activity in the liver for long periods after administration of radio-active vitamin B₁₂.

A. M. Copping.

4143

GLASS, G. B. J., BOYD, L. J., STEPHANSON, L. and JONES, E. L. Metabolic interrelations between intrinsic factor and vit. B₁₂. 3. B₁₂ absorption at varied intrinsic factor doses.

GLASS, G. B. J. and JONES, E. L. 4. Relative thermostability of some intrinsic factor preparations. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 1-5; 69-73. [Dept. Med., New York Med. Coll.]

3. The uptake of radio-active vitamin B₁₂, given by mouth mixed with intrinsic factor from pig's stomach or from human gastric juice, was measured from counts of radio-activity over the liver area in 6 patients with pernicious anaemia, one patient after total gastrectomy and one normal subject. With a constant dose of vitamin B₁₂, increasing amounts of intrinsic factor increased the amount of vitamin absorbed up to a point beyond which further increase in intrinsic factor did not raise absorption and in some in-

stances even decreased it. This latter effect might have been due to excess intrinsic factor binding vitamin B₁₂ and preventing its absorption.

4. The activity of intrinsic factor preparations from heated and unheated human gastric juice and from pig's stomach was measured by giving the materials with radio-active vitamin B₁₂ and making surface scintillation measurements of the amount of vitamin absorbed. It was confirmed that human intrinsic factor was thermolabile and that it was destroyed or inactivated by boiling at pH from 1.2 to 1.4 for 30 min. Preparations from pig's stomach were destroyed by boiling at pH 1.2, but not at pH 6.0. The problem of the relative stability of some preparations at neutrality is discussed.—A. M. Copping.

4144

FRANZ, W. and PENDL, I. Über den Einfluss der Bakterienbesiedlung des Magens auf die perorale Vitamin B₁₂-Resorption bei perniziöser Anämie. [Influence of the bacterial flora of the stomach on the absorption of vitamin B₁₂ given orally in pernicious anaemia.] *Klin. Wochenschr.*, 1954, 32, 1092-1096. [2. Med. Klin., Univ. Frankfurt a.M.]

In the gastric juice of treated and untreated patients with pernicious anaemia, *Bacterium coli* was present in all except 3 whose anaemia was severe and who had never been treated, but who, notwithstanding, had relatively high values for the number of reticulocytes in the circulating blood. The evidence that absence of *Bact. coli* from the gastric juice can cause a spontaneous remission of pernicious anaemia is discussed. The gastric juice of the 3 patients contained no bound vitamin B₁₂ and was incapable of binding it *in vitro*. Treatment of 2 of the patients with small daily doses, 5, 10 and 30 µg. of vitamin B₁₂ given orally was successful after 98 days in one but failed in the other with appearance of paracoli bacteria in the gastric juice.

The authors suggest that vitamin B₁₂ given orally can be absorbed by patients with pernicious anaemia if it is not first destroyed by *Bact. coli*, and that the binding of vitamin B₁₂ protects it from the micro-organisms.—E. M. Hume.

4145

GLASS, G. B. J., BOYD, L. J. and GELIN, G. A. Surface scintillation measurements in humans of the uptake of parenterally administered radioactive vitamin B₁₂. *Blood, J. Hematol.*, 1955, 10, 95-114. [Dept. Med., New York Med. Coll.]

A procedure is described for making surface measurements of radio-activity in underlying organs of human subjects who have received injections of vitamin B₁₂ containing ⁶⁰Co. In two

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young patients with no anaemia, and in a man of 55, 18 months after total gastrectomy, the radio-activity disappeared rapidly from the site of injection and within 4 hr. rose to its highest value in areas over the kidneys, spleen and iliac crest. The peak value in muscles occurred somewhat later, and in the liver after 5 or 6 days. Radio-activity decreased very slowly and after 3 months was from one-half to one-quarter of the peak values. The decline was slowest in the liver and iliac crest areas.

In a patient with pernicious anaemia in partial remission the uptake of radio-active vitamin B₁₂ was greater than in the subjects just described, and the decline in radio-activity was more rapid. In this patient and in one with sprue a high percentage of the peak value still persisted over the liver after 5 months. The long storage of vitamin B₁₂ in the liver shown by these observations may explain the long remissions found when pernicious anaemia is treated by injection of vitamin B₁₂ or liver extracts.—A. M. Copping.

4146

BEST, W. R., WHITE, W. F., LOUIS, J. and LIMARZI, L. R. Experiences with the Schilling test using Co⁶⁰ labeled vitamin B₁₂ in pernicious anaemia, sprue, and other conditions. *J. Lab. Clin. Med.*, 1954, **44**, 767-768. *Proc.* [Chicago, Ill.]

4147

ALÉS, J. M. and VIVANCO, F. Vitamin B₁₂ assay in the blood of patients and normal subjects. *Bull. Inst. Med. Res., Univ. Madrid*, 1954, **7**, 33-39. [Dept. Bacteriol.]

See Abst. 2701, Vol. 25.

4148

GROSSOWICZ, N., ARONOVITCH, J. and RACHMILEWITZ, M. Determination of vitamin B₁₂ in human serum by a mutant of *Escherichia coli*. *Proc. Soc. Exp. Biol. Med.*, 1954, **87**, 513-514. [Dept. Bacteriol., Hadassah Med. Sch., Hebrew Univ., Jerusalem.]

Vitamin B₁₂ was estimated with *Bacterium coli* 113/3 in a medium containing a methionine-free hydrolysate of casein. Satisfactory results could be obtained for blood serum in from 40 to 48 hr. In 30 normal subjects the vitamin B₁₂ content of the serum, in $\mu\mu\text{g}$. per ml., ranged from 200 to 1000. Patients with untreated pernicious anaemia showed values of from 50 to 150 and after treatment of from 500 to 1050.—A. M. Copping.

4149

LEAR, A. A., HARRIS, J. W., CASTLE, W. B. and FLEMING, E. M. The serum vitamin B₁₂ concentration in pernicious anemia. *J. Lab.*

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Clin. Med., 1954, **44**, 715-722. [Thorndike Mem. Lab., Boston City Hosp., Mass.]

The vitamin B₁₂ content of human serum was measured microbiologically with *Englena gracilis*. The mean values, in $\mu\mu\text{g}$. per ml., were 532 for 20 normal subjects, 39 in 33 patients with pernicious anaemia in relapse, 525 in 22 cases of pernicious anaemia in remission, 439 in 14 patients with neurological signs but no anaemia, 307 in 12 patients with macrocytic anaemia which responded to folic acid, and 714 in 29 patients with cirrhosis of the liver. In patients taking sulphonamides the presence of derivatives in the serum inhibited the growth of *Englena* but the inhibition could be overcome by adding *p*-aminobenzoic acid to the medium. Capacity to bind vitamin B₁₂ into complexes from which it was not available to *Englena* was about the same in patients with pernicious anaemia as in normal subjects.—A. M. Copping.

4150

PATRICK, S. J. Some observations on the metabolism of vitamin B₁₂ by Jamaican children. *J. Nutrition*, 1955, **55**, 129-135. [Dept. Physiol., Univ. Coll. West Indies, Jamaica.]

Two groups of 19 children, comparable in age, sex and economic status, were chosen from a Jamaican village. One group received vitamin B₁₂ by mouth for 9 months and the other group had a dummy. The children having vitamin B₁₂ had significantly higher values for vitamin B₁₂ in the blood plasma. Excretion of vitamin B₁₂ in the urine was studied in 2 children who had repeated injections of the vitamin and, though the value in the plasma rose, the percentage of the dose excreted did not increase significantly. The urinary excretion of vitamin B₁₂ was not very different in normal children after a test dose and in children showing retarded growth after a test dose or a dietary supplement of vitamin B₁₂.

A. M. Copping.

4151

KARLIN, R. Variations du taux de vitamine B₁₂ dans le lait de femme au cours de la lactation. [Variations in the vitamin B₁₂ content of human milk during lactation.] *C.R. Soc. Biol.*, 1954, **148**, 1419-1422. [Inst. Pasteur, Lyons.]

Vitamin B₁₂ was estimated with *Lactobacillus leichmannii* in human colostrum and milk at different stages of lactation. The highest values, ranging from 1.35 to 7.90 $\mu\mu\text{g}$. vitamin B₁₂ per ml., were found in colostrum. As lactation progressed there was a decrease up to the third month when a consistently low average value of 0.26 $\mu\mu\text{g}$. per ml. was found. After the third month little variation occurred. It is noted that in cow's milk variations in the vitamin B₁₂ content may be considerable in the later stages of lactation.

A. M. Copping.

4152

HOUGS, W. and SKOUBY, A. P. **The anti-anaemic action of extracts from placenta.** *Acta med. scand.*, 1954, 150, 453-458. [Res. Lab., Gea, Copenhagen.]

Placentas and other organs were obtained from cows and rabbits killed towards the end of pregnancy, and human placentas at delivery. Extracts were prepared with vitamin-B₁₂-like activity.

The greatest activity shown in microbiological tests with animal tissues was in kidney, spleen, liver and placenta, but for any one tissue there was wide variation. In human placenta the activity corresponded to from 5 to 40 μg . vitamin B₁₂ per g. wet tissue.

Placenta extract was given parenterally to 9 patients with Addisonian anaemia in relapse, and was effective in producing and maintaining full remission, including recovery from nerve symptoms in 5 of the patients. In one patient with atypical megaloblastic anaemia not influenced by liver extract or vitamin B₁₂, a submaximum response to placenta extract was followed by full response to folic acid with gastric mucosal extract, but in another patient resistant to vitamin B₁₂, folic acid and liver extract, there was no response to placenta extract.—D. Duncan.

4153

PITNEY, W. R., BEARD, M. F. and VAN LOON, E. J. **The vitamin B₁₂ content of electrophoretic fractions of liver homogenates.** *J. Biol. Chem.*, 1955, 212, 117-123. [Sect. Haematol., Dept. Med., Sch. Med., Univ. Louisville, Ky.]

Euglena gracilis was used to measure the vitamin B₁₂ content of livers from 12 healthy subjects who had died suddenly. The values in μg . per g. wet tissue ranged from 0.11 to 0.47, mean 0.28. Vitamin B₁₂ appeared to be present in liver as a loosely bound protein complex which was available to *E. gracilis*. It differed in this respect from vitamin B₁₂ in serum, which was not available to *E. gracilis* without preliminary heat treatment. Electrophoretic fractionation of liver homogenates showed that the migration of vitamin B₁₂ corresponded to the movement of serum β -globulin on a control strip. Estimation of the vitamin B₁₂ in the different fractions accounted for the whole of the vitamin B₁₂ activity.—A. M. Copping.

4154

BAOCHER, K. R. **Vitamin B₁₂ zur Behandlung des Alkoholdeliriums.** [Treatment of delirium tremens with vitamin B₁₂.] *Deutsch. med. Wochenschr.*, 1954, 79, 1901-1903. [Chirurg. Abt., Städt. Krankenhaus "Hetzelstift", Neustadt a. d. Weinstrasse.]

All but one of 7 patients, regular drinkers of 3 or more litres of wine daily, who developed de-

lirium tremens after accident or operation, were treated successfully with one or more intramuscular injections of 1000 μg . vitamin B₁₂ (Berubi-1000, Dr. Wachter und Gross GmbH, Bad Ems). The prophylactic use of smaller amounts, from 48 to 333 μg ., in patients thought to be in danger of developing delirium tremens after accident or operation is proposed. The trial was suggested by the results of Lereboullet and Pluvinaige (*J. Amer. Med. Assoc.*, 1952, 148, 667) and Menof (Abst. 4092, Vol. 21) in patients with alcoholic polyneuritis.—W. M. Deans.

4155

WILSON, S. J., GRADY, H. J., ROSE, D. I. and HEATH, H. E. **A metabolic and therapeutic study of various cobalamins in multiple sclerosis.** *J. Lab. Clin. Med.*, 1954, 44, 954. *Proc.* [Kansas City, Mo.]

4156

RULLAN-FERRER, J. A., MARCHAND, E. J. and DE TORREGROSA, M. V. **Relationship of pancytopenia to megaloblastic anemias: report of seven cases clinically confused with blood dyscrasias and subacute bacterial endocarditis.** *J. Amer. Med. Assoc.*, 1955, 157, 638-645. [City Hosp., San Juan, Puerto Rico.]

Evidence is presented for the occurrence of syndromes characterised by pancytopenia, generalised hyperplasia and megaloblastic arrest of the bone marrow activity, which have the clinical appearance of diseases such as aplastic anaemia, leukaemia, thrombocytopenic states or subacute bacterial endocarditis, yet respond readily to treatment with parenteral liver extract or vitamin B₁₂, improved diet, antibiotics and other drugs.

F. C. Aitken.

4157

CAMPBELL, R. E. and PRUITT, F. W. **The effect of vitamin B₁₂ and folic acid in the treatment of viral hepatitis.** *Amer. J. Med. Sci.*, 1955, 229, 8-15. [Med. Serv., U.S. Army Hosp., Kyoto.]

Two groups of 44 patients with severe viral hepatitis were matched for race, age, duration of illness and intensity of jaundice. Both groups received the usual high-protein, high-carbohydrate, moderate-fat diet, and one group received an intramuscular injection of 30 μg . vitamin B₁₂ every other day, and 15 mg. folic acid daily by mouth, for the first 10 days in hospital. The addition of vitamin B₁₂ and folic acid caused more rapid recovery of appetite, and return of normal values for serum bilirubin and bromosulphalein retention. The mean duration of illness was 47.5 days for the group given vitamin B₁₂ and folic acid, and 57.2 days for the others. The effect of the vitamins was most marked in patients with high total serum bilirubin before treatment began.

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The theoretical reasons for the value of vitamin B₁₂ and folic acid in repairing liver damage are discussed.—A. M. Copping.

See also Abst. 4224.

Vitamin C

4158

SINGH, A. Infantile scurvy in the Punjab. *Indian Med. Gaz.*, 1954, **89**, 288-289. [Rajendra Hosp., Patiala.]

Scurvy is considered to be the commonest deficiency disease among children in the Punjab. During the last 5 years 16 cases of infantile scurvy and 4 of rickets have been encountered. The children with scurvy were usually between 1 and 2 years old; their mothers were poor and ill fed, and the babies were weaned on to cow's milk when 4 or 5 months old. None of them had had any fruit juice. Three typical case histories are given. Scurvy is said to be rare in adults.

E. M. Hume.

4159

LEVINE, V. E. Scurvy in Nebraska: 1. The epidemic of scurvy at Cantonment Missouri (Fort Atkinson), Nebraska, 1819-1820. *Amer. J. Digest. Dis.*, 1955, **22**, 9-17. [Dept. Chem., Sch. Med., Creighton Univ., Omaha, Nebr.]

A description is given, with quotations from the original records, of the worst outbreak of scurvy ever recorded in the United States Army.

D. Harvey.

4160

THOMSON, T. J. Scurvy—a rare disease? *Glasgow Med. J.*, 1954, **85**, 363-365. [Dept. Materia Med., Univ. Glasgow.]

From records at Stobhill General Hospital, Glasgow, 100 cases of scurvy were found among admissions over 15 years. Only 6 of the patients were women, the others were men mostly over 70 years of age and bachelors or widowers fending for themselves. Many subclinical cases may never have reached hospital, and it is suggested that ascorbic acid might be issued free to all inmates of lodging-houses in large cities.—D. Harvey.

4161

STIEPP, W. Zum Vitamin-C-Bedarf Erwachsener. Bemerkungen und Betrachtungen zu der Studie von Bartley, W., Krebs, H. A., O'Brien, J. P. R.: "Vitamin - C - Requirement of Human Adults". (Her Majesty's Stationery Office, London 1953). [Vitamin C requirement of adults. Comments on the study of Bartley, W., Krebs, H. A. and O'Brien, J. P. R.: "Vitamin C requirement of human adults". *H.M.S.O.*, London, 1953.] *Deutsch. med. Wochenschr.*, 1955, **80**, 289-292.

The paper is not a review of the M.R.C. Report

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(Abst. 3695, Vol. 24), but a discussion of the importance of estimates of minimum and of optimum supplies, the optimum being envisaged as covering abnormal losses such as those caused by gastro-intestinal disease or "stress". [The Report is credited wrongly with an estimate for the requirement of 70 mg., 7 times the minimum protective dose, as permitting "full performance", especially in "stress", and UNO with an estimate of 30 mg.]—I. Leitch.

4162

FISHER, K. H. and DODDS, M. L. Variability in the measure of total ascorbic acid utilization by the human. *J. Nutrition*, 1954, **54**, 389-396. [Coll. Home Econ., Pennsylvania State Univ., State College.]

In healthy young women the effect of both high and low intakes of total ascorbic acid was still evident in the blood plasma at least 23 days after the intake of ascorbic acid was changed. Excretion of total ascorbic acid in the urine was adjusted more rapidly. A daily supplement of 50 or 125 mg. synthetic ascorbic acid was given to women having a basal diet containing 25 mg. total ascorbic acid. There was no significant difference in the plasma or urinary total ascorbic acid values whether the daily dose was given at one meal or divided at 2 meals.

An adjustment period of from 10 to 17 days preceded a 10-day test in 2 small groups of women, one given 60 and the other 75 mg. ascorbic acid daily. Blood plasma values and the urinary excretion of total ascorbic acid in the 24 hr. were significantly different in the 2 groups.

F. C. Aitken.

4163

POTGIETER, M., MORSE, E. H. and WALKER, G. R. Ascorbic acid utilization by women. Response of serum level and night urinary excretion to increasing levels of intake. *J. Nutrition*, 1955, **55**, 217-224. [Sch. Home Econ., Univ. Connecticut, Storrs.]

Twenty mentally retarded women aged from 27 to 63 years, in good physical health, were studied. After 2 months of a diet restricted by the omission of citrus fruits and tomatoes to provide 45 mg. ascorbic acid daily, the subjects were divided into 2 groups, of which one received daily in addition 25 mg. ascorbic acid during the third month of study, 50 mg. during the fourth month and 100 mg. during the fifth month. The other group meanwhile received the same diet without supplement. Ascorbic acid was estimated in venous blood at the beginning of the study, after one and two months on the restricted diet, and at the end of each subsequent month, and also in 8-hr. night urine samples twice near the end of each period when supplements were given.

The average serum ascorbic acid value for the 20 subjects fell from 0.97 to 0.42 mg. per 100 ml. during the 2 months of restricted intake. The maximum average value of 1.49 mg. per 100 ml. was reached after a month of the 50-mg. supplement. The average value for the untreated group dropped to 0.13 at the end of the 5 months of restricted diet. The average value for total ascorbic acid in the 8-hr. night urine increased very slightly with the supplements of 25 and 50 mg. but did not rise above 5 mg. until the end of the month with the 100-mg. supplement when it increased to 30 mg. The amount excreted by the untreated group remained at about 2 mg. throughout the study.—G. F. Garton.

4164

OGLIVIE, G. F. and PETT, L. B. A long term study on ascorbic acid supplementation. *Canad. Serv. Med. J.*, 1954, 10, 191-197. [Nutrit. Div., Dept. Nat. Health and Welfare, Ottawa.]

In the school selected for study the daily intake of ascorbic acid was about 50 mg. per head; the incidence of poor oral hygiene with associated gingivitis was high. The children were divided into 2 groups which received tablets with 100 mg. ascorbic acid or dummies daily for 4 years. Of the total number of 165 children, 89 completed the study.

The values for serum ascorbic acid were significantly higher in the group given ascorbic acid, but there was no significant difference in the Hb values or incidence of gingivitis. Red and swollen gums, characteristic of gingivitis but not of scurvy, occurred in about 21 per cent. of the children, whether they received the supplement of ascorbic acid or not.—F. C. Aitken.

4165

BAKER, A. Z. and WINCKLER, I. Vitamin C for the prevention of winter absence in industry. *Med. Officer*, 1955, 93, 31-32. [Dept. Med. Res., Vitamins, Ltd., London.]

The effect of a daily supplement of 100 mg. ascorbic acid on the incidence of short absences from work was studied in an industrial organisation during 3 successive winters. The groups given and not given the supplement totalled for the 3 years about 600 persons. The results suggested that a winter supplement of 100 mg. ascorbic acid daily helped to reduce absences of short duration.

F. C. Aitken.

Other Vitamins

4166

PASSARO, G. Protrombina, fattore V e VII nel neonato. [Prothrombin and factors V and VII in the newborn.] *Arch. ital. Pediat. Puericolt.*, 1955, 17, 59-90. [Ist. Clin. Pediat.

Univ. Rome.] French, English and German summaries.

Factor V was estimated by the method of Quick and Stefanini (*J. Lab. Clin. Med.*, 1948, 33, 819), and prothrombin and Factor VII by methods of Koller and his colleagues, in the blood of 31 healthy newborn infants on the first or second day of life, and of 10 between the first 2 days and 2 weeks. Estimation of the prothrombin time of Quick gave varying results considered unreliable. The prothrombin content estimated by the method of Koller was low even in the second week of life. The values for Factor V were normal. The values for Factor VII were very low, the mean being only a quarter of that in the adult, and they remained so into the second week of life.—E. M. Hume.

4167

DELAGE, J. M. Les syndromes hémorragiques. Les hypoprothrombinémies. [Haemorrhagic syndromes: the hypoprothrombinaemias.] *Laval méd.*, 1954, 19, 929-942. [Hôp. Saint-Sacrement.]

A review.

4168

STÜRUP, H. Effects of intravenously injected vitamin K₁ and water-soluble vitamin K (menadione sodium bisulphite) on hypoprothrombinaemia during anticoagulation treatment. *Acta med. scand.*, 1954, 150, 437-442. [Med. Dept. B., Frederiksberg Hosp., Copenhagen.]

Twenty patients under treatment with dicoumarol were given, by intravenous injection, 50 mg. menadione sodium bisulphite or from 10 to 40 mg. vitamin K₁. Prothrombin activity was measured before, at the time of, and 1, 2, 6 12 and 24 hr. after injection. The effect of vitamin K₁ was both greater and quicker than that of menadione sodium bisulphite and, in patients in whom activity was low, the amount of vitamin K₁ given would produce in from 2 to 6 hr. the same therapeutic effect as 50 mg. of the water-soluble product in from 12 to 24 hr.

D. Harvey.

4169

GAMBLE, J. R., DENNIS, E. W., COON, W. W., HODGSON, P., WILLIS, P. W. (III), MACRIS, J. A. and DUFF, I. F. Clinical comparison of vitamin K₁ and water-soluble vitamin K. *Arch. Int. Med.*, 1955, 95, 52-58. [Dept. Int. Med., Univ. Michigan Hosp., Ann Arbor.]

Patients with low blood prothrombin caused by anticoagulant drugs were treated more effectively by vitamin K₁ than by the water-soluble vitamin K preparation menadione sodium bisulphite, which had an inconstant and unreliable effect. In

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many cases from 1 to 5 mg. vitamin K₁ by mouth gave a satisfactory response in 4 hr. and permitted the early resumption of anticoagulant therapy. In patients with absorption difficulties the 2 substances were about equally effective. Vitamin K₁ seemed the more effective in patients with severe liver disease.—A. Hepburn.

4170

SHRIFFER, H. and STEIGMANN, F. The effect of large doses of synthetic vitamin K and K₁ on the prothrombin time of patients with liver disease. *J. Lab. Clin. Med.*, 1954, 44, 930-931. *Proc.* [Chicago, Ill.]

4171

KING, J. T. Effect of vitamin K compound (Synkayvite) on computed blood loss during adenotonsillectomy. *Ann. Otol. Rhinol. Laryngol.*, 1954, 63, 1029-1030. [Atlanta, Ga.]

No significant effect was found.

4172

BISKIND, M. S. and MARTIN, W. C. The use of citrus flavonoids in infections. 2. *Amer. J. Digest. Dis.*, 1955, 22, 41-45. [Wesport, Conn.]

A preliminary report appeared in *Amer. J. Digest. Dis.*, 1954, 21, 177. In 69 patients with acute respiratory infections, treatment with vitamin P complex resulted in rapid subsidence of infection in all but 6. Some typical cases are described. Preliminary observations suggested that the treatment was effective also in bursitis.

F. C. Aitken.

DENTAL DISEASES

4173

SAVARA, B. S. and SUHER, T. Incidence of dental caries in children 1 to 6 years of age. *J. Dent. Res.*, 1954, 33, 808-823. [Univ. Oregon Dent. Sch., Portland.]

4174

GUSTAFSSON, B. E. The Vipeholm dental caries study. Survey of the literature on carbohydrates and dental caries. *Acta odontol. scand.*, 1954, 11, 207-231. [Dent. Res. Stat., Royal Med. Board, Vipeholm Hosp., Lund.]

4175

GUSTAFSSON, B. E., QUENSEL, C. E., LANKE, L. S., LUNQVIST, C., GRAHNEN, H., BONOW, B. E. and KRASSE, B. The Vipeholm dental caries study. The effect of different levels of carbohydrate intake on caries activity in 436 individuals observed for five years. *Acta odontol. scand.*, 1954, 11, 232-364. [Dent. Res. Stat., Royal Med. Board, Vipeholm Hosp., Lund.]

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The study began in March 1945 and the present report is a revised edition of one in Swedish in *Sv. Tandl.-Tidskr.*, 1952, 45, Suppl.

There were 4 stages, a preparatory period, 1945, a vitamin study period, 1946 to 1947, when vitamins A, C or D or a combination of these were tested, and two carbohydrate study periods, 1947 to 1949 and 1949 to 1951, when the carbohydrate intake was increased and sources which differed in their degree of stickiness were used. In these latter periods the groups were: a control group to which the basal diet without added carbohydrate was given, a sucrose group to which this non-sticky form was given at meals, a bread group given carbohydrate at meals in this form with its tendency to be retained on the surfaces of the teeth and 4 other groups given sugar, between meals, as chocolate, caramel, or toffees at 2 levels.

The subjects were mentally deficient patients in an institution near Lund; their average age was about 32 years and they were under continuous observation. Their mental condition, age, low standard of oral hygiene and the low incidence of caries found among them in the preliminary study made their susceptibility difficult to judge; the findings, it is thought, would probably have been more pronounced with a population of ordinary and younger subjects.

The main conclusions are that increased consumption of sugar can increase caries activity and that the risk becomes greater the stronger the tendency for the sugar to be retained on the surfaces of the teeth. The risk is greatest if the sugar is eaten in a sticky form and between meals with resulting transient high concentrations of sugar on these surfaces. Under uniform conditions the increase in caries activity varies widely between individuals. When the intake of sugar is reduced the incidence of caries will fall but carious lesions may continue to appear even with a restricted intake of carbohydrate.—D. Harvey.

4176

KITCHIN, P. C. and PERMAR, D. Results of an eight-year study of the effectiveness of carbohydrate restriction in reducing salivary lactobacillus counts. *J. Dent. Res.*, 1955, 34, 89-93. [Coll. Dent., Ohio State Univ., Columbus.]

Of 1089 patients, 811 had over 10,000 lactobacilli per ml. saliva and were deemed caries-active, as were later 101 of the remainder. Lactobacillus counts were reduced almost to zero after 2 weeks on diet 1, which contained about 100 g. carbohydrate daily. Successive diets 2, 3 and 4, containing increasing amounts of carbohydrate, 4 being almost unrestricted, were then given for 2-week periods provided the lactobacillus count remained low. Of the 811 patients in whom

caries was active, 410, 318, 225 and 142 completed the respective courses and at the end had low counts. After 6 months, 1 year, 2 years and 3 or more years on diet 4, in 91 of 126, 53 of 75, 25 of 34 and 14 of 23 patients counts remained low.

A. Hepburn.

4177

CARTER, W. J., JAY, P., SHELLE, I. L. and DANIEL, L. H. The effect of topical fluoride on dental caries experience in adult females of a military population. *J. Dent. Res.*, 1955, **34**, 73-76. [Res. Depts., Dental Dept., Great Lakes Naval Training Centre, Ill.]

Sixty U.S. Navy women had several thorough topical applications of 2 per cent. NaF solution and 88 had 0.9 per cent. NaCl solution. When they were re-examined after from 8 to 14 months, the difference between the groups in incidence of fresh caries was not significant. The NaF did not affect the salivary lactobacillus counts.

W. M. Deans.

4178

GIARDINO, G. and POLICE, P. Ricerca sul contenuto in fluoro dell'acqua potabile di Napoli. [Fluorine content of drinking water in Naples.] *Bol. Soc. ital. Biol. sper.*, 1954, **30**, 191-194. [Clin. Odontoiatrica, Univ. Naples.]

Fluorine was estimated by the method in "A.O.A.C. Methods of Analysis", 1945. Drinking water in Naples comes from springs in the territory of Serino, province of Avellino, with addition, especially in summer, of water from artesian wells in the city. The proportion of artesian-well water is greatest in the industrial area of the city, less in the centre of the city, and none in the old city (Vomero). The mean F content, in μg . per litre, for the 3 regions, respectively, is 225, 219 and 212. In water from the Serino springs it is 210. Water from the artesian wells was not tested separately. If 1 mg. per litre is taken as the concentration suitable for prophylaxis against dental caries, the Naples water had only one-fifth that required.—E. M. Hume.

4179

HILL, I. N., BLAYNEY, J. R. and WOLF, W. The Evanston dental caries study. 11. The caries experience rates of 12-, 13-, and 14-year-old children after exposure to fluoridated water for fifty-nine to seventy months. *J. Dent. Res.*, 1955, **34**, 77-88. [Walter G. Zoller Mem. Dent. Clin., Univ. Chicago, Ill.]

For parts 9 and 10 see Abst. 938, Vol. 23.

Part 7 concerned children after exposure for from 23 to 34 months (see Abst. 5366, Vol. 21).

The DMF rate per 100 children was reduced by about 21 per cent. for 12- and 13-, and by 12.5 per cent. for 14-year-old children in comparison with

the pre-treatment rates; the reductions were about double those which appeared after 2 years' treatment. For permanent molar teeth per 100 children the reductions in pit and fissure caries or fillings in occlusal surfaces were about 18.5 per cent. for 12- and 13-, and 12 per cent. for 14-year-old children. The number of occlusal surfaces free from caries or fillings increased by 49.7, 69.4 and 75.4 per cent. for the respective age groups. These data may be more closely correlated when they are stated on the basis of number of teeth. For permanent maxillary teeth the reduction of decayed and filled teeth per 100 children was thought not to be statistically significant for 14-year-old children, but might be so on the basis of number of teeth. The increase in immune permanent dentitions was significant only for the 13-year-old group.

The overall findings are considered to be significant and to show that a reduction in caries rates has occurred of 4 per cent. for each year of fluoridation.—D. Harvey.

4180

ZIMMERMANN, E. R. Fluoride and nonfluoride enamel opacities. *Pub. Health Rep., Washington*, 1954, **69**, 1115-1120. [Epidemiol. Branch, Nat. Inst. Dent. Res., Bethesda, Md.]

Children aged from 12 to 14 years were examined at Aurora, Illinois, where the F content of water is 1.8 p.p.m., and in Montgomery and Prince Georges Counties, Maryland, where tap water is almost devoid of F but where fluoridation was instituted 1 year before the examinations were made. Of those examined, 650 in Illinois and about 800 in Maryland, 352 and 220 children satisfied the criterion of having resided for all their lives in the respective districts. Opacities were classified in 2 main categories, as idiopathic white spots, non-fluoride in origin, or as fluorosis, questionable, very mild or mild in degree. The percentages of children unaffected or showing such opacities were, at Aurora, none 48, idiopathic 9, questionable fluorosis 26, very mild fluorosis 15, and mild fluorosis 2; in Maryland corresponding percentages were 64, 36, 0, 0 and 0.

Differentiation of the 2 types, idiopathic opacity and questionable fluorosis, is by appearance, idiopathic being usually as oval spots, the other tending to form horizontal striations; by distribution, idiopathic being not ordinarily in a definite pattern, the other being bilateral, and by extent, idiopathic affecting only 1 or 2 teeth, the other affecting several.—D. Harvey.

4181

ADRIASOLA, G. and KAEMFFER, A. M. Algunos aspectos del primer programa de fluoración del agua potable en Chile. [Some aspects of the

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first programme for adding fluorine to drinking water in Chile.] *Bol. Ofic. sanit. panamer.*, 1954, **37**, 66-75. [Escuela Salubridad, Univ. Chile.]

Dental examination of children aged from 3 to 12 years in San Fernando and Curico showed an average of 4.9 and 5.9 carious teeth per head in the two towns before the addition of F to the drinking water. In San Fernando 87.4 per cent. of the population used the public water supply and in Curico 92.7 per cent. In 1953, 1 p.p.m. F was added to the drinking water and a further dental examination will be made on children of the same age groups in 1956.—A. M. Copping.

4182

TAKAMORI, T., MIYANAGA, S., KAWAHARA, H., KONO, K., WAKATSUKI, H. and OKUSHI, I. [Dental fluorosis and skeletal changes in Aso-volcano district.] *Shikoku Acta Med.*, 1954, **5**, No. 4, 42-47. [Dept. Int. Med., Sch. Med., Tokushima Univ.] In Japanese: English summary.

For earlier work see Title 5069, Vol. 23.

In villages where the F content of drinking water was 1.1, between 0.7 and 0.8, or 0.2 p.p.m. slight myocardial damage in children was detected

by electrocardiograph and mottling of their teeth was recorded; in another area where the content was generally lower, mottling was less frequent or absent. [It is difficult to reconcile the conclusions with the data as tabulated].—D. Harvey.

POISONS: PATHOGENIC ORGANISMS: FOOD LAWS

4183

TRUHAUT, R. Les dangers de cancérisation résultant de la présence de substances étrangères dans les aliments. Essai d'établissement d'une doctrine générale concernant les limitations d'emploi. [The danger of cancer due to the presence of foreign substances in foods. Attempt to establish a general law on the limitation of their use.] *Ann. Nutrit. Alimentation*, 1955, **9**, 5-37. [Fac. Pharm., Univ. Paris.]

See also Absts. 3362, 4081.

IMMUNITY

4184

MILNE, J. A. Food allergy. *Proc. Nutrition Soc.*, 1955, **14**, 54-56. [Dept. Pathol., Western Infirmary, Glasgow.]

See also Abst. 4035.

THERAPEUTIC AND PREVENTIVE DIETETICS

GENERAL

4185

DOBERSKÝ, P. Nový dietní systém a jeho uvádění do praxe. [A new diet system and its practical use.] *Sborn. pathofysiol. tráv.*, 1954, **8**, 135-142. [Human Nutrit. Res. Inst., Prague.]

Systems are described for hospitals and for public kitchens which aim at the exclusion of fast days, the provision of diets of high protein content, the improvement of the feeding of diabetic patients who are working, the removal of the monotony of diets and the better feeding of patients after surgical operations.

A. Jančařík (Czechoslovakia).

4186

RABENN, W. B. Hospital diets in eighteenth century England. *J. Amer. Dietetic Assoc.*, 1954, **30**, 1216-1221. [Dept. Hist. Med., Univ. Wisconsin, Madison.]

Examples are given of typical full hospital diets of the period. They consisted mainly of beef, broth, bread and beer, with some pottage or pudding. Small amounts of cheese and butter were given, but seldom was milk served as a beverage. In the later years some roots and greens found a place in the diet. The few special

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diets prescribed, such as fever, dry and salivation diets, were equally inadequate as judged by modern nutritional standards.—F. C. Aitken.

4187

WADDELL, W. R., GEYER, R. P., GRILLO, H. C. and STARE, F. J. The treatment of malnutrition with particular reference to the surgical patient. *Amer. J. Surg.*, 1954, **88**, 698-702. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Modern methods of parenteral feeding are briefly surveyed and a case report is presented to show that an adequate supply of protein, carbohydrate, fat, minerals and vitamins can be obtained parenterally and utilised efficiently to maintain N equilibrium.

A table is presented showing in 77 patients a low incidence of reactions to infusions of emulsified fat.—F. C. Aitken.

4188

BECKER, G. H., MOELLER, H. C. and GROSSMAN, M. I. Studies on the febrile response following intravenous administration of fat emulsions to human subjects. *J. Lab. Clin. Med.*, 1954, **44**, 766. *Proc.* [U.S. Army.]

4189

OLMSTEAD, E. G., CASSIDY, J. E. and MURPHY, F. D. The use of beer in the low salt diet with special reference to renal disease. *J. Lab. Clin. Med.*, 1954, **44**, 904. *Proc.* [Milwaukee, Wis.]

4190

ROBINSON, C. H. Planning the sodium-restricted diet. *J. Amer. Dietetic Assoc.*, 1955, **31**, 28-32. [Dept. Foods Nutrit., Coll. Home Econ., Drexel Inst. Technol., Philadelphia, Pa.]

4191

DEMOLÉ, M. La part des protides dans les régimes déchlorurés. [The part played by proteins in diets low in chloride.] *Schweiz. med. Wochenschr.*, 1955, **85**, 6-8. [Fac. Méd., Geneva.]

In a general article it is stressed that diets designed to be low in chloride are liable to be dangerously low in protein. The problem is discussed in relation to the diseases for which it is usual to prescribe a diet low in chloride.

E. M. Hume.

4192

WATTERSON, R. P. Degenerative disease reversible with depletion of storage metabolites. *J. Lab. Clin. Med.*, 1954, **44**, 948-949. *Proc.* [McPherson, Kans.]

Rice diet is used.

See also Abst. 3790.

DIABETES

4193

WILKINS, S. N., RUBY, D. O., KELLY, H. G. and JACKSON, R. L. Nutritional management of children with diabetes mellitus. *J. Lab. Clin. Med.*, 1954, **44**, 951-952. *Proc.* [Columbia, Mo.]

4194

SINGH, I. Low-fat diet and therapeutic doses of insulin in diabetes mellitus. *Lancet*, 1955, **268**, 422-425.

Eighty patients with insulin-sensitive diabetes were treated with a diet containing 20 to 30 g. fat, 120 to 150 g. protein, and carbohydrate according to energy requirement. Insulin dosage was progressively reduced as patients became sugar-free at each level. Most of the patients did not require insulin after 3 to 6 weeks. Some patients were able to dispense with insulin after 18 weeks and some continued to require small doses. In a follow-up study of the patients no longer requiring insulin, serial glucose tolerance tests were made on 7, of whom 5 showed a return to normal.

F. C. Aitken.

4195

KINSELL, L. W., MICHAELS, G. D. and FOREMAN, N. High vegetable fat diet in diabetics with extensive vascular disease. *Geriatrics*, 1955, **10**, 67-71. [Inst. Metabol. Res., Oakland, Calif.]

The effect on plasma lipids of a diet high in vegetable fat was studied in a group of elderly diabetic patients and in a group of young ones with widespread vascular disease. Plasma cholesterol and phospholipin values are shown graphically for 5 of the elderly and 3 of the young patients. The diet high in vegetable fat resulted in reductions of cholesterol and phospholipin. In the 3 subjects with vascular disease there was improvement in retinal but not in renal pathology.

F. C. Aitken.

4196

BELLWINKEL, H. W. Erfahrungen mit einem neuen Verzögerungsinsulin. [Trials with a new delayed-action insulin.] *Deutsch. med. Wochenschr.*, 1954, **79**, 1896-1899. [Knappschaftskrankenhaus, Bochum, Lungendreier.]

Good results were obtained in 32 of 50 patients with moderate or severe diabetes from a single morning injection of from 25 to 110 units of Long-Insulin (Farbwerke Hoechst A.G.). Since its maximum effect occurs after 8 to 9 hr., most of the carbohydrates should be taken at the midday and afternoon meals, and 50 to 100 g. fruit about 9 p.m. is recommended to prevent hypoglycaemic reactions during the night.—W. M. Deans.

See also Abst. 3694.

GASTRO-INTESTINAL CONDITIONS

4197

HOLT, L. E. (Jr.). Nuevos puntos de vista en la alimentación del niño. [New points of view in infant feeding.] *Rev. española Pediat.*, 1954, **10**, 741-748. [New York Univ.-Bellevue Med. Centre.]

A discussion of results obtained by the author and his colleagues (see also Absts. 3658, 3659, Vol. 18; 5707, Vol. 20; Somersalo, O., *Amer. J. Dis. Child.*, 1952, **84**, 767), which suggest that in intestinal disorders, including diarrhoea and steatorrhoea, the amounts of fat and carbohydrate which are tolerated and absorbed are larger than was earlier thought.—D. Duncan.

4198

HAYES, M. A. Dietary control of the post-gastrectomy "dumping syndrome". *J. Amer. Dietetic Assoc.*, 1955, **31**, 133-137. [Samuel C. Harvey Metabol. Unit, Dept. Surg., Sch. Med., Yale Univ., New Haven, Conn.]

Seven cases of failure to gain weight, with or without postprandial distress, were treated satisfactorily with a diet high in fat and protein and

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low in carbohydrate. The progress of the most severe case is described in detail. A satisfactory diet for such patients seems to be one in which the calories from carbohydrate, protein and fat are in the ratio 1 : 1.5 : 5.—F. C. Aitken.

4199

PAULSON, M. and HARVEY, J. C. **Hematological alterations after total gastrectomy: evolutionary sequences over a decade.** *J. Amer. Med. Assoc.*, 1954, **156**, 1556-1560. [Dept. Med., Johns Hopkins Univ., Baltimore, Md.]

The 27 patients studied haematologically after removal of the stomach were 21 men and 6 women, 18 negro and 9 white, mostly between 40 and 55 years old.

Fe deficiency anaemia developed shortly after operation as a result of oesophageal and duodenal erosion and slow bleeding, so Fe was given as a routine; this was considered to be responsible for a normal peripheral blood picture in 5 patients who died within a year after operation. Macrocytosis developed in 19 patients from 6 months to 7 years, but commonly 1 to 2 years, after operation. When patients lived long enough it was invariably followed by anaemia and later by the appearance of megaloblasts in the bone marrow. The condition responded to vitamin B₁₂ given parenterally in all 5 patients so treated.—D. Duncan.

4200

BOTHE, F. A., MAGEE, W. S. and DRISCOLL, R. H. **A massive resection of the small intestine from fifteen centimeters distal to the ligament of Treitz to within six centimeters of the ileocecal valve—with a four year follow-up.** *Ann. Surg.*, 1954, **140**, 755-758. [Philadelphia, Pa.]

The patient, now a man of 60, daily takes over 2 qt. milk, at least $\frac{1}{4}$ lb. cheese and, contrary to earlier recommendations (Absts. 4787, Vol. 8; 2620, Vol. 10) large quantities of butter. Diarrhoea is prevented by a mixture of Kaomagna and paregoric and avoidance of certain foods, e.g., stewed fruit. He works as a travelling salesman. His weight is only 10 lb. below that before operation and anaemia has not developed. Biochemical results at follow-up were: blood Ca 10.4 mg. per cent.; serum proteins in separate studies 6.4 and 6.7 g. per cent.; daily loss of fat in stools 15.3 g.

W. M. Deans.

4201

DEKKERS, H. J. N. **De behandeling van lijders aan ulcus duodeni met koolhydraatrijk dieet.** [Treatment of patients with duodenal ulcer with carbohydrate-rich diet.] *Nederland. Tijdschr. Geneesk.*, 1955, **99**, 176-182. [Amsterdam.] English summary.

On the theory that it is the pain of duodenal

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ulcer that is invaliding and that the pain is caused by gastric juice, a diet was devised to cause no gastric secretion, of water, tea, sugar, dry rusks, dry white bread, jam, syrup, honey, dry rice, fruit juices, potatoes, boiled leafy vegetables, raw lettuce with sugar and lemon, and the whites of one or two eggs daily. It is difficult to achieve a sufficient intake of energy on this diet for patients who are working, but it can be maintained for a few weeks. After three weeks 25 to 50 g. butter and 50 g. lean meat daily are allowed, and, if the patient wishes, 2 glasses of a mixture half milk, half water. The tests described lasted 6 months. Of 68 patients with duodenal ulcer, confirmed by X-ray, given this diet 22 received no drug; they were free of pain after 2 weeks and 15 remained so after 6 months; 7 were not seen again. Of the other 46, 37 had to be given antacids, in addition to the diet, either because of severe pain or because they could not be persuaded that the diet alone would help them. All improved and 31 were still free of pain after 6 months; 6 were not seen again. Nine patients did not react favourably to the diet.

From consideration of findings in concentration camps and during food shortage in Holland and of reports from other countries, the conclusion is drawn that a high standard of living may cause ulcers.—M. Eddison.

4202

HARDT, L. L. and STEIGMANN, F. **Improved antacid therapy of peptic ulcer.** *Amer. J. Digest. Dis.*, 1954, **21**, 353-357. [Stritch Sch. Med., Loyola Univ., Chicago, Ill.]

Satisfactory results in clinical trials with a new proprietary antacid mixture are reported.

F. C. Aitken.

4203

ASHBY, D. W. and WHITEHOUSE, D. **Treatment of haemorrhage from peptic ulcer by continuous intragastric milk drip.** *Brit. Med. J.*, 1955, **i**, 512-515. [Gateshead Group Hosps.]

Five or 6 pints of milk was given during 24 hr. by the intragastric technique described and with a bland diet at 4-hr. intervals the patient's energy intake was about 3700 Cal. One hundred patients with peptic ulcer were so treated and, as controls, 53 were given conventional one-hourly milk feeds with early feeding of solids. Duration of bleeding as measured by the presence of occult blood in faeces was shorter in the treated than in the control patients and their apparent wellbeing and confidence were more improved.—D. Harvey.

4204

KRAINICK, H. G. and DEBATIN, F. **Der schädliche Mehleffekt bei der kindlichen Cöliakie.** [The harmful effect of flour in coeliac disease

in children.] *Monatsschr. Kinderheilk.*, 1954, 102, 407-413. [Kinderklin., Univ. Freiburg i. Br.]

The position of gliadin as the toxic constituent of flour which causes coeliac disease is reviewed. An account is given of 7 patients aged from 1½ to 4 years, treated as in-patients, and of 11 treated as out-patients. The results were in full agreement with the original observations of the Dutch workers (see Abst. 5284, Vol. 24).—E. M. Hume.

4205

VAN SCHOONHOVEN VAN BEURDEN, A. J. R. E. Bijdrage tot de behandeling van coeliakie. [Contribution to the treatment of coeliac disease.] *Nederland. Tijdschr. Geneesk.*, 1955, 99, 795-802. [R. K. Ziekenhuis, Sittard.] English summary.

A case history.

4206

GERRARD, J. W., ROSS, C. A. C. and SMELLIE, J. M. Coeliac disease. Results of late treatment with gluten-free wheat diet. *Lancet*, 1955, 268, 587-589. [Dept. Paediat., Univ. Saskatchewan.] Despite intervals of from 3 to 14 years between the diagnosis of coeliac disease and the beginning of treatment with gluten-free diet, the 18 children and adolescents, treated for from 4 to 25 months, responded with acceleration of growth in height and weight and disappearance of steatorrhoea. F. C. Aitken.

4207

HAEX, A. J. C. and LIPS, J. B. Nieuwe mogelijkheden bij de behandeling van spruw. [New possibilities for the treatment of sprue.] *Nederland. Tijdschr. Geneesk.*, 1955, 99, 102-106. [Acad. Ziekenhuis, Leyden.] English summary.

Steatorrhoea, without visible anatomical lesion, is the main sign of a group of diseases consisting of coeliac disease in children, tropical sprue and non-tropical sprue. Patients with non-tropical sprue seem often to have had coeliac disease in childhood or to have near relatives suffering from this disease. Steatorrhoea in these diseases gives rise to serious general upset, though fat absorption remains at 60 to 80 per cent. This is in contrast to steatorrhoea of pancreatic origin, which with a far smaller absorption of fats often gives only slight signs. Dicke, Weijers and van de Kamer (Title 5091, Vol. 23) have demonstrated that gluten from wheat plays an important part in coeliac disease, and report success in its treatment with a gluten-free diet. This led to experimental treatment with gluten-free diet of a patient seriously ill with steatorrhoea for which all possible diagnosis except sprue had been excluded. Usual modes of treatment, continued for 6 years, gave

no improvement. Treatment with ACTH did give some improvement, but as this treatment would have to be continued indefinitely, an experiment with a gluten-free diet seemed justified. After 3 or 4 weeks of a diet completely free of gluten, all symptoms and signs had disappeared. They returned when, experimentally, some wheat products were added to the diet.—M. Eddison.

4208

OEHME, J., SUCKOW, J. and DITTRICH, J. K. Zur Symptomatologie und glutenfreien Therapie der einheimischen Sprue. [Symptomatology and treatment by gluten-free diet of non-tropical sprue.] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselerk.*, 1954, 14, 257-263. [Kinderklin., Univ. Leipzig.]

In the introduction the relation between diseases of the digestive tract, the nervous system and the blood is discussed. The case history is then given of a 15½-year-old girl, admitted to the clinic with obvious tetany and a blood condition resembling pernicious anaemia. She had been in hospital twice before, first at the age of 8 elsewhere; the diagnosis had then been abdominal tuberculosis. In 1952 she had been admitted to the university clinic. She was then 35 cm. below the average height for her age and 2.8 kg. too light for her size, and showed severe hyperchromic anaemia. Vitamin B₁₂ gave a reticulocyte crisis after 8 days and after this a considerable improvement in the blood.

When admitted to the clinic in 1954 there was no gastro-intestinal upset apart from an occasional attack of "doughlike" diarrhoea. X-ray photographs showed abnormalities in motility, tonus and secretion of the digestive tract. This led to the diagnosis of non-tropical sprue [there is no mention of steatorrhoea]. A gluten-free diet was given, with good results. Calcium and later Antitetanin was given for the tetany, vitamin B₁₂ for the anaemia and pepsin for anacidity. In 50 days the patient gained 7.2 kg. on the gluten-free diet; in 1952 she had gained only 2.7 kg. in 50 days on a normal diet.—M. Eddison.

4209

BARR, M., DELAVA, S. and ZETTERSTRÖM, R. Studies of the anemia in ulcerative colitis with special reference to the iron metabolism. *Acta paediat.*, 1955, 44, 62-72. [Paediat. Clin., Karolinska Sjukhuset, Stockholm.] French, German and Spanish summaries.

The subjects were 9 children, aged 6 to 16 years, with typical ulcerative colitis. Most of them had normochromic anaemia, 2 had hypochromic anaemia and all had low serum Fe values. Blood transfusions and intravenous saccharated iron oxide produced only slight improvement. There

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was no firm correlation between the degree of anaemia and the loss of blood in stools.

Total Fe-binding capacity was variable, but usually below normal. Absorption of 25 mg. Fe labelled with ^{59}Fe was high, ranging from 8 to 56 per cent., but usually only a small proportion was used for Hb formation.

It is concluded that a primary increase in Fe storage or a failure of bone marrow function may be the main cause of anaemia in ulcerative colitis. Spontaneous improvement of the anaemia may be expected when remission of the primary condition occurs.—D. Duncan.

THYROID DISEASE

4210

MARINE, D. Endemic goiter: a problem in preventive medicine. *Ann. Int. Med.*, 1954, **41**, 875-886. [Rahoboth, Del.]

4211

SCHAMAUN, H. M. and BAUMANN, T. Über die Behandlung der Struma congenita mit Thyroxin "Roche". [Treatment of congenital goitre with thyroxine Roche.] *Helv. paediat. Acta*, 1954, **9**, 449-454. [Kinderspital, Aarau.] French, Italian and English summaries.

Between 1945 and 1952, 30 newborn or very young babies with congenital goitre and without signs of hypothyroidism were treated with thyroxine. Eleven belonged to grade 2, 5 to grade 4 and others to intermediate overlapping grades according to the Swiss Goitre Commission's system of classification. The children were given thyroxine equivalent to from 325 to 1950 μg . total I. In 16 the goitre disappeared completely; in 13 it decreased greatly; in one, only a slight decrease occurred. There was no harmful effect apart from occasional mild diarrhoea which soon disappeared. M. Eddison.

4212

SCHAMAUN, H. M. Pathologisch-anatomische Untersuchungen über die Struma congenita im Kanton Aargau 1940-1951. [Studies in the pathological anatomy of congenital goitre in Kanton Aargau, 1940-1951.] *Helv. paediat. Acta*, 1954, **9**, 455-475. [Kinderspital, Aarau.] French, Italian and English summaries.

Theories of goitre formation are considered.

Reports on congenital goitre in the canton of Aargau were studied for the period from 1940 to 1952 before the prophylactic use of iodine in salt, which began in 1952. Before 1940 the size of the thyroid was not always accurately recorded at post-mortem examinations of infants. Data were available for 325 stillborn and newly born infants measuring at least 45 cm.; 174 were boys and 151 girls. The glands were classified according to size and ranged from under 3 g. to over 20 g.,

those up to 3 g. being considered normal. The percentage of infants with glands weighing more than 3 g. fell from 77.8 in 1940-42 to 29.4 in 1949-51; those of over 6 g. dropped from 33.3 to 6.4 per cent. The average relative thyroid weight fell from 2.52 to 1.13 g. per kg. bodyweight. Enlargement of the heart and hyperplasia of the thymus gland were often found to accompany the goitre, most frequently when the thyroid gland weighed more than 6 g.

There was a spontaneous decrease in numbers of goitre patients other than infants; it was seen also in youths registering for military service, the incidence falling from 10 per cent. in 1939-40 to 2.5 per cent. in 1947. That decrease is attributed to a general improvement in hygiene and nutrition. M. Eddison.

4213

SOLLGRUBER, K. Zum Problem der Säuglingsstruma. [Goitre in infants.] *Öst. Ztschr. Kinderheilk.*, 1954, **10**, 312-315. [Moosmähldstr. 14, Dornbirn, Vorarlberg.]

Among 4800 infants examined since 1943 in the ward for the newborn at the hospital, the average percentage with goitre was 7. In the last 2 years the percentage has been 11 and in the first quarter of 1954, 20. The sexes were equally affected. Treatment has been given from the third day of life with large doses of iodine spread over several days. The use of iodised salt by the people is strongly recommended, but ignorance of the need is common. It is considered that iodised table salt should be on sale everywhere as the rule, and that untreated salt should be available only on special application.—E. M. Hume.

4214

SAXÉN, E. A. and SAXÉN, L. O. Mortality from thyroid diseases in an endemic goitre area. Studies in Finland. *Doc. Med. geogr. trop.*, 1954, **6**, 335-341. [Lab. Pathol., Central Inst. Radiotherap., Helsinki.]

The distribution in Finland of deaths from thyroid cancer, malignant goitre, exophthalmic goitre and toxic goitre were compared with the distribution of endemic goitre. Only the deaths from toxic goitre seemed to be significantly higher in the rural areas where there was high frequency of endemic goitre.—E. M. Hume.

4215

SILVA, W. and BORGES, P. Incidência do bócio em escolares nas cidades de Cuiabá, Goiânia e Goiás—1952. [Incidence of goitre in school children in the towns of Cuiabá, Goiânia and Goiás in 1952.] *Univ. Brasil Inst. Nutrição Trab. e Pesq.*, 1952, **5**, 19-40. English summary.

The percentage incidence of endemic goitre in

schoolchildren from the 3 Brazilian towns was 71.09, 66.62 and 81.07. The incidence was higher among the coloured than the white children, in girls than in boys, in the country than in the towns, in public than in private schools, in lower than in upper economic groups and in Indian than in other communities. Iodine deficiency is thought to be the cause. (From summary.)—A. Hepburn.

See also Abst. 3374.

ANAEMIA

- 4216
VAHLQUIST, B. Prematuridad y anemia. [Prematurity and anaemia.] *Rev. española Pediat.*, 1954, 10, 645-650. [Clin. Paediat., Univ. Upsala.] French, English and German summaries.

The types of anaemia met in the premature infant during the first weeks of life are discussed. The initial fall in Hb and red cell count which is usually seen is not fully understood and does not respond to the known methods of treatment for anaemia. Hypochromic microcytic anaemia responding to Fe may also occur, as well as the types of anaemia seen in full-term infants.—D. Duncan.

- 4217
POROWALLA, J. N. and RANGAM, C. M. Pattern of anaemias in infants of Central India. *Indian J. Pediat.*, 1955, 22, 1-4. [Dept. Paediat., Mahatma Gandhi Mem. Med. Coll., Indore.]

A haematological study was made of 100 infants under 2 years of age, with less than 10 g. Hb per 100 ml. blood. Infants who were wholly breast fed weighed, on the average, 67.8 per cent. of the expected bodyweight and had 8.94 g. Hb per 100 ml. blood; for infants on mixed feeding the values were 62.2 per cent. and 7.49 g. Hb. Thirty had tuberculosis, 21 diarrhoea and vomiting, 22 non-tubercular respiratory infections. Besides the 30 with active tuberculosis, 36 others were Mantoux-positive.

The infants not entirely breast fed received foods such as dal, roti (home-made bread) and rice, with a negligible Fe content. Data for the blood pictures are tabulated. Only one infant showed an appreciable number of megaloblasts in the bone marrow. It is concluded that the anaemia of infants in Central India is usually normocytic and hypochromic and is associated with Fe deficiency. Tuberculosis has an important contributory influence.—D. Duncan.

- 4218
VILTER, R. W. Essential nutrients in the management of hematopoietic disorders of human beings: a résumé. *Amer. J. Clin. Nutr.*, 1955, 3, 72-74. [Dept. Int. Med., Univ. Cincinnati, Ohio.]

4219

- SCOTT, E. M., WRIGHT, R. C. and HANAN, B. T. Anemia in Alaskan Eskimos. *J. Nutrition*, 1955, 55, 137-149. [Arctic Health Res. Centre, Pub. Health Serv., Anchorage, Alaska.]

The study was made on 297 Northern and 418 Southern Eskimos and on 110 white soldiers who were stationed near Anchorage. Mean Hb values and standard deviations were, respectively, 14.91 \pm 1.06, 14.60 \pm 1.19 and 15.76 \pm 1.23 g. Hb. per 100 ml. blood. Values for serum Fe were lower and for serum Cu higher in Eskimos and Aleuts than in the white subjects. The inhabitants of 4 villages were chosen for more intensive study. In 3 villages mean values for Hb for all age groups were low; those in the fourth were higher than in these. In 2 of the 3 villages the degree of anaemia was moderate, with a tendency to microcytosis; in the third the tendency was not apparent.

A therapeutic trial was made in one village; the inhabitants were given pills of FeSO₄, calcium lactate or ascorbic acid. Serum Fe was increased by each supplement, most by FeSO₄, but changes in Hb were small and variable.

The available foods are considered in relation to these findings as well as the family connections existing between the inhabitants of the villages. Deficiency of Fe with some other, as yet unidentified, cause is thought likely to account for the mild degree of anaemia.—D. Harvey.

- 4220
MOORE, C. V. The importance of nutritional factors in the pathogenesis of iron-deficiency anemia. *Amer. J. Clin. Nutr.*, 1955, 3, 3-10. [Dept. Int. Med., Sch. Med., Washington Univ., St. Louis 10, Mo.]

On the basis that about 5 to 10 per cent. of food iron is assimilated by normal adults, daily retention from a diet containing 12 to 15 mg. Fe would be about 0.6 to 1.5 mg. The amount of Fe lost from the body in all ways other than in blood is estimated to be about 0.5 to 1.0 mg. daily. An adult man or post-menopausal woman would not readily become anaemic on account of poor intake or absorption of Fe. It is calculated that if they absorbed no Fe and excreted 1 mg. daily, 6 and 4 years, respectively, would be required before they would have only 7.5 g. Hb per 100 ml. The positions of the menstruating woman, whose monthly loss of Fe in blood is of the order of 14 to 28 mg., and of the growing child, are more precarious.

F. C. Aitken.

- 4221
VAN BUCHEM, F. S. P. Hypochrome anaemie bij jonge mannen. [Hypochromic anaemia in young men.] *Nederland. Tijdschr. Geneesk.*, 1955, 99, 324-328. [Groningen.]

A clinical lecture.

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4222

WILL, J. J. and VILTER, R. W. A study of the absorption and utilization of an iron chelate in iron-deficient patients. *J. Lab. Clin. Med.*, 1954, 44, 499-505. [Dept. Int. Med., Coll. Med., Univ. Cincinnati, Ohio.]

As judged by reticulocyte response and Hb regeneration in patients with hypochromic anaemia and from isotopic Fe absorption studies in normal subjects and subjects with hypochromic anaemia, absorption and utilisation of Fe from ferrie sodium versenate were no better than from ferrous sulphate.—F. C. Aitken.

4223

FISHER, M. and BIGGS, R. Iron deficiency in pregnancy. *Brit. Med. J.*, 1955, i, 385-386. [Health Dept., City of Oxford.]

The so-called physiological anaemia of pregnancy was prevented in 92 out of 104 patients by daily administration of iron throughout pregnancy. It is suggested that iron should be given as a routine to all pregnant women.—F. C. Aitken.

4224

HAWKINS, C. F. Value of serum iron levels in assessing effect of haematinics in the macrocytic anaemias. *Brit. Med. J.*, 1955, i, 383-385. [United Birmingham Hosps.]

Serum iron was estimated in samples from 100 patients before and after treatment, usually with vitamin B₁₂ or folic acid by injection. Macrocytic anaemias of all types were included.

In 60 patients treatment was successful, and the serum Fe level fell. In 32 out of 33 samples taken 48 hr. after successful treatment the mean fall in serum Fe was 105 µg. per 100 ml. Whatever the original level the values tended to fall to about 50 or 60 µg. per 100 ml. and to remain there until the blood count returned to normal. Impending Fe deficiency was indicated when the level was 40 µg. per 100 ml. or less. No fall in serum Fe occurred in the 40 patients in whom the treatment was ineffective, or in 12 normal subjects given injections of vitamin B₁₂ or folic acid.

The 48-hr. serum Fe test is considered a reliable method of assessing the effect of treatment in macrocytic anaemia.—D. Duncan.

4225

BOEN SAN TJANG. Veranderingen in epitheelcellen van lijders aan pernicioze anaemie; de invloed hierop van therapie. [Changes in epithelial cells in patients with pernicious anaemia; the effect of treatment.] *Nederl. Tijdschr. Geneesk.*, 1955, 99, 937-944. [Klin. Inw. Ziekten, Binnengasthuis, Univ. Amsterdam.] English summary.

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The finding by Graham and Rheault (Abst. 5214, Vol. 24) of an increase in the size of gastric epithelial cells and of their nuclei in pernicious anaemia was confirmed in 3 patients. Parenteral treatment with vitamin B₁₂ or giving the vitamin by mouth with intrinsic factor counteracted the change.

M. Eddison.

See also Absts. 3555, 3567-60, 3851, 4129-39, 4152, 4156, 4199.

OTHER CONDITIONS

4226

ILLINGWORTH, R. S., PHILPOTT, M. G. and RENDLE-SHORT, J. A controlled investigation of the effect of diet on acute nephritis. *Arch. Dis. Childhood*, 1954, 29, 551-555. [Dept. Child Health, Univ. Sheffield.]

No significant difference in rate of healing was found between a group of 22 children treated with a low-protein diet, 0.3 g. protein per lb. bodyweight daily, and a comparable group of 20 children given normal hospital diet. With the exception of one child in the low-protein group who died, no case was studied for less than 1 year and the average period of observation was over 2½ years.

F. C. Aitken.

4227

GREENMAN, L., WEIGAND, F. A. and DANOWSKI, T. S. Therapy of the nephrotic syndrome. Sodium restriction, dextran, and corticotropin (ACTH) alone or combined with nitrogen mustard. *Amer. J. Dis. Child.*, 1955, 89, 169-181. [Child. Hosp., Renziehausen Found., Pittsburgh, Pa.]

The treatment described was given in conjunction with a diet, which is described in an appendix, providing 50 mg. Na, 5521 mg. K and 2644 Cal.

D. Duncan.

4228

NATIONAL RESEARCH COUNCIL, FOOD AND NUTRITION BOARD, WASHINGTON. Sodium-restricted diets. The rationale, complications, and practical aspects of their use. *Div. Biol. Agric., Nat. Res. Council, Publ. No. 325*, July 1954, pp. vi + 71.

About half of this important report of the Food and Nutrition Board of the National Research Council consists of documented chapters on normal sodium metabolism; the use of sodium-restricted diets to treat different disorders; the accompanying risks of producing sodium depletion or other deficiency states; the planning of sodium-restricted diets, with a table of nutrients provided by a standard 500-mg.-sodium diet, and hints on flavouring; the sodium contents of foods and drinking waters; methods of estimating small quantities of sodium in foods; and salt substitutes. A comprehensive 17-page table of the

sodium and potassium contents of foods and a condensed derived table of the estimated best values for sodium content follow. The other tables include one of towns in the United States where the drinking water is known to contain over 2.0 mg. Na per 100 g.; this may affect the sodium content of cooked or canned foods, soft drinks and beer.

Information about the sodium content of many foods is inadequate, owing either to natural variation or to the failure of manufacturers to make precise statements on their labels. Since it is the sodium content that is vital, such terms as "salt-poor diet" or "salt-free food" should be dropped.—W. M. Deans.

4229

CLIFFORD, P. A. Sodium content of foods. *J. Amer. Dietetic Assoc.*, 1955, **31**, 21-27. [Div. Food, Food and Drug Admin., Washington, D.C.]

See preceding Abst. and also Title 2700, Vol. 25. The standard 500-mg.-sodium diet is included.

4230

VAN STEENIS, P. B. Levercirrhose bij gerepatrieerden uit Indonesië. [Cirrhosis of the liver in repatriates from Indonesia.] *Nederland. Tijdschr. Geneesk.*, 1955, **99**, 166-173. [Amsterdam.]

Out of 3500 patients repatriated since the war, 18 were diagnosed as suffering from cirrhosis of the liver. Two case histories are discussed to illustrate difficulties of diagnosis. All had suffered from temporary serious malnutrition. In the tropics cirrhosis occurs mostly in Indonesian men, though for religious reasons they drink no alcohol. In 1931 Professor Bonne published statistics for the east coast of Sumatra showing that out of 10,000 people, 3.1 Indonesian men over 18 died of cirrhosis, as against 1.8 Chinese over 28 and 0.39 Dutch of all ages, these being, respectively, 4.29, 1.85 and 0.54 per cent. of the total death rate.

Cirrhosis is discussed in relation to kwashiorkor and hepatitis. High-protein diet, especially with milk, is the treatment of choice. Fruit is helpful. Drugs, isolated amino-acids and synthetic vitamins are not recommended.—M. Eddison.

4231

GOODMAN, J. I. The relationship of obesity to chronic disease. *Geriatrics*, 1955, **10**, 78-82. [Med. Sch., Western Reserve Univ., Cleveland, Ohio.]

Of 1219 patients in hospital with chronic disease 12 per cent. were obese. One out of every 3 obese patients had enlargement of the liver and 75 per

cent. had high blood pressure. Weight reduction was achieved by diet treatment in two-thirds of the obese patients, but in only one-third of the patients was the effect permanent. Weight reduction was accompanied by reduction of blood pressure and a return of the liver to normal size. The incidence of diabetes, amputations and cardiac failure was higher in obese than in non-obese patients.—F. C. Aitken.

4232

MINDRUM, G. High fat diet in cases of fatty liver (and other hepatic disorders). *J. Lab. Clin. Med.*, 1954, **44**, 898-899. *Proc.* [Cincinnati, Ohio.]

4233

TRÉMOLIÈRES, J., MOSSE, A., LYON, L., PASCHOUD, J. and SAUTIER, C. Étude des effets métaboliques des régimes hyperprotidiques désodés dans le traitement des cirrhoses de foie. [Study of the metabolic effects of high-protein low-sodium diets in the treatment of cirrhosis of the liver.] *Presse méd.*, 1954, **62**, 1862-1864. [Clin. Méd., Hôp. Bichat.]

4234

KHALEVINA, G. L. Vliyaniye razgruzochnykh dnei v pitanii na gipertonicheskie krizy. [Influence of light-diet days on hypertensive crises.] *Vop. Pitani.*, 1955, **14**, 24-26.

4235

HATCH, F. T., WERTHEIM, A. R., BURMAN, G. H., WATKIN, D. M., FROEB, H. F. and ERSTEIN, H. A. (with MCPHEE, G., ENGLISH, S. and DAYTON, J.) Effects of diet in essential hypertension. 3. Alterations in sodium chloride, protein and fat intake. *Amer. J. Med.*, 1954, **17**, 499-513. [Res. Serv., Columbia Univ., New York.]

A group of 47 patients, whose blood pressure did not decrease significantly during a control period in hospital, were used in this study of the effect of adding supplements to the Kempner rice diet in the treatment of essential hypertension. In patients who responded favourably to the unmodified rice diet no loss of beneficial effects was seen when 0.5 g. NaCl, 12 to 50 g. low-Na protein, 20 to 40 g. fat or 200 g. vegetable daily was added. Larger additions of NaCl usually evoked significant rises of blood pressure. A special low-Na diet which incorporated many of the modifications of the basic rice diet was tested and is recommended for hospital maintenance of patients who have responded to the Kempner diet. (For parts 1 and 2 see *Amer. J. Med.*, 1950, **9**, 428; 441.)

F. C. Aitken.

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4236

GOULDER, N. E., KISSANE, R. W. and BOHL, R. W. Provocative aspects of lipotropic therapy in angina pectoris. *Amer. Heart J.*, 1954, **48**, 906-913. [Div. Cardiol., Dept. Med., Coll. Med., Ohio State Univ., Columbus.]

Of 25 patients treated with a soya lecithin preparation 6 showed clinical improvement which was not maintained when treatment was discontinued. In response to treatment serum cholesterol and phospholipin levels fell and the ratio of serum cholesterol to phospholipins increased. The changes were of greater degree in those patients who showed clinical improvement. These values tended to return towards normal while patients were undergoing treatment.—F. C. Aitken.

4237

RUSSELL, A. and YOUNG, W. F. Severe idiopathic infantile hypercalcaemia. Long-term response of 2 cases to low calcium diet. *Proc. Roy. Soc. Med.*, 1954, **47**, 1036-1040. [Queen Elizabeth Hosp. Child., London.]

Two mentally and physically retarded infants with serum calcium levels of 14.5 and 14 to 14.6 mg. per 100 ml. are described. They were treated with a low-Ca diet with soya bean flour (Soylac) in place of milk.

The serum Ca fell to 9.5 mg. per 100 ml. in the infant so fed for 14 weeks, and remained normal; blood urea also fell to normal and there was clinical improvement which persisted when the normal diet was restored. In the second infant the diet could be given for only 4 weeks, during which the serum Ca fell to 10.5 mg. per 100 ml., but blood urea remained high. Subsequent progress was slow, and serum Ca was normal but urea still high at 2½ years of age.

The etiology of the condition and its possible relation to vitamin D excess are discussed.

D. Duncan.

4238

KESSLER, E. Hypercalcemia and renal insufficiency secondary to excessive milk and alkali intake. *Ann. Int. Med.*, 1955, **42**, 324-338. [Med. Serv., Veterans Admin. Hosp., Albany, N.Y.]

Three cases are described and discussed with 18 previously reported by other workers. Treatment in all recorded cases was by giving a low-Ca diet and withholding absorbable alkali. Improvement resulted in most.—F. C. Aitken.

4239

LEEDHAM, J. N. Glutamic acid in the treatment of mental deficiency. *Med. Officer*, 1955, **93**, 117-122; 133-137. [Dept. Pub. Health, Bradford.]

The subjects were 12 pairs of children mentally handicapped in different ways, with ages ranging

from 4½ to 17½ years and intelligence quotients mostly between 30 and 60. For 6 months one of each pair had 10 g. glutamic acid daily in powder form, the other saccharine lactate.

Intelligence and performance tests before and after revealed no significant difference between the groups. However, many of the parents of children who had glutamic acid reported that they seemed more energetic than before.

The second instalment consists of a detailed discussion of the literature. A large scale trial, particularly with borderline or educationally backward children, would seem desirable, since among them even a small improvement would yield great social and economic results.

W. M. Deans.

4240

WOOLF, L. I., GRIFFITHS, R. and MONCRIEFF, A. Treatment of phenylketonuria with a diet low in phenylalanine. *Brit. Med. J.*, 1955, **i**, 57-64. [Hosp. Sick Child., Great Ormond St., London.]

The passage of an acid hydrolysate of casein through charcoal removed phenylalanine, tyrosine and tryptophan. The residual amino-acids with additions of tyrosine, tryptophan and milk were the principal sources of amino-acids in a diet given to 3 mentally defective children with phenylketonuria. Phenylpyruvic acid disappeared from the urine and general intelligence increased in all 3, most improvement occurring in the 2 younger children, each aged about 2 years 8 months before treatment lasting 9 and 10 months. The initial effect on the third child aged 5 years and 4 months was striking.—A. Hepburn.

4241

WISSLER, H., GAUTIER, R. and LINDER, A. Über die Gewichtszunahme von Kindern verschiedener Altersstufen bei Mast. Beitrag zum Problem der Fettsucht. [Weight increase of children of different ages when fattened. The problem of obesity.] *Helv. paediat. Acta*, 1954, **9**, 524-529. [Kindersanat. Pro Juventute, Davos.] French, Italian and English summaries.

The increase in weight of 480 children during 3 months' stay in a sanatorium was analysed. Children who had been seriously ill with pulmonary disease before admission were excluded from the analyses. Their daily timetable consisted of 2½ to 3 hr. at rest, 3 to 4 hr. at school, 1 hr. walking; the rest of the day was spent in their individual occupations and in eating. The amount of food taken, though difficult to estimate, was probably about 130 per cent. of the normal energy intake. The children were divided into 4 age groups, 2 to 5, 6 to 9, 10 to 12 and 13 to 16 years. The weight increases for the groups, as percentages of original

weight, were, respectively, 6.3, 6.2, 9.7 and 9.6. In the lower age groups boys and girls showed no difference, but in the age group 13 to 16 years the girls increased more than the boys, 10.6 and 8.6 per cent., respectively.—M. Eddison.

4242

NOGALLYER, A. M., VISHNEVSKAYA, YU. C., MAKAROVA, L. A., PROKOPCHUK, N. M., GYANDZHETSYAN, N. A. and PANOVA, V. A. Opyt lecheniya na kyrorte bol'nykh khronicheskim kholetzistitom dietoi, obogashche-

noi solyami magniya, vitaminami i rastitel'noi kletchatkoi. [An experiment in the treatment at a health resort of patients with chronic cholecystitis by a diet enriched with magnesium salts, vitamins and plant cellulose.] *Vop. Pitani.*, 1955, 14, No. 1, 17-23.

An account of the clinical and psychological responses of patients with chronic cholecystitis of varying etiology to an enriched diet, full details of which are given.—D. W. Taylor.

See also Absts. 3253, 3768, 3840, 3920, 3939, 4107, 4109, 4154, 4157, 4172, 4195.

6. FEEDING OF ANIMALS

GENERAL, INCLUDING DIGESTIBILITY TRIALS

4243

CRASEMANN, E. Neuere Ergebnisse von Respirationsversuchen. [Recent results of respiration experiments.] *Landwirtsch. Forsch., Suppl.* 5, pp. 13-28. [Inst. Haustierernährung, Eidg. Tech. Hochschule, Zürich.] English summary.

This lecture summarises and discusses the technique of estimating energy production value of feedingstuffs. The use of different experiments is discussed and the suggestion is made that the ratio between net energy as a percentage of metabolisable energy when protein and fat are laid down (growth) to that when only fat is laid down may be of importance. Breirem (Absts. 1090, Vol. 10; 3508, Vol. 5) found in respiration experiments with pigs that there was more loss of energy as heat during growth than during fattening, i.e., a lower ratio of net to metabolisable energy, which is the reverse of what is commonly found with farm and laboratory animals.

A table summarises data to compare the net calories for fattening (NK_F) and the ratio of net to metabolisable energy of 1 kg. digested starch, fat and protein in cattle, sheep, rabbit, pig and fowl. Finally the Kellner "Wertigkeit", the ratio of observed to computed net energy, is discussed with reference to the possible effect of fibre and the desirability of respiration experiments sufficiently numerous to permit of statistical analysis.—I. Leitch.

4244

FUCHS, P. Prinzipien der absoluten Futterwertmessung. [Principles of measuring absolute feeding value.] *Arch. Tierernährung*, 1954, No. 5, Beihefte, 182-196. [Böhlitz, Ehrenberg, Leipzig.]

The arguments presented in an earlier paper (Abst. 2791, Vol. 21) are presented afresh without much change. A footnote discusses the proposal

by Nehring (Abst. 2816, Vol. 25) to make the Kellner unit (K.E.) 2500 Cal. There would be advantages of ease of arithmetical manipulation, but from that point of view the ideal would be a unit of 1000 Cal., which would be entirely divorced from Kellner's work.

The crux of the matter is that the productive value of any feed is different for different species of animal and must be estimated for each. And then the value is valid only for fat production.

I. Leitch.

4245

WALKER, D. M. and HEPBURN, W. R. The nutritive value of roughages for sheep. 1. The relationship between the gross digestible energy and the chemical composition of hays. *J. Agric. Sci.*, 1955, 45, 298-310. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

With 3 groups of 3 Cheviot lambs, 4 months old, the relationship between gross digestible energy (G.D.E.) and the proximate constituents found by chemical analysis of 24 hays was studied. Each hay was given to one of the groups of lambs for a preliminary period of 10 days and a similar collection period in metabolism crates. There was a high negative correlation between percentage G.D.E. and crude fibre, lignin and cellulose, but there was no advantage in analysing for the last 2. Crude fibre estimated by digestion with 5 per cent. H₂SO₄ was closely related to digestibility of energy, and metabolisable energy to percentage G.D.E. When starch equivalent was calculated from G.D.E., the values were always lower than conventional values.—T. D. Bell.

4246

CRASEMANN, E. Die Fettansatzwirkung der Futtermittel bei verschiedenen Nutztierarten und ihre Bedeutung für das Messen des Futterwertes. [Fattening value of feeds in different

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farm animals and its significance for the measurement of feeding value.] *Wiss. Abh. Deutsch. Akad. Landwirtschaft. (Berlin)*, 1954, 5, 141-164. [Inst. Haustierernährung, Eidg. Tech. Hochschule, Zürich.] English summary.

Methods of evaluating feedingstuffs, the units in which feeding value is expressed, and the possibility of extending the production equivalent of Møllgaard and Breirem, estimated with bullocks, to other species, are critically discussed, with references.

A table is given of the fattening effect of starch, fat and protein for bullock, sheep, rabbit, pig and poultry. The relative efficiency of the conversion of energy from fat or protein into energy of body fat is much the same for the first 4 species, and the slightly higher values for poultry are of no practical importance. That the fattening effects of the different nutrients given separately or mixed or in the form of a feedingstuff are additive was shown by Kellner and Fingerling for the bullock and the pig; recent experiments suggest that this is true also for sheep and poultry; it has not yet been demonstrated for the rabbit. Another table gives coefficients for applying Møllgaard's NK_F values, established with the bullock, to fattening sheep, rabbit, pig and poultry, with an example of their use; the results are also given in terms of starch equivalents.

All this applies only to highly digestible feedingstuffs low in fibre. Difficulties arising from differences in the capacity of different species to digest fibre may eventually be overcome, but the prospect of dealing with those due to species differences in Kellner's "value" (*Wertigkeit*) seems less hopeful.

W. M. Deans.

4247

ARMSTRONG, D. G., PRESTON, T. R. and ARMSTRONG, R. H. Digestibility of a sample of pasture grass by calves. *Nature*, 1954, 174, 1182-1183. [Sch. Agric., King's Coll., Univ. Durham.]

Pasture grass, cold-stored at 0° to 5° F., was given to 4 calves aged from 10 to 12 weeks and the digestibility of the proximate nutrients was estimated over a 10-day collection period by conventional and faecal-index methods, using chromium oxide. Lignin and cellulose were also estimated, and the mean digestibility coefficients were: dry matter 75.0, organic matter 77.1, crude protein 59.8, ether extractives 45.6, crude fibre 79.7, N-free extractives 82.9, cellulose 84.0, and lignin, 3.0. The mean percentage recovery of chromium oxide was 102.3 ± 1.93 .—D. M. Walker.

4248

MAYMONE, B., PETRUCCI, E. and TIBERIO, M. Ricerche sulla produttività e sul valore nutritivo di una Polygonacea della flora spontanea, resistente alla siccità: *Polygonum romanum* Jacq. [The yield and nutritive value of a native plant resistant to drought, *Polygonum romanum*, Jacq.] *Ann. Sper. agrar.*, 1953, 7, 647-673. [Ist. Sper. Zootec., Rome.] English summary.

Polygonum romanum, Jacq., a herb which commonly occurs naturally in pastures round Rome, is relished by grazing stock, and is very resistant to drought, flowering in the late summer. Samples at 2 stages of growth were analysed and tested for digestibility. The ash contained more Mg than usual, but did not seem to upset the animals used in the trials. The plants at the beginning of flowering and in full flower had the following composition, respectively (mean percentage digestibility in brackets): dry matter 32.14, 38.78 (57.06); crude protein 3.80, 3.85 (42.91); ether extract 1.00, 0.76 (57.74); crude fibre 10.70, 11.20 (47.42); ash 2.57, 2.31; N-free extract 14.07, 20.66 (70.43). In digestible nutrients it was similar to timothy grass.—T. D. Bell.

4249

MAYMONE, B., DATILLO, M. and MAZZIOTTI DI CELSO, P. Ricerche sulla produttività e sul valore nutritivo della leguminosa *Scorpiurus muricata* L. var. *subvillosa* (L.), pregevole foraggiera dei prati naturali e dei pascoli meridionali. [The productivity and nutritive value of the legume *Scorpiurus muricata*, L., var. *subvillosa* (L.), a forage plant of natural meadows and pastures in the South.] *Ann. Sper. agrar.*, 1953, 7, 1289-1329. [Ist. Sper. Zootec., Rome.] English summary.

Scorpiurus muricata, L., var. *subvillosa* (L.) is an annual legume which readily sets seed and occurs naturally in the pastures of the Campagna romana. It is held in high esteem by local shepherds. Attempts to establish it in pastures on the experimental farm were successful in 4 years' trials. It was found to give a high yield of dry matter per acre with a good protein percentage. Its digestibility by sheep was higher than that reported for alfalfa and red clover.—T. D. Bell.

4250

MAYMONE, B., PETRUCCI, E. and BATTAGLINI, A. Ricerche sulla produttività e sull'elevato valore nutritivo di *Helminthia echinoides* (L.) Gaertn., Composita infestante nel bacino del Mediterraneo. [The productivity and high nutritive value of *Helminthia echinoides*, (L.) Gaertn., one of the Compositae infesting (pastures) in the Mediterranean basin.] *Ann. Sper. agrar.*, 1953, 7, 1331-1366. [Ist. Sper. Zootec., Rome.] English summary.

Helminthia echinoides, (L.) Gaertn. is regarded as a weed very common in natural pastures and in

stubbles. It is readily eaten by grazing stock. Chemical analysis of the plant at the early flowering stage, when a good yield of dry matter was obtained, showed that in protein content and digestibility by sheep, it was comparable to alfalfa. The digestibility rapidly declined as flowering advanced, but remained comparable to that of common fodders such as red clover at a similar stage of growth.—T. D. Bell.

4251

MAYMONE, B. and BATTAGLINI, A. Ricerche sulla digeribilità e sul valore nutritivo dei semi di carrubo (*Ceratonia siliqua* L.). [The digestibility and nutritive value of carob beans (*Ceratonia siliqua*, L.).] Ricerche sulla digeribilità e sul valore nutritivo del "germe" di carruba (*Ceratonia siliqua* L.). [The digestibility and nutritive value of carob bean germ (*Ceratonia siliqua*, L.).] Ricerche sul valore nutritivo delle polpe di carrube esaurite, residue dalla preparazione industriale dell'alcool. [The nutritive value of extracted carob bean pulp residues from the industrial production of alcohol.] *Ann. Sper. agrar.*, 1953, 7, 1367-1375; 1977-1984; 1985-1999. [Ist. Sper. Zootec., Rome.] English summary.

The composition of the dry matter of the carob bean seeds (with digestibility by sheep given in brackets) was: crude protein 18.5 (67.0), ether extract 2.0 (70.5), crude fibre 3.0 (64.8), ash 3.5 and N-free extract 68.0 (87.8) per cent. Comparison with other values reported shows a wide variation depending on the variety and source of the seed.

The composition of the dry matter, and the digestibility, of the germ or embryo and cotyledons of the seed were: crude protein 40 (81), ether extract 3.5 (83), crude fibre 8 (75), ash 5.6 and N-free extract 33 (84) per cent. Here the variation between varieties and sources was slight.

The pulp obtained after industrial processing for the extraction of alcohol had a satisfactory chemical analysis, but was nearly indigestible, and was not readily accepted by animals.

T. D. Bell.

4252

MAYMONE, B., TRIULZI, G. A. and TIBERIO, M. Ricerche sulla digeribilità e sul valore nutritivo della produzione foraggera autunno-invernale dei prati naturali e dei pascoli centro-meridionali. [The digestibility and nutritive value of autumn and winter forage produced in the central-southern natural meadows and pastures.] *Ann. Sper. agrar.*, 1953, 7, 2027-2040. [Ist. Sper. Zootec., Rome.] English summary.

The natural pastures of central and southern Italy in autumn and winter are similar in chemical composition and digestibility to spring and summer

pastures in Germany and Sweden. There is a greater difference between the hill and the lowland pastures, owing to differences of soil rather than of botanical composition.—T. D. Bell.

4253

MAYMONE, B. and TIBERIO, M. Ricerche sulla digeribilità e sul valore nutritivo delle crisalidi sgrassate di *Bombyx mori*. [The digestibility and nutritive value of defatted chrysalides of *Bombyx mori*.] *Ann. Sper. agrar.*, 1954, 8, 203-228. [Ist. Sper. Zootec., Rome.] English summary.

After the silk has been removed the fat is extracted from the chrysalides of the silkworm, and the defatted chrysalides can be ground and used as a valuable source of protein in concentrates for stock. Chemical analysis of the meal gave the following percentage composition of the dry matter: crude protein 70 to 75, true protein 65 to 70, ether extract 4 to 9.5, crude fibre 5 to 8, ash 4 to 6.5 and N-free extract 9 to 10. There was great variation in the ether extract, depending on the original method of extraction. The ash had high P and S contents. The protein was of high biological value and contained all the essential amino-acids. It was superior to fishmeal, meat-meal and tankage in cystine, tyrosine, tryptophan, lysine and glutamic acid. In trials with sheep the following digestibilities were found: crude protein 87.7, true protein 87.0, ether extract 94.6, crude fibre 73.5 and N-free extract 36.2 per cent.

T. D. Bell.

4254

McCULLOUGH, M. E., BAIRD, D. M. and SELL, O. E. The relationship between forage dry matter digestibility and weight gain by dairy heifers on three winter grazing crops. *J. Dairy Sci.*, 1954, 37, 1435-1438. [Georgia Agric. Exp. Stat., Experiment.]

The forages used were Abruzzi rye, Arlington oats and Chapel hill rescue grass. Two one-acre plots of each forage were sown in September 1953. An 18-week grazing trial of three 6-week periods was begun in January 1954, with 9 dairy heifers. Fortnightly weights were recorded. Faeces were sampled and digestibilities of dry matter of the forages were estimated by the chromogen method. Analyses of hand-clipped samples of the forages were also made. Non-significant correlations were obtained between dry matter digestibility and average daily gain. It was concluded that digestibility of dry matter did not limit weight gain until the forages began to mature in early spring. The average daily gains of the heifers on rye, oats and rescue grass were, respectively, 1.64, 1.91 and 1.63 lb. The average dry matter digestibilities of the forages were rye 73.5, oats 73.9 and rescue grass 74.7 per cent.—J. N. Aitken.

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4255

DIJKSTRA, N. D. and FRENS, A. M. De verteerbaarheid en voedervaarde van de perskoek van boegroemakka-pitten. [The digestibility and feeding value of the expeller cake of boegroemakka palm kernels.] *Landbouwk. Tijdschr.*, 1954, **66**, 634-638. [Rijkslandbouwproefstat., Hoorn.] English summary.

There are 3 palms of the *Astrocaryum* group in the Dutch East Indies, of which the kernels are collected and exported to Holland. The oil is a good edible oil. The percentage composition of the expeller-process residue of one of these, boegroemakka, was as follows: dry matter 87.55 and on the dry matter crude protein 10.17, true protein 10.07, fat 9.14, N-free extract 57.40, crude fibre 19.95 and ash 3.34. Digestibility coefficients of the organic constituents, from data for 2 wethers, in the same order were: 52.7, 57.3, 92.3, 83.2 and 54.3. Assuming a value (*Wertigkeit*, Kellner) of 100 on analogy with ordinary palm kernel, the starch equivalent of 100 g. dry matter is 84.0 or of 100 g. press cake with 12.45 per cent. moisture 73.5. The cake contains much less protein than ordinary palm kernel.—I. Leitch.

4256

CHAPPEL, C. F., SIRNY, R. J., WHITEHAIR, C. K. and MACVICAR, R. Effect of mineral supplements on digestibility of a corncob ration by sheep. *J. Animal Sci.*, 1955, **14**, 153-159. [Dept. Animal Husb., Oklahoma Agric. Exp. Stat.]

Digestibility by sheep of a corncob ration which had a low total ash content but had adequate total digestible nutrients, protein, calcium, phosphorus and cobalt was not improved by addition of sodium, magnesium, potassium, copper, manganese, zinc and iron. Digestibility of organic matter and crude fibre of such a ration was significantly increased by the addition of natural alfalfa ash and also by synthetic alfalfa ash. These additions also improved appetite.—J. C. Gill.

4257

CHALMERS, M. I. and SYNGE, R. L. M. The digestion of protein and nitrogenous compounds in ruminants. *Advances in Protein Chem.*, 1954, **9**, 93-120. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

4258

HORN, L. H. (JR.), SNAPP, R. R. and GALL, L. S. The effect of antibiotics upon the digestion of feed nutrients by yearling steers, with bacteriological data. *J. Animal Sci.*, 1955, **14**, 243-248. [Dept. Animal Sci., Univ. Illinois, Urbana.]

A series of trials were made to find the effect of
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penicillin, aureomycin or a mixture of antibiotics and sulphathalidine on digestibility and rumen efficiency in year-old steers. The mixture of antibiotics given 9 days before the collection for estimation of digestibility increased the apparent digestibility of all the constituents of the feed. The effect of small doses of penicillin, 32 and 100 mg., was variable. Aureomycin at all levels, 32 to 100 mg., and penicillin at high levels, 400 and 800 mg., depressed the digestibility of protein and crude fibre. N retention was decreased equally by penicillin and aureomycin. The high doses of penicillin and all doses of aureomycin gave rise to a rumen flora unsuited to the digestion of fibre.

T. D. Bell.

4259

KOX, S. K. The function of antibiotics in animal nutrition. *Proc. Roy. Soc. Med.*, 1954, **47**, 747-748. [Nat. Inst. Res. Dairying, Univ. Reading.]

4260

GORDON, W. S. and TAYLOR, J. H. The growth-promoting effect of antibiotics and their possible modes of action. *Proc. Roy. Soc. Med.*, 1954, **47**, 744-747. [Agric. Res. Coun. Field Stat., Compton, near Newbury, Berks.]

4261

FROST, D. V., OVERBY, L. R. and SPREUTH, H. C. Arsenicals in feeds. Studies with arsanilic acid and related compounds. *J. Agric. Food Chem.*, 1955, **3**, 235-243. [Abbott Labs., N. Chicago, Ill.]

A review.

4262

LINTZEL, W. Probleme der Eiweissqualität im Erhaltung- und Leistungsfutter beim Pflanzenfresser und beim Fleischnfresser. [Protein quality in maintenance and production rations for herbivores and carnivores.] *Arch. Tierernähr.*, 1954, No. 5, Beihefte, 127-134. [Biochem. Lab. Prof. W. Lintzel, Krefeld.]

The argument is elaborated that protein metabolism in the plant-eater is a one-phase process, in the flesh-eater biphasic, i.e., that in the former the supply of protein is continuous, especially in the ruminant, and amino-acids go straight to the product; in the latter, deposit protein is first built and then is later used for production. From this it follows that the type of protein supplied is not important for maintenance in the plant-eater; proteins low in lysine, such as that of cereals and potatoes, are of full value. On the other hand, for production all animals require protein rich in all the essential amino-acids, especially lysine.

I. Leitch.

4263

HENNAUX, L. and LÉCOMTE, R. L'épeautre en alimentation animale. [Value of spelt in animal nutrition.] *Bull. Inst. agronom. Gembloux*, 1954, 22, No. 3/4, 232-234. [Stat. Recherches Zootech., Gembloux.]

Reasons for the superiority of spelt, a grain allied to wheat, over other cereals for the feeding of breeding livestock are unknown. A complete analysis, including proximate principles, minerals and vitamins (carotene, tocopherol and vitamin D) was made of spelt and other grains but only for vitamin D was a significant difference found. By biological estimation with rats, spelt was found to contain from 203.7 to 340.7 I.U. per kg. as compared with 33.2 I.U. for oats, 66.5 I.U. for winter barley and nil for wheat. The amino-acid contents are being investigated.—J. S. Thomson.

4264

WOODMAN, H. E. Rations for livestock. Minist. Agric. and Fish. Bull. No. 48, 1954, 13th ed., pp. iv + 150. H.M.S.O., London. Price 4s. 6d. net.

The new edition of this popular bulletin appears in its familiar form with all the information expected. There is an additional section on the use of antibiotics for fattening pigs, their advantages and limitations, and it is stressed that the last word has not yet been said on this matter. Another new section gives a general description of the American system of rearing baby pigs on artificial diets in brooders. The protein requirements of pigs are discussed with modifications based on recent investigations at Cambridge showing that high levels of vegetable protein may be as good as the normal levels of animal protein. In the section on calf rearing the findings of the Hannah Dairy Research Institute are described, embodying a warning about the risk that even low levels of cod liver oil may cause muscular dystrophy.

T. D. Bell.

4265

KLUSSENDORF, R. C. Animal fats in animal feeds. *Vet. Med.*, 1955, 50, 57-58; 70. [Vet. Med. Serv., Commercial Solvents Corp., Terre Haute, Ind.]

4266

WHITING, F. The feeding value of damaged grain. *Exp. Farms Serv., Dept. Agric., Ottawa*, Publ. No. 914, November 1954, pp. 13. [Exp. Stat., Lethbridge, Alta.]

A brief review is made of experiments on the uses of barley, wheat, oats and flax grains damaged by frost, mould, sprouting, rust, smut, ergot or fire, for stockfeeding. Though of lower feeding value than undamaged grains, they can usually be

given safely to all classes of stock. Exceptions which are harmful are ergot-infested grains of all cereals and frozen flax. Some types of mould may also be harmful, especially to horses.—T. D. Bell.

4267

FARINAS, E. C. *Ipil-ipil*, the "alfalfa" of the tropics. Its establishment, culture and utilization as a fodder and pasture crop. *Philippine J. Animal Indust.*, 1951, 12, 64-84. [Bur. Animal Indust.]

Ipil-ipil (*Leucaena glauca*) is a leguminous shrub occurring naturally in the Philippines. It provides good fodder with a high protein content, superior to alfalfa. It readily lends itself to cultivation. It can replace other roughages for ruminants, but the presence of a toxic substance, mimosine, makes it unsuitable for single-stomached animals. *Ipil-ipil* meal can be included up to 10 per cent. in rations for poultry. The plant, its habits, composition, cultivation and use are described.

T. D. Bell.

4268

JUCKER, H. Möglichkeiten zur Verbesserung der betriebseigenen Futterbasis. [Possibilities of improving homegrown fodder.] *Die Grüne*, 1954, 2, No. 14, pp. 18. [Inst. Haustiernährung, Eidg. Tech. Hochschule, Zürich.]

The first condition for productive and economic winter feeding of cattle is strict limitation to homegrown fodder. On this basis the improvement of homegrown fodder is urgently required. The effects of time of cutting and method of conservation on composition of pasture, satiety value, palatability, carotene content and feeding value, and the costs of different methods of conservation, are summarised in table and diagram. Examples are given of production rations for cows giving from 5 to 30 kg. milk daily.—I. Leitch.

4269

MYERS, K. H. and PASTO, J. K. Grassland in organization of dairy farms in northeastern Pennsylvania. *Pennsylvania Agric. Exp. Stat. Bull.* No. 583, September, 1954, pp. 25.

A survey of 304 representative farms in Northeast Pennsylvania was made. They were dairy farms with some permanent pasture, and some of the crop area under grass. Hay on all farms and grass or maize silage on some farms were used. Some maize and small grains were cropped, usually for stock feed.

The topography, climate and soil are very well suited to grassland, but few of the farms approached the desirable standard, and many pastures were in poor condition. Improvement of yield and quality, and in some cases greater areas, of grassland are advocated.—T. D. Bell.

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4270

BARRERO GONZÁLEZ, A. Modificación del valor alimenticio de la paja. [Improving the feeding value of straw.] *An. Inst. Invest. Vet., Madrid*, 1953, 5, 133-135. English and German summaries.

4271

ZORN, W. Antibiotica und züchterische Selektion. [Antibiotics and selection for breeding.] *Züchtungskunde*, 1955, 26, 257-264.

Aims in selecting stock for breeding will be to increase production by improving health, fertility, rate of growth and efficiency of use of feed. Antibiotics control disease, and so one means of distinguishing better stock is removed. A good criterion would be "so healthy that there is no reaction to antibiotics". Antibiotics may improve utilisation of feed, may appear to make a poor ration good and produce results in some areas that are not reproducible in others with different feeds. Their effects on production are small at the best. They have made it possible to rear pigs on artificial milk substitutes but none of these effects can replace selection to maintain and improve performance. So far, no effect of antibiotics on fertility has been claimed.—I. Leitch.

4272

Two pilot schemes to solve the overstocking problem in Tanganyika. *Trop. Agric., Trinidad*, 1955, 32, 30-37. [Dept. Vet. Serv., Tanganyika.]

In Tanganyika livestock are concentrated into relatively small areas because of the prevalence of tsetse fly and the scarcity of permanent water

supplies. To prevent further deterioration of the land some redistribution of stock is necessary. Large areas of natural grazing are available, but these might be ruined by the mismanagement of stockowners. A further problem is how to absorb and prevent the slaughter of the many immature animals which come on the market through culling and destocking. It has been shown that large-scale ranching and holding grounds not only are possible but can be profitable.—J. S. Thomson.

4273

COOLHAAS, C. Landbouwkundig onderzoek in Nieuw-Guinea. [Agricultural research in New Guinea.] *Landbouwk. Tijdschr.*, 1954 (Nieuw-Guinea No.), 30-38. [Landbouwhoges., Wageningen.] English summary.

In general, soils are of low fertility. Development must be based on the study and planned exploitation of "islands" of better soil. Possible crops are cocoa and rice, the rice to be grown on polders to be reclaimed.—I. Leitch.

4274

FARINAS, E. C. Better fodders and improved pastures in livestock production in the Philippines. *Philippine J. Animal Indust.*, 1951, 12, 45-60. [Bur. Animal Indust.]

In order to improve livestock and attain a greater degree of self-sufficiency in the Philippines with reduced imports of food and feedingstuffs it is necessary to improve pastures. The possibility of improving indigenous and importing other suitable fodder crops is discussed.—T. D. Bell.

See also Absts. 3422, 3893.

HORSES

4275

KALININ, V. I. Obezpechit' khoroschoe kormlenie loshadei kolkhozov. [The provision of good feeding for horses at collective farms.] *Konevodstvo*, 1954, 24, No. 10, 1-3.

Instructions are given for the maintenance of horses in winter and the necessity for laying in stocks of food, for providing warm stables and drinking water at stable temperature and for seeing that the food is properly prepared is emphasised. Oats and hay are no longer the only food for horses; working horses can be given up to 10 kg. potatoes and 15 kg. silage daily. Too much silage should not be given to brood mares lest it cause abortion. The rations of horses,

particularly working horses, should contain also succulent fodder and root crops. Potatoes could be either boiled or raw; root crops should be given raw.

On one collective farm the brood mares' daily ration consisted of 3 to 4 kg. oats, 10 kg. legume hay with timothy, 2 kg. oat straw and 2 to 3 kg. carrots. Salt licks were supplied. Part of the oat ration was germinated and given in this form from September to May. Green needles of firs and pines were a valuable source of vitamins. In spring the stallions were given increased amounts of concentrates in the ration, 300 to 500 g. germinated oats, and eggs before mating.

H. Scherbatoff.

CATTLE

GROWTH AND FATTENING

4276

ROY, J. H. B., PALMER, J., SHILLAM, K. W. G., INGRAM, P. L. and WOOD, P. C. **The nutritive value of colostrum for the calf. 10. The relationship between the period of time that a calfhous has been occupied and the incidence of scouring and mortality in young calves.**

ROY, J. H. B., SHILLAM, K. W. G., PALMER, J. and INGRAM, P. L. **11. The effect of aureomycin on the performance of colostrum-deprived calves.** *Brit. J. Nutrition*, 1955, 9, 11-20; 94-103. [Nat. Inst. Res. Dairying, Univ. Reading.]

10. The results reported were extracted from experiments of randomised block design made during the winters 1949-50 to 1953-54 (see Absts. 4231, 5669, Vol. 21; 3014, Vol. 22 and 320, Vol. 24). In some of these experiments one calf in each block was deprived of colostrum. In each year the calfhous was disinfected at the end of winter and left empty during the summer months. During each winter it was filled with a succession of calves, each calf being kept there for 3 weeks. Data from 202 Shorthorn calves were available for statistical analysis. The incidence of scouring was lowest among calves occupying the calfhous immediately after the period of vacancy. Scouring increased with order of occupation. This effect was less noticeable among calves receiving whole milk than among those having a synthetic milk. The increase in scouring occurred irrespective of the amount of colostrum given to the calves and of the presence or absence of calves deprived of colostrum. Scouring was reduced after the calfhous was vacated for 47 days in mid-winter. Vacating the calfhous for 15 days had no effect. It is suggested that under ordinary farm conditions there may be a build-up of "infection" in calfhouses which are permanently occupied during the winter and that this may account for the known increase in scouring and mortality among calves in late winter.

11. Sixteen Ayrshire and 24 Shorthorn bull calves were used in an experiment of randomised block design with 4 treatments in each of 10 blocks. Three calves in each block were deprived of colostrum. One of these received no aureomycin, the remaining 2 received aureomycin, either 238 mg. daily from Aurolac for the first 5 days and 119 mg. for the subsequent 5 days; or 250 mg. crystalline aureomycin hydrochloride for the first 5 days followed by 125 mg. for the next 5 days. The fourth calf in each block received 6 pints of colostrum without aureomycin supplement. All

calves received a basal diet of whole milk. All of the calves receiving colostrum survived; 4 of the untreated calves deprived of colostrum died. One calf deprived of colostrum died on each of the 2 treatments in which aureomycin was given. Both aureomycin treatments significantly increased live-weight gain and reduced the incidence of scouring. Aureomycin treatment also reduced the incidence of high rectal temperature.—J. N. Aitken.

4277

ROBERTS, H. E., WORDEN, A. N. and EVANS, E. T. R. **Observations on some effects of colostrum deprivation in the calf.** *J. Comp. Pathol.*, 1954, 64, 283-305. [Dept. Animal Health, Univ. Coll. Wales, Aberystwyth.]

Calves deprived of colostrum showed a high incidence of scouring, and later joint-ill. Rectal temperatures were higher than normal, and showed a peak on the third and ninth day. Changes in the blood picture of normal calves and calves deprived of colostrum are described and discussed.

T. D. Bell.

4278

STAROSHEL'SKI, L. S. **Gigiena sokhraneniya i vyrashchevaniya telyat. [Method of rearing calves.]** *Veterinariya*, 1954, 31, No. 9, 21-25.

An account is given of the rearing of calves on collective farms. On one farm with a high standard of calf rearing, the calves eat hay at 5 to 7 days old and concentrates at 20 days. When they were a month old the ration was increased by the introduction of sliced carrots and beet, starting with 100 g. daily and rising to 2 kg. daily at 2 months. They were also given 10 to 15 g. salt each.

To prevent digestive disorders the calves were given infusions of hay, starting at 12 to 20 days, up to the age of 4 to 5 months; 50 litres of infusion were made from 7 to 9 kg. lucerne and vetch. The calves were given 0.5 litre at first and finally 5 to 8 litres. The average amount of feed per calf up to 6 months old was 380 kg. milk, 300 kg. hay, 200 kg. silage and root crops, and 180 kg. concentrates.—H. Scherbatoff.

4279

WILLIAMS, J. B. and JENSEN, C. **Dried rumen contents in calf milk replacements.** *Bi-m. Bull. N. Dakota Agric. Exp. Stat.*, 1955, 17, 91-94. [Dept. Dairy Husb.]

The inclusion of a preparation of dried rumen contents in a milk replacement formula had no effect on the growth rates of Holstein and Guernsey calves. Adding terramycin and vitamin B₁₂ to

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the replacement formula also had no effect on growth rate. The growth rate of 2 calves receiving a replacement containing 20 per cent. of ground beet pulp was satisfactory, but there was considerable loss of hair over two-thirds of the body. The addition of soya bean lecithin to the experimental rations did not prevent the ingredients from settling out. The growth rate of a group of calves receiving whole milk was superior to that of calves on the experimental diets.—J. N. Aitken.

4280

MEREGALLI, A. Contributo allo studio di un metodo pratico ed economico di allattamento di vitelle di razza lattifera. [A practical and economical method of feeding dairy calves.] *Ann. Sper. agrar.*, 1953, 7, 555-580. [Lab. Zootec., Florence.] English summary.

Four dairy heifer calves were successfully reared to 4 months of age with a great saving of milk. The method was to give colostrum and whole milk only for the first 3 weeks, and then gradually to decrease the milk at the rate of 1 litre a day and give concentrates and first quality hay to appetite. The concentrate mixture should contain about 18 to 22 per cent. protein, a quarter of this being of animal origin. The hay should be leafy alfalfa or seeds hay. No milk was given after 60 to 70 days. By this method about 600 litres of milk were saved per calf. The method is advocated only for dairy calves, though when the milk supplied by the dams of beef or dual purpose breeds is insufficient the same supplements might be used.—T. D. Bell.

4281

SEN, K. C., PREMACHANDRA, B. N., DASTUR, N. N. and RANGASWAMY, M. C. Effect of iodinated casein on growth in calves. 2. Feeding iodinated casein at low levels. *Indian J. Dairy Sci.*, 1954, 7, 198-204. [Indian Dairy Res. Inst., Bangalore.]

For part 1, see Abst. 3866, Vol. 24.

The animals used were 15 female calves of the Gir, Sindhi and Ayrshire × Sindhi breeds. They were divided into 3 comparable groups of 5 animals. All groups received the same basal ration of 3 to 6 lb. of a mixture of lucerne and guinea grass, the higher amounts being given to the heavier animals. Ragi straw was given to appetite. A concentrate mixture was given at the rate of 1 lb. per 100 lb. liveweight to animals weighing less than 450 lb. and at the rate of 0.75 lb. to heavier animals. The crossbreds received an additional 0.25 lb. Group 1 was used as a control and received no iodinated casein. Calves in group 2 were given 1.25 g. per 100 lb. bodyweight for 20 weeks, after which it was withdrawn and the animals were kept under observation for a further 15 weeks. The third group received 0.75 g. per 100 lb. live-

weight for 20 weeks and the amount was then increased to 2 g. per 100 lb. liveweight for a further 10 weeks.

Growth in terms of liveweight gain was stimulated in both treated groups as compared with the controls. In the group which received 1.25 g. per 100 lb. liveweight the accelerated growth was maintained even after treatment stopped. When the amount given to group 3 was increased from 0.75 to 2 g. per 100 lb. liveweight the liveweight gain was reduced from 0.90 to 0.41 lb. daily.

J. N. Aitken.

4282

KEHAR, N. D. Effect of feeding alkali-treated cereal straws on the growth of young cattle. *Indian J. Vet. Sci.*, 1954, 24, 189-216. [Div. Animal Nutrit., Indian Vet. Res. Inst., Izatnagar.]

Field experiments were made at 4 centres to compare untreated and alkali-treated straws for cattle feeding. Rice straw was used at 2 of the centres and wheat straw at the other 2. The straw was treated by soaking in caustic soda solution and then washing. Apart from the treatment of the straw for the experimental animals, management at each centre was not changed from the normal. Only at one of the centres was the level of nutrition up to the standards of Morrison.

The treated straw produced greater and quicker liveweight gains than the untreated. This effect was greater in the less well nourished cattle. The possible advantages and the economics of alkali treatment under Indian conditions are discussed.—T. D. Bell.

4283

GAUNYA, W. S., MOCHRIE, R. D., JOHNSON, R. E. and DEMBICZAK, C. M. Effects of adding small quantities of aureomycin (Aurofac) to the starter of calves. *J. Dairy Sci.*, 1955, 38, 1-5. [Dept. Animal Indust., Univ. Connecticut, Storrs.]

In a randomised block experiment with 24 calves the feeding of a calf starter supplemented with 4.5 or 9.0 mg. aureomycin per lb. had no effect on growth rates as compared with controls on a similar starter without aureomycin. The experiment was continued for 91 days. The efficiency of gain of the calves receiving the higher level of aureomycin supplement was greater during the first 49 days, but there was no difference between treated and untreated calves at the end of 91 days. Aureomycin did not reduce the incidence of scouring.—J. N. Aitken.

4284

LAMBERT, M. R., JACOBSON, N. L., ALLEN, R. S. and BELL, M. R. The relation of growth, feed

consumption, and certain blood constituents to changes in the dietary of young dairy calves. *J. Dairy Sci.*, 1955, 38, 6-12. [Dept. Animal Husb., Iowa Agric. Exp. Stat., Ames.]

Six calf starters were given, respectively, to 6 groups of 9 calves each during an experimental period of 116 days. The starters varied from simple to relatively complex mixtures. The ingredients were chosen from the following: ground maize, crushed oats, soya bean oilmeal, steamed bonemeal, salt, dried whey product, maize molasses product, wheat bran, linseed oilmeal, molasses and dehydrated alfalfa meal. The calves received whole milk for the first 7 weeks. The amount of starter was limited to 4 lb. per calf daily. Hay was given to appetite. Feed consumption and bodyweight were recorded. Samples of venous blood were analysed for reducing sugar, fat, vitamin A and carotenoids.

There was no significant difference between the groups in any of the characters studied. When the blood data of all groups were combined it was found that under the experimental conditions plasma fat values were closely correlated with dietary fat intake. The values reached a peak after the fourth week and were lowest at 9 weeks of age. Plasma carotenoids decreased during the initial 3 weeks but increased subsequently. Blood plasma vitamin A decreased during the last 3 weeks of the milk feeding period. After the withdrawal of milk there was a consistent increase in vitamin A. Blood glucose values declined during the first 6 weeks and remained relatively constant thereafter.—J. N. Aitken.

4285

KING, J. W. B. and DONALD, H. P. A study of variation in twin cattle. 3. Growth. *J. Dairy Res.*, 1955, 22, 1-9. [Agric. Res. Council. Animal Breeding Res. Organiz., Edinburgh.]

Increases in liveweight from birth to 19 months of age and in height at withers to 27 months of age of monozygotic twins, dizygotic twins and half-sisters from the same sire, all reared under the same conditions, were recorded, and the results were treated statistically. The variations between pairs in the 2 types of twins and the half-sisters were in the ratio of 1:6.8:10 for liveweight increase and there was a similar ratio for height at withers. It was calculated that unrelated pairs would show 20 times as much variation as monozygotic twins. The limitations of the present inquiry, and of the use of monozygous twins for experimental comparisons, are discussed.—T. D. Bell.

4286

NEWLANDER, J. A. and RIDDELL, W. H. Comparison of high-quality and low-quality hays for raising dairy calves. (Birth to 24 months

of age.) *Vermont Agric. Exp. Stat. Bull. No. 577*, November 1954, pp. 8. [Burlington, Vt.]

Dairy calves were raised from birth to 2 years of age. They received colostrum, whole milk for 5 weeks and skimmed milk for a further 4 weeks with the same grain ration, and had access to this and either good or poor quality hay from 2 weeks of age. Hay was given to appetite throughout the trial, and a maximum of 4 lb. grain in the first year and 2 lb. in the second year was allowed. The growth of the calves is considered in 6-month periods. Overall the calves getting good hay gained 10-18 per cent. more than the others, and this difference was seen in each separate period. In efficiency of feed conversion there was no difference between the groups.—T. D. Bell.

4287

VORSTER, T. H. The influence of certain environmental factors and breed differences on cattle production. *Rhodesia Agric. J.*, 1954, 51, 428-473. [Dept. Animal Husb., Matopos Res. Stat., Bulawayo.]

The natural conditions for cattle rearing in Southern Rhodesia are very poor. An extensive study was made to find the best type of stock for beef production under those conditions. Native and European cows were bred to native, Africander or Hereford bulls. All the animals in the investigation lived under the usual free range management of the area.

Birthweights and weaning weights of calves, the influence of dam and sire on them, their interactions and the influence of breed and parentage on growth rate and carcass characteristics were recorded and are discussed.

Birthweights were influenced most by the size of the dam, which was least in the native cows, and bull calves were heavier than heifer in each breed. The year and month of birth, and therefore the climate, also affected birthweights significantly.

Weaning weights were greater in the calves which were heavier at birth, and again the influence of the sire was negligible. The same was observed with weights at 4½ years of age, when they were slaughtered, and in the heifers at 3½ years of age, when they were bred.

Carcass weights and dressing percentages of the bullocks from European cows were greater; the highest grades were from Hereford sires. However, any small advantage of the progeny of Hereford was offset by the higher rate of mortality from birth to slaughter. Most of the deaths were from birth to weaning. Mortality was influenced by climatic conditions.

Taken as a whole, the amount of beef produced per cow bred was similar for all breed groups, since the higher survival rate of the native breeds offset their lower birthweight and growth rate. It

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was not considered advantageous to introduce selected European cattle into the existing environmental conditions.—T. D. Bell.

4288

NELSON, A. B., FONTENOT, J. P., ROSS, O. B., MACVICAR, R. and DARLOW, A. E. **The value of 20-, 30-, and 40-percent protein supplements for wintering heifer calves.** *Oklahoma Agric. Exp. Stat. Bull.* No. B-437, November 1954, pp. 14. [Div. Agric., Oklahoma Agric. and Mech. Coll., Stillwater.]

Feeding trials were made with heifers on winter rations of hay or pasture. The trials were made in the same form in 4 consecutive years. Some of the heifers received hay and 1 lb. of 20, 30 or 40 per cent. protein supplements in drylot feeding (groups 1, 2 and 3). The rest grazed winter pasture and got 2 lb. of 20 or 40 per cent. protein supplement (groups 4 and 5) or 1 lb. of 20 or 40 per cent. protein supplement (groups 6 and 7). The average gains or losses of groups 1 to 7 were, respectively: -11, 34, 81, 15, 38, -26 and 15 lb. All heifers were grazed on summer pasture for the rest of the year after the winter feeding period. The average gains for the whole year were: 250, 273, 290, 276, 268, 250 and 266 lb. Among the animals fed in drylot, the winter gains were in direct proportion to the percentage protein in the supplement. On winter pasture, 2 lb. of 20 per cent. protein supplement was equal to 1 lb. of 40 per cent. protein. The subsequent gains on summer pasture were greatest in the heifers which had gained least during the winter.

Further trials to see what effect those treatments have on later life and reproduction are in progress.—T. D. Bell.

4289

LITTLE, C. J. **The palatability of hay crop silage treated with sodium bisulfite.** *Quart. Bull. Michigan Agric. Exp. Stat.*, 1954, 37, 119-121. [Dairy Dept., Upper Peninsula Exp. Stat., Chatham, Mich.]

In an experiment with heifers given a choice of untreated silage or silage treated with sodium bisulfite at the rate of 2 lb. per 500 lb. forage, more than half the daily intake of silage was of the treated kind.—J. S. Thomson.

4290

REID, J. T., TURK, K. L., HARDISON, W. A., MARTIN, C. M. and WOOLFOLK, P. G. **The adequacy of some pastures as the sole source of nutrients for growing cattle.** *J. Dairy Sci.*, 1955, 38, 20-28. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

Groups of 2 or 3 steers, mostly Holsteins,

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received herbage from 6 different pastures, either by grazing or by hand-feeding. Each pasture was studied at 3 to 5 stages of plant growth, between May and August, when composition, digestibility and amount of herbage consumed by the steers were estimated for 4 to 11 days. The hand-fed steers provided information needed to estimate composition and digestibility (see Abst. 3871, Vol. 24).

All 6 pastures were first-growth herbage, except in the last period or two when 5 of them were aftermaths. Non-legume pastures, especially those rich in brome grass, did not provide enough protein for growing cattle, by Morrison's standards, after the beginning of July. The pastures rich in legumes provided more than enough protein at all stages. Aftermath pastures, even the non-leguminous ones, met the minimum protein needs at the end of the experiment. It was concluded that under ordinary conditions of grazing or cutting most pastures supply enough protein, but with mature first-growth herbage a protein supplement may be needed.

The first-growth pastures became deficient in total digestible nutrients (TDN) earlier in the season and more often than they were deficient in protein, but aftermaths supplied enough TDN.

D. Duncan.

4291

KLOSTERMAN, E. W. and KUNKLE, L. E. **Acres yields of beef from corn and meadow crops.** *Ohio Agric. Exp. Stat. Res. Bull.* No. 753, January 1955, pp. 18. [Wooster, Ohio.]

The results of 4 years' feeding trials are reported. The relative values of maize silage (the whole plant, including the ear) with a protein supplement, with maize meal supplement, or alone, maize meal alone, hay crop silage alone or with maize meal supplement, and pasture were estimated. Pounds of beef produced per acre were determined from the area required to produce all the feeds given to the cattle. The average lb. beef produced per acre were: maize silage with soya bean oil meal 573; maize silage with soya bean oil meal and $\frac{1}{2}$ feed of maize meal (maize grain and cob) 508; maize meal and soya bean oil meal 438; hay crop silage and $\frac{1}{2}$ feed maize meal 430; pasture 368. When the market value of the cattle, based on grade, price per cwt. and dressing percentage, was considered the best overall returns were from cattle fattened on maize silage, $\frac{1}{2}$ feed of maize meal and protein supplement. Protein supplement was not required with hay silage.

Before a complete evaluation can be made a study of labour and equipment costs will be necessary, and the importance of grassland for the crop rotation and conservation of the soil must be considered.—T. D. Bell.

4292

NELSON, A. B., POPE, L. S., MACVICAR, R., DARLOW, A. E. and STEPHENS, D. F. Self-feeding salt and cottonseed meal to beef cattle. A summary of experiments on self-feeding winter supplements. *Oklahoma Agric. Exp. Stat. Bull.* No. B-440, November 1954, pp. 14. [Div. Agric., Oklahoma Agric. and Mech. Coll., Stillwater.]

Feeding trials were made with beef steers and pregnant beef cows over 3 years. The costs of cottonseed meal hand-fed and of a mixture of cottonseed meal and 25 per cent. salt self-fed to limit consumption were compared. In the self-feeding groups slightly more meal was eaten, and the cost of feed was slightly higher, but no account was taken of the cost of labour used in hand feeding on the one hand or of mixing and equipment on the other. No effect on weight changes or calving was found. Blood and milk of the self-fed cows were normal. It was concluded that as long as there is sufficient water and winter pasture, no danger arises from self-feeding a mixture of salt and cottonseed.—T. D. Bell.

4293

PAWSON, H. C. and INNES, P. Wintering store cattle. Cocker Park trial, 1953-54. *Agric., J. Minist. Agric. Engl.*, 1955, 61, 599-604. [King's Coll., Newcastle upon Tyne.]

Bullocks wintered indoors on hay, roots, oats and beans made greater gains than those wintered outdoors on hay, oats and beans, and also graded better at the end of the year. Heifers wintered did not gain as much as similarly managed bullocks.

In a trial comparing alfalfa and grass silages, the former produced inferior weight gains, probably because of lower intake owing to poor quality. Alfalfa and seeds hay were equal in feeding value for fattening bullocks, as was expected from the chemical analysis.—T. D. Bell.

4294

SHEPHERD, W. O. and DILLARD, E. U. Best grazing rates for beef production on cane range. *N. Carolina Agric. Exp. Stat. Bull.* No. 384, October 1953, pp. 23. [Raleigh, N.C.]

Beef cows and their calves were used to determine the best grazing rate for cane (*Arundinaria* sp.) range. The method was to let groups of animals graze equal areas for 7 months at different rates of stocking. The trials were made in 3 consecutive years. It was shown that the best results were obtained by using not more than 50 to 60 per cent. of the available forage in one grazing period. This allowed the greatest overall weight increases, and the stands of cane were maintained in vigorous condition.—T. D. Bell.

4295

VEZZANTI, V. and RAIMONDI, R. L'influenza della castrazione sullo sviluppo somatico e sui caratteri delle carni di vitelli piemontesi all'ingrasso. [The influence of castration on somatic growth and on the character of the meat of fattening Piedmontese calves.] *Riv. Zootec.*, 1954, 27, 341-347. [Ist. Zootec. Piemonte, Turin.]

Twelve bull calves of the Piedmontese breed, similar in age, weight and type, were reared under identical conditions, but 6 were castrated at 3 months of age and 6 were left entire. They were killed at 8 to 9 months of age.

The mean initial weights were identical, 72.3 kg. The mean final weight of steers was 316, that of bulls 340 kg. The mean daily increments were 975 and 1072 g. As both groups received the same amount of feed the coefficient of utilisation was better and the cost per kg. liveweight gain was less in the bulls than in the steers; the feed consumed per kg. liveweight gain was 9.86 per cent. less.

The differences in body measurements between the 2 groups are tabulated. Inspection favoured the steers, which received a commercial valuation on the hoof of L. 380 per kg., compared with L. 365 for the bulls. The killing-out percentages were 61.53 for steers, 61.02 for bulls, giving carcass weights of 198 and 214.5 kg. There was no difference in chemical analysis of meat samples. Beef from the steers was more acceptable in texture and flavour when cooked.

It is concluded that the use of entire bulls for production of baby beef in Piedmont could produce an appreciable increase in the annual output.—D. Duncan.

4296

BOHMAN, V. R. Compensatory growth of beef cattle: the effect of hay maturity. *J. Animal Sci.*, 1955, 14, 249-255. [Dept. Animal Husb., Univ. Nevada, Reno.]

Early- and late-cut hay as the only winter ration were compared for fattening beef cattle. When early-cut hay was given the cattle gained faster during the winter, but during the following summer, on pasture, those getting late-cut hay in the winter, with lower protein and less phosphorus, gained faster. At the end of the summer the difference between the groups was small but in favour of the animals fed on early-cut hay. When the experiment was continued through another year the animals getting the poorer hay in both winters had caught up with the others by the end of the second summer. There was no permanent stunting caused by the poor feeding in the first winter.—T. D. Bell.

4297

FERRARI, E. L'ingrassamento del bovino nelle stalle delle provincie lombarde. [Fattening of cattle indoors in the provinces of Lombardy.] *Riv. Zootec.*, 1954, 27, 356-357.

Methods of fattening dairy cows at the end of their productive life, and calves, are discussed.

D. Duncan.

4298

SEIDLER, S. Opas bydla młodocianego wybrakowanego na wywarze kiszonym ziemniaczanym i ziemniaczano-cykoriowym. [The use of distillery potato slop silage and chicory-potato slop silage for fattening young cattle.] *Rocz. Nauk rol.* [B], 1954, 68, 235-252. Russian and English summaries.

The trial was made on 24 Friesian bullocks aged 1 to 2½ years in 4 groups: (1) chicory and potato slop silage with concentrates throughout the period; (2) potato slop silage with concentrates throughout; (3) potato slop silage and concentrates after 43 days; (4) potato slop silage and concentrates after 71 days. Hay, straw and dehydrated sugar beet pulp were given to all groups.

All groups showed good weight gains, and feed utilisation was also good. There was little difference between groups in carcass quality at slaughter. By introducing the concentrates only after 71 days 124 kg. concentrates were saved, replaced by 473 kg. slop silage and 93 kg. sugar beet pulp. (From summary.)—J. S. Thomson.

4299

MARTIN, C. M., BRANNON, W. F. and REID, J. T. Relationship of size of growing cattle to pasture intake and its use as an index of palatability. *J. Dairy Sci.*, 1955, 38, 181-185. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

Investigations with growing dairy and beef steers showed a significant correlation between the amount of dry matter eaten when grazing and the bodyweight of the animal. By using this correlation for adjustment of dry matter intake it would be possible to estimate the palatability of the pasture. Further studies with heavier, and mature, animals to examine this suggestion are contemplated.—T. D. Bell.

4300

McDOWELL, R. E., LEE, D. H. K., McMULLAN, H. W., FOERMAN, M. H. and SWETT, W. W. Body weights, body measurements, and surface area of Jersey and Sindhi-Jersey (F₁) crossbred females. *J. Dairy Sci.*, 1954, 37, 1420-1428. [Dairy Husb. Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Beltsville, Md.]

Bodyweight at all ages from birth, and during the first 3 lactations, body measurements at 6, 12

and 18 months of age and during the first lactation, and surface areas of mature animals were compared in pure Jersey cows and their Sindhi × Jersey daughters.

Bodyweights at all ages were greater in the crossbreds, and the difference was more pronounced from birth to 15 months. At the earlier ages the crossbreds were taller with greater body width and depth, but shorter bodies. The differences lessened with increasing age, and in some cases were reversed at 18 months.

There was no difference between breeds in the ratio of surface area to bodyweight or to the two-thirds power of bodyweight.—T. D. Bell.

4301

CAREROLL, F. D., ROLLINS, W. C. and ITTNER, N. R. Brahman-Hereford crossbreds and Herefords—gains, carcass yields and carcass differences. *J. Animal Sci.*, 1955, 14, 218-223. [Univ. California, Davis.]

When fattened in feedlot from autumn to spring, Herefords made significantly greater gains and were more efficient than Brahman × Hereford crosses. The dressing percentage of the crossbred was higher. There was little difference in the value of the cuts from the carcasses of the breeds; the crossbred had more bone but less fat. When percentage bone was estimated by complete de-boning and by consideration of the eleventh and twelfth ribs, there was a significant difference between the methods, but this was the same for the pure-bred and the crossbreds, and the latter method was sufficient for breed comparisons. Herefords graded higher than Brahman × Herefords, because they carried more fat and were better finished. There was a similar difference between heifers and steers. The heifers gained more slowly than steers but were mature at an earlier age, and carried more finish when fattened for the same time. Their carcasses had less forequarter and more flank and loin.—T. D. Bell.

4302

KIDWELL, J. F. A study of the relation between body conformation and carcass quality in fat calves. *J. Animal Sci.*, 1955, 14, 233-242. [Dept. Animal Husb., Univ. Nevada, Reno.]

The relation between body measurements and slaughter grade, carcass grade and dressing percentage was ascertained from data from 64 Hereford steer calves varying in age from 10 to 18 months. Heart girth was highly correlated with bodyweight; it was also closely associated with all other measurements except round (distance from patella to patella parallel to the ground), and with carcass grade. It was concluded that heart girth provides a more suitable measure of total size than weight for studies of growth. The most

important measures influencing carcase quality were chest width and the ratios height at withers : heart girth and length : heart girth.—J. N. Aitken.

4303

WOODWARD, R. R., QUESENBERRY, J. R., CLARK, R. T., SHELBY, C. E. and HANKINS, O. G. Relationships between preslaughter and post-slaughter evaluations of beef cattle. *U.S. Dept. Agric. Circular No. 945*, May 1954, pp. 24. [Animal and Poultry Husb. Res. Branch, Agric. Res. Serv.]

Records of the growth and carcasses, including grading at slaughter, and efficiency of feed conversion, of 635 Hereford steers were collected from 1942 to 1951, and the relations between them were computed and all are presented in tables. All the steers were uniformly treated, and slaughtered after 252 days.

Birthweight was correlated with growth rate and carcase grade, more closely with the former. Weaning weight was not so closely related to growth rate, and was negatively correlated with efficiency of feed conversion. Efficiency of feed conversion was negatively correlated with dressing percentage but not correlated with any other carcase measurements. Long-bodied steers produced as desirable carcasses as the compact type. Grading before slaughter did not give a good estimate of dressing percentage.—T. D. Bell.

4304

CLEGG, M. T., ALBAUGH, R., STRONG, H. and COLE, H. H. The use of stilbestrol in fattening cattle. *California Agric. Exp. Stat. Circular No. 441*, October, 1954, pp. 16. [Div. Agric. Sci., Univ. California.]

A number of trials involving 599 cattle in all were made. The results showed that faster gains were made by cattle treated with stilboestrol, and carcase grades were almost as good as in untreated cattle. The treated animals ate more, but the efficiency of feed conversion was much greater, with higher financial returns. Heifers did not show sufficient improvement to make the treatment worth while. The stilboestrol was implanted subcutaneously in 5-mg. tablets, 60 mg. in one dose giving maximum effect. Implantation was in the neck in some trials, but later in the ear to ensure that there was no contamination of the edible portions, and this site proved just as efficient. Other effects of stilboestrol on the cattle, such as mammary development, which had subsided by slaughter time, and the raising of the tail, are discussed.—T. D. Bell.

4305

COOPER, M. M. Beef production. *Proc. Nutrition Soc.*, 1955, 14, 1-7. [Wye Coll., Univ. London.]

4306

JOUBERT, D. M. On the post-natal growth and development of muscle in relation to quality in meat. *Proc. Brit. Soc. Animal Prod.*, 1954, 49-58. [Sch. Agric., Cambridge.]

4307

CORBETT, J. L. Winter grazing of cattle in the North-East of Scotland. *Proc. Brit. Soc. Animal Prod.*, 1954, 17-25. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

See also Absts. 3593, 4354.

MILK PRODUCTION

4308

BRÜGGEMANN, J. and DREPPER, K. Stoffwechseluntersuchungen an jungen Rinden. 1. Über den Stoffwechsel von Rohwasser, Trockensubstanz, Rohasche, organischer Substanz, Rohprotein, Rohfett, Rohfaser und der stickstofffreien Extraktstoffe. [Metabolism studies on young cattle. 1. Metabolism of moisture, dry matter, ash, organic matter, crude protein, crude fat, crude fibre and N-free extract.] *Arch. Tierernährung*, 1954, No. 5, Beihefte, 210-215. [Inst. Physiol., Univ. Munich.]

The investigation was undertaken to show whether there was a seasonal difference in metabolism in young cattle which might explain the occurrence of Lecksucht in winter in the district (Upper Bavaria), especially in moor areas. The farm on which the study was made lies partly on high moor, partly on moraine. Four young cattle were used, healthy except for a tendency to lick objects within reach more than normal young animals do. Two were thin. They were given weighed winter rations in cement stalls for 10 days during which faeces and urine were collected, and, after 26 days on grass, cut grass only for 10 days in stall. Data for intake and excretion of water, dry matter, ash, organic matter and the usual proximate constituents, and also for Ca, P, Mg, K, Na, Cl, S, Fe, Cu, Mn, Co, I and carotene are given.

Except for N there was little difference between metabolic behaviour on the winter rations of 16 kg. grass silage and 4 kg. hay and on the summer diet of grass to appetite. These provided, respectively, 2700 starch units (g. starch equivalent) with 470 g. digestible protein, and 5500 starch units with 690 g. digestible protein, but the N balance was negative on fresh grass. The balances of minerals and trace elements will be discussed in a later paper.

I. Leitch.

4309

BRÜGGEMANN, J., DREPPER, K. and DREPPER, G. Stoffwechseluntersuchungen an jungen Rinden. 2. Über den Stoffwechsel von Calcium, Phosphor, Magnesium, Kalium,

N.A. and R., July 1955

Natrium, Chlor und Schwefel bei gleichzeitiger Durchführung eines Gesamt-Nährstoffbilanzversuches. [Metabolism experiments on young cattle. 2. Metabolism of calcium, phosphorus, magnesium, potassium, sodium, chlorine and sulphur with simultaneous estimation of the balance of total nutrients.]

BRÜGGEMANN, J., DREPPER, K. and TIEWS, J. 3. Über den Stoffwechsel von Eisen, Kupfer, Mangan, Kobalt, Jod und Carotin bei gleichzeitiger Durchführung eines Gesamtnährstoffbilanzversuches. [3. Metabolism of iron, copper, manganese, cobalt, iodine and carotene with simultaneous estimation of the balance of total nutrients.] *Arch. Tierernährung*, 1954, 4, 219-230; 231-240. [Inst. Physiol. Tiere, Univ. Munich.]

2. The mineral balances discussed were obtained in the experiment described in the preceding Abst.

In the winter experiment the mean daily intakes and amounts retained, in g., were Ca 75.5 and 37.7, P 14.7 and 7.74, Mg 7.9 and 4.2, K 103 and 9.6, Na 3.8 and 2.4, Cl 34.0 and 10.0. In summer the corresponding amounts were Ca 63.0 and 23.2, P 25.0 and 16.0, Mg 7.3 and 1.15, K 112 and 7.2, Na 3.9 and 2.4, Cl 65.0 and 20.2. The apparently excessive retention of Ca and the wide Ca : P ratio, especially in winter, are discussed and it is stated that the optimum ratio is between 2 : 1 and 1 : 1. The licking disease might be related to the wide Ca : P ratio or equally to the wide K : Na ratio.

The balances of Cl and S showed no peculiarity. The blood contents of the minerals studied were estimated at intervals, and were always within normal limits.

3. The intakes of Fe, 860 mg. per head daily in the winter experiment and 770 mg. in the summer balance, were considered low. The Cu intakes, 18.5 and 18.6 mg., seemed low, but there was only one negative balance. There was excessive intake of Mn in winter, 2.2 g. daily, because a Mn fertiliser had been used in the preceding year, and 4 mg. daily was retained. The Co intakes were 170 and 196 µg. daily and might be insufficient.

Supplies of I and carotene were ample. Co and Cu were not estimated in the blood.

It is concluded that the licking disease in this region is probably caused by insufficient supply of several elements.—D. Duncan.

4310

RICHTER, K. and BECKER, M. Beiträge zum Ernährungshaushalt von Milchkühen hoher Leistung. Stoffwechselversuche an Milchkühen. [Feed economy of high-yielding milk cows. Metabolism experiments with milk cows.]

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OSLAGE, W. and BECKER, M. 3. Über den Mineralstoffhaushalt und Mineralstoffbedarf von Milchkühen hoher Leistung unter den Futterverhältnissen des Rübenbaus nach Versuchen mit wechselnden Zulagen von Calcium und Phosphor. [3. Mineral metabolism and mineral requirements of high-yielding milk cows in fodder beet areas, from experiments with different supplements of calcium and phosphorus.]

BECKER, M., OSLAGE, W. and KARSTEN, G. 4. Menge, Verdaulichkeit und Bedeutung des Fettes und der essentiellen Fettsäuren im Futter bei Versuchen an Milchkühen hoher Leistung. [4. Quantity, digestibility and importance of fat and essential fatty acids in feed, from experiments with high-yielding milk cows.] *Arch. Tierernährung*, 1955, 4, 265-281; 282-292. [Inst. Tierernährung, Forschungsanst. Landwirtschaft., Brunswick, Völknerode.]

For earlier parts see Absts. 1619, Vol. 22; 3649, Vol. 23.

3. Ca and P balances were studied for eight 10-day periods in 3 cows at different stages of lactation and for 3 periods in dry pregnant cows. All were fed on ensiled beet tops, a little alfalfa hay, relatively large amounts of dried beet pulp, and concentrates consisting of wheat bran, soya bean meal and groundnut meal, according to milk yield. Even without added minerals the rations were rich in Ca and P. It was considered that the Ca requirement was high because all 3 bulky foods contained much oxalic acid. The negative Ca balances in cows receiving from 175 to 217 g. Ca daily and giving from 16.6 to 27.9 kg. milk were ascribed to interference of oxalic acid and other substances with Ca absorption. Retention of Ca occurred in one cow in 2 periods, after 121 and 169 days of lactation and with a yield of 24 kg. daily, when she received 256 and 261 g. Ca daily. The dry cows all retained Ca, from intakes of 94 to 113 g. P balances were all positive from intakes of 45.5 to 88.8 g. daily, but one cow had a negative balance in the second half of lactation from an intake of 43.5 g.

Supplements of calcium carbonate and phosphate are recommended for dairy cows.

4. In 4 similar experiments with cows on the rations described in the preceding Abst. fat balances were studied. Much of the faecal lipid was of endogenous origin, and it was considered that balances of essential fatty acids were of more value than conventional fat balances.

The bulk fodders, especially the silage, contributed at least as much as the concentrates to the supply of essential fatty acids. Bran at the rate of 2 kg. daily contributed some 40 per cent. of the

essential fatty acids for milk fat; extracted oil-meal with 1 or 2 per cent. fat contributed only 5 to 8 per cent.

The relation of the food fatty acids, especially linoleic acid, to milk fat production is discussed.

D. Duncan.

4311

BECKER, R. B., ARNOLD, P. T. D., KIRK, W. G., DAVIS, G. K. and KIDDER, R. W. **Minerals for dairy and beef cattle. 1. Minerals for dairy cattle. 2. Mineral consumption by cattle on Florida ranges. 3. Relation of copper and molybdenum to cattle nutrition. 4. Recommended mineral mixtures.** *Univ. Florida Agric. Exp. Stat. Bull.* No. 513, February 1953, pp. 51. [Gainesville, Fla.]

There is a brief general discussion of the mineral requirements of livestock and their sources. Trials are reported showing the average monthly intakes of salt, bonemeal, phosphates and an iron, copper and cobalt mixture placed in boxes to which dairy cattle had free access. The effect of Ca and P deficiency on bone strength and milk production was demonstrated, and the choice of the different mineral supplements of cattle under different grazing and feeding conditions was investigated. It is recommended that minerals should be mixed with the feed, and that access to boxes containing salt, bonemeal or a salt and phosphate mixture, and an iron, copper and cobalt mixture be allowed. Where there is a likelihood or signs of Ca deficiency marble dust is a palatable, safe and cheap supplement.

Beef cattle on range, even when receiving supplementary feeds, ate mineral supplements from boxes, and chemical analyses of forage showed that some were deficient in P.

Copper and molybdenum in the nutrition of cattle are discussed, and signs of copper deficiency are described and illustrated. Suitable mineral mixtures for general use, and their preparation, are described.—T. D. Bell.

4312

VENKATAPPAIAH, D. and BASU, K. P. **Non-protein nitrogenous constituents of milk. 2. Effect of feeding high and low protein rations to cows and of putting the cows to work.** *Indian J. Dairy Sci.*, 1954, 7, 213-218. [Indian Dairy Res. Inst., Bangalore.]

Normal, high- and low-protein concentrate mixtures were given in that order in 3 successive 14-day periods to 6 Sindhi cows, at the rate of 1 lb. per 2.5 lb. milk produced. A basal ration of guinea grass 40, ragi straw 5, groundnut cake 1 and gram husk 2 lb. was given throughout. The nutritive ratios of the 3 rations were, respectively, 1:6.7; 1:4.7 and 1:7.8. Total N, protein N and

N.P.N. were estimated on milk samples at intervals of 5 days.

N.P.N. as a percentage of total N in the milk of cows on the normal-, high- and low-protein mixtures was 5.14, 7.06 and 4.70. Total N.P.N., urea N and amino-acid N increased when the change was made from normal to high protein and decreased on the low-protein ration.

To study the effect of work on total N and N.P.N. of milk 2 groups of 7 Sindhi cows were used. One group was put to work for 4½ hr. daily. Each cow received a basal ration of ragi straw 6, hariali hay 2 and grass 28 lb. and a concentrate mixture at the rate of 1 lb. per 2.5 lb. milk produced. Working cows were given an extra 2 lb. of the concentrate mixture to meet their extra energy requirement. The difference between the total N and N.P.N. constituents of the milk of the 2 groups was not significant.—J. N. Aitken.

4313

WITT, M. **Einfluss einer stark überhöhten Eiweissgabe auf die Milchmenge und den Fettgehalt der Milch bei Kühen. [Effect of excess protein on milk yield and fat content of milk in cows.]** *Arch. Tierernährung*, 1954, No. 5, Beihefte, 166-181. [Max Planck Inst. Tierzucht, Mariensee, Trenthorst.]

The transition from stall to pasture is usually followed by a fall in the fat yield of cows; the changes are many and their effects have not been separately analysed. Here, the effect of a sudden increase of protein in the ration was tested. There were 34 cows in all, with an average daily yield of about 20 kg. milk with 3.9 per cent. fat. They were in 3 sets of paired groups of which 1 group had the high-protein ration between 2 periods on the normal ration and the other group had 2 high-protein periods with a normal between. The normal ration was of hay, beet leaf silage, fodder beet, dried beet slices and Troblako, with a concentrate mixture of barley meal, oatmeal, wheat bran, soya bean meal and groundnut meal. This was abruptly changed to one of soya and groundnut only. The components were analysed and their feeding values were computed with conventional coefficients of digestibility. [There is no statement about the fat content of the oilmeals used.]

On the average, milk yield rose by 2.5 per cent. and fat fell by 0.128 per cent., both statistically significant results. [We are unable to reconcile these general conclusions with the detailed group data presented.]—I. Leitch.

4314

FRENS, A. M. **Die Fettversorgung der Milchkühe. [The supply of fat for dairy cows.]** *Futtermittel und Fütterung*, 1953, No. 35, pp. 3.

N.A. and R., July 1955

Studies were made on groups of from 6 to 13 dairy cows. The control groups received low-fat rations for 126 days; the experimental groups received the same rations for at least 35 days and then the experimental rations for 56 days.

The low-fat rations contained extracted oilcakes; in the experimental rations unextracted linseed, groundnut and coconut meals were combined.

In the first experiment the cows received about 19 kg. good silage and 6.6 kg. grass hay which provided about 360 g. crude fat daily; 5 kg. concentrates provided another 420 g. crude fat for the low-fat and 523 g. for the high-fat group. The only difference found between the groups was a slightly higher fat content of the milk of the high-fat group.

In the second experiment the basal ration of hay, fodder beet and rye straw provided only 121 g. crude fat daily, and the low- and high-fat concentrates brought the total fat intakes to 144 and 288 g. The low-fat group ate more than the high-fat group and gained slightly in weight. The experiment was repeated with fat intakes of 218 and 356 g. The high-fat group produced more milk than the low-fat group, with a mean difference of 1.05 ± 0.19 kg. per cow daily. It is concluded that when the bulk ration is relatively rich in fat the fat content of the concentrates is without effect on production, but that with low-fat bulky feeds a total of about 4 per cent. fat in the concentrates is needed for maximum milk production. A combination of hay and silage can provide sufficient fatty acids to eliminate the need for high-fat concentrates. The 3 oilcakes used in the experiment may increase butterfat production even when milk output is maximum.—D. Duncan.

4315

BALCH, C. C., BALCH, D. A., BARTLETT, S., HOSKING, Z. D., JOHNSON, V. W., ROWLAND, S. J. and TURNER, J. *Studies of the secretion of milk of low fat content by cows on diets low in hay and high in concentrates. 5. The importance of the type of starch in the concentrates. J. Dairy Res.*, 1955, 22, 10-15. [Nat. Inst. Res. Dairying, Univ. Reading.]

For part 4 see Abst. 2900, Vol. 25.

Fifteen cows were used in an experiment lasting 13 weeks. In the preliminary and final control periods, of 3 and 4 weeks' duration, all cows received 16 lb. hay daily and a mixture of concentrates at about 4 lb. per 10 lb. milk. The mixture, in parts by weight, was of decorticated groundnut cake 3, weatings 7 and flaked maize 10. In the intervening experimental period of 6 weeks the ration of hay was reduced to 4 lb. daily and that of concentrates increased for all. Five cows got the original mixture but for the 10 others changes were made and, for 5 and 5, respectively,

maizemeal and ground dredge corn (oats and barley) completely replaced the flaked maize.

In the experimental period yields of milk and of fat were less for the group on flaked maize than for the others. In the last 2 weeks of the period adjusted mean fat percentage for the flaked maize group was 0.51 and 0.71 below the means for the maizemeal and dredge corn groups, respectively. There was no effect on the solids-not-fat in percentage or total yield.

It is concluded that, associated with the changes produced during the processing of flaked maize by rupture of the grains and partial dextrinisation of the starch, there may have been an effect on the bacterial metabolism in the reticulo-rumen which would account for the findings.—D. Harvey.

4316

SCHOORL, P. *The relation between the crude fibre content of food and the milk production. Netherlands J. Agric. Sci.*, 1955, 3, 35-39. [Vet. Fac. Dept. Nutrit. Sci., Univ. Indonesia, Bogor.]

A survey of 27 farms in Indonesia, with, in all, 840 cows showed that the average weight was 450 kg., the daily feed consumption 1.2 kg. digestible true protein, 9.2 kg. starch equivalent and 4.1 kg. crude fibre and the daily milk production 5.6 litres. The intake is about twice the amount needed and is discussed in relation to the high respiration rate reported in imported as well as in some native-born Friesian cows. The high intake of crude fibre, much of it in a highly indigestible form, is thought to be the direct cause of the low milk yield and, in a preliminary trial with 1 cow given reedy grass (*Pennisetum maximum*) in her first and young meadow grass in her second lactation, the yields were 1003 litres in 110 days and 1870 litres in 102 days, respectively. Climatic conditions favour the growing of meadow grass; with suitable manurial treatment, the author has obtained a yield in a year of 120,000 kg. per hectare [47.8 tons per acre].—D. Harvey.

4317

BAILEY, G. L., CLOUGH, P. A. and DODD, F. H. *The rate of secretion of milk and fat. J. Dairy Res.*, 1955, 22, 22-36. [Nat. Inst. Res. Dairying, Univ. Reading.]

The effects of residual milk on the yield and composition of the milk obtained at subsequent milkings and the rate of milk and fat secretion after residual milk effects had been eliminated were investigated with 5 cows. Rates of secretion were measured at milking intervals of 3, 6, 9, 12, 15 and 18 hr. Statistical analysis of the results showed that the yield of milk increased with the length and decreased with the square of the length of the milking interval and of the previous milking

interval. Butterfat yield increased with the length of the milking interval and the length of the preceding milking intervals and decreased with the square of the length of the milking interval. The effect of the preceding interval on milk and fat yields was directly due to residual milk effects and to changes in the metabolic rate of the udder. As the length of the milking interval increased the rates of milk and fat secretion decreased.

J. N. Aitken.

4318

DIJKSTRA, N. D. Vergelijkende voederproeven met kunstmatig gedroogd voorjaars en herfst-gras bij melkvee. [Comparative feeding trials on dairy cows with artificially dried spring and autumn grass.] *Versl. Landbouwk. Onderzoek.*, 1954, No. 60.1, pp. 42. English summary.

Analyses of and digestibility trials with spring and autumn grass from the same fields show little difference in value but the impression persists among farmers that spring grass is better. Two trials were made with dried grass, the first lot from an aerodrome and not of ideal quality, the second from one of the best research pastures. Full details are presented of composition and digestibility, by wethers, of the grass and of the progress of the trials.

There was no significant difference in either trial in yield or fat content of milk or in condition of the cows. In both, iodine number of butterfat was slightly higher with autumn grass, and in both autumn grass gave slightly more carotene, 10.3 and 9.2 I.U. as against 9.3 and 7.2, and more vitamin A, 16.3 and 13.9 I.U. as against 15.5 and 13.4 I.U. per g. butterfat.—I. Leitch.

4319

ELLENBERGER, H. B., NEWLANDER, J. A. and JONES, C. H. Effects of feeding different grades of hay and cod-liver oil concentrate to dairy cattle. 3. From 361 to 720 days of age. *Vermont Agric. Exp. Stat. Bull.* No. 576, May 1954, pp. 44. [Burlington, Vt.]

The trials already described in parts 1 and 2 (Absts. 326, Vol. 22; 1725, Vol. 24) were continued over the fifth to eighth 90-day-periods of the cow's life. The animals were those left from the preceding trials, in all 43 cattle representing 4 generations. There were 4 groups getting good or poor quality hay each without or with cod liver oil, 10 ml. daily mixed with the feed. All groups received the same meal ration, about 1.6 lb. per head daily, and succulents and silage, about 20 lb. daily in season. Feed intake and weight changes were noted and blood was analysed for Ca and inorganic P.

In all the periods, taken separately or together, there was very little difference between the

groups getting poor and good quality hay, and the only advantage of cod liver oil was a slight improvement in the groups getting poor quality hay. All animals got as much nutrient intake as is recommended by the lower limits of the Morrison and Eckles standards, and Ca and P intakes were well above National Research Council recommendations. The weight increases in all groups were average.—T. D. Bell.

4320

BATTAGLINI, A. Ricerche comparative sul valore nutritivo della crusca di frumento, sgrassata con solventi chimici, e della crusca integrale, impiegate nell'alimentazione delle vacche da latte. [Comparison of the nutritive value of wheat bran defatted with chemical solvents and of whole bran in the feeding of dairy cows.] *Ann. Sper. agrar.*, 1954, 8, 1141-1149. [Ist. Sper. Zootec., Rome.] English summary.

In a trial lasting 139 days, with 2 groups of dairy cows, chemically extracted and whole wheat bran as 60 per cent. of the concentrate ration were compared. There was no difference between the groups in milk yield, butterfat percentage, body-weight changes, regularity of the sexual cycle or fertility.—T. D. Bell.

4321

HUFFMAN, C. F. and DUNCAN, C. W. Corn silage as a source of the unidentified grain factor(s) needed for milk production. *Quart. Bull. Michigan Agric. Exp. Stat.*, 1954, 37, 23-26. [Dept. Dairy Chem.]

The effect on milk production of replacing part of the hay in an all-hay ration by maize silage, on an equal total digestible nutrient (T.D.N.) basis, was determined in 7 trials with 8 Holstein cows. The all-hay ration was given in the preliminary period preceding each trial in order to deplete the cows of the unidentified factor(s) in grain needed to balance the T.D.N. in roughage (Abst. 3036, Vol. 22).

Replacement of part of the hay resulted in a significant increase in the production of fat-corrected milk. The increase in milk production coincided with a fall in T.D.N. intake. The cows lost weight in the initial stages of silage feeding. It is concluded that an allowance should be made for the amount of grain in the maize silage when feeding cows for efficient milk production.

J. N. Aitken.

4322

DUNN, K. M., ELY, R. E., HUFFMAN, C. F. and DUNCAN, C. W. The value of snapped corn-ear silage and grainless corn silage (ears removed) for milk production. *Quart. Bull.*

N.A. and R., July 1955

Michigan Agric. Exp. Stat., 1954, **37**, 223-229.
[Dept. Dairy Chem.]

Silage was made from chopped maize ears and from the chopped stalks after the ears had been removed. Tables of the composition and digestibility of these silages and of clover hay, maize-meal and corn-and-cob meal are presented.

When maize ear silage was given to dairy cows to replace half the hay ration on an equivalent total digestible nutrient (T.D.N.) basis, the production of fat-corrected milk increased from 16.0 to 20.8 lb. daily. Corn-and-cob meal was then introduced on the same basis in place of the silage, and the higher level of production was maintained.

When 55 lb. grainless maize silage replaced 17.6 lb. clover hay there was a slight increase in T.D.N. intake, which was the probable cause of the slight increase in milk yield. The grainless silage was then replaced by 10.8 lb. maize-meal, and milk production increased from 14.6 to 16.9 daily.

The results seemed to confirm previous suggestions that there is an unidentified factor in maize grain necessary to balance a hay ration for milk production (Abst. 3036, Vol. 22).—T. D. Bell.

4323

DUNN, K. M., ELY, R. E., HUFFMAN, C. F. and DUNCAN, C. W. **The value of corn silage and recombined corn silage in respect to milk production.** *J. Dairy Sci.*, 1955, **38**, 58-64.
[Dept. Dairy Chem., Michigan State Coll., East Lansing.]

Maize silage and recombined maize silage were compared in 14 trials with 11 Holstein and 2 Brown Swiss cows. The recombined silage consisted of silage from maize from which the grain had been removed and made into corn-and-cob meal. This meal was then used to supplement the grainless silage in amounts equivalent to ordinary maize silage. It was concluded that the maize grain in maize silage was of the same value for milk production as maize grain given in the form of dry corn-and-cob meal.—J. N. Aitken.

4324

FRENS, A. M. **The effect of silage-feeding on the quality of the milk.** *European Grassland Conference, Paris*, June 1954, pp. 7.

Substitution of good quality silage for hay in a hay and concentrate ration increased the vitamin A content and yellow colour of butterfat, and improved the spreading quality of butter through an increase in iodine number. Silage taints in milk are discussed.—J. L. Corbett.

4325

FEATHERSTONE, J., GRIFFITHS, T. W. and SHUTTLEWORTH, F. A. **Silage for beef and milk production.** *Agriculture, J. Minist. Agric. Engl.*,

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1955, **61**, 474-478. [Nat. Agric. Advisory Serv., W. Midland Province.]

The objects of the 2 trials described were to obtain information on the performance of dairy cows and fattening bullocks given heavy rations of silage, to determine the feeding value in terms of starch and protein equivalents from the performance of the animals and to compare these values with those obtained from the chemical analysis of the silage.

In the fattening trial the silage contained 17.5 per cent. dry matter, which contained 16.6 per cent. crude protein. The trial was made over a period of 5 months with four 2-year-old Shorthorn steers. The average consumption of silage over the period was 80 lb. per head daily. During the last 13 weeks of the trial oats were given at the rate of 5 lb. per head daily. The bullocks gained on the average 1.8 lb. per head daily. At slaughter all animals achieved satisfactory grades. The starch equivalent derived from the performance of the animals was 11.1 compared with 9.3 estimated from the analysis of the silage.

In an 8-week trial with 14 Ayrshire cows milk production was sustained on the following ration: 60 lb. silage and 10 lb. oats for maintenance and the first 2 gal.; over 2 gal., 3 lb. dairy cake. During the trial the cows lost on the average 19 lb. weight. The starch equivalent and protein equivalent from analysis were 9.5 and 1.75 and from performance 8.1 and 1.71.

Both trials were costed and steers born, reared and fattened on the farm returned a satisfactory profit when their whole life period was taken into account. In the milking trial it was estimated that the milk was produced at an average cost of only 2.1 shillings per gal.—J. N. Aitken.

4326

RICHARDS, C. R. and COOK, B. M. **Lima bean silage for dairy cattle.** *J. Dairy Sci.*, 1955, **38**, 34-39. [Dept. Animal Poultry Indust., Univ. Delaware, Newark.]

Lima bean and maize silages were compared in the rations of 2 groups of 3 lactating Holstein cows. The experiments were made in 2 successive winters and were of single reversal design. Both silages were given at a rate of 30 lb. daily, with a concentrate mixture according to production and hay to appetite. Analysis of the silages showed that the lima bean silage had less dry matter and more crude protein than the maize silage. Lima bean silage was less palatable. When the bean silage was given more hay was consumed. There was no difference between the groups in the amount of milk produced. The digestibility of the bean silage was estimated in a digestion trial with 2 young Holstein bulls. The apparent digestibilities of the dry matter, crude protein, ether extract

and carbohydrates were, respectively, 53.3, 41.1, 43.2 and 60.2 per cent.—J. N. Aitken.

4327

CORDERO DEL CAMPELO, M. Contribución al estudio de los altramuces (*lupinus*) como alimento del ganado. [*Lupins as feed for cattle.*] *An. Inst. Vet., Madrid*, 1953, 5, 137-147. English and German summaries.

4328

DAMMERS, J. Hebben rauwe en gestoomde aardappelen bij rundvee een specifieke werking op resp. de melkproductie en de vetaanzet? [*Have raw and steamed potatoes specific effects on milk production and fattening in cattle?*] *Versl. Landbouwk. Onderzoek.*, 1954, No. 60-6, pp. 27. English and French summaries.

There is a popular belief that raw potatoes increase milk yield of cows and steamed potatoes lay on fat. The belief was tested in experiments in each of 2 years with 2 groups of sterile cows fattened during their last lactation and with dairy cows in early lactation, a total of 72 cows. The experimental period was of 8 weeks. There was no effect on milk yield or weight gained by the sterile cows but raw potatoes raised and steamed potatoes reduced the fat content of milk by from 0.08 to 0.20 per cent.—I. Leitch.

4329

ASHEFA, M. and MASON, I. L. Environmental and genetical effects on milk yield in Pakistani buffalo. *Empire J. Exp. Agric.*, 1954, 22, 161-175. [Dept. Anat., Punjab Coll. Animal Husb.]

The conditions and management of the government buffalo breeding farm, Bahadurnagar, is described. The records of 754 lactations of 338 buffalo cows on this farm between 1947 and 1951 were examined. The average age at first calving was 3 years 11 months, and calving was most frequent in the hot wet summer. The average interval between consecutive calvings was 487 days, but this had decreased from 614 days in 1947 to 385 days in 1951, owing to improved management. The average yield was 438 gal., less in summer than in winter calvings. The second calving gave a yield 11 per cent. greater than the first, and the third 8 per cent. greater than the second. The length of the dry period was reduced by the later improved management, but this did not affect the milk yield. The heritability of yield was low. Owing to lack of equipment milk fat was not estimated.—T. D. Bell.

4330

ITTNER, N. R., GUILBERT, H. R. and CARROLL, F. D. Adaptation of beef and dairy cattle to

the irrigated desert. *California Agric. Exp. Stat. Bull.* No. 745, September 1954, pp. 36. [Div. Agric. Sci., Univ. California.]

There is an introductory discussion on the reaction of cattle to hot climates, and the climate of the area of California under investigation is described.

For the investigation on dairy cattle, Holsteins, Jerseys and Guernseys were used. The effects of environmental temperature on body temperature, respiration rate, milk yield and general behaviour were recorded. High environmental temperatures increased body temperature and respiration rate, and milk yield declined. The critical temperature was higher in Jerseys and Guernseys, and they were more heat-tolerant than Holsteins. The higher-yielding cows showed greater changes in body temperature and yield than the lower. Dry cows showed least reaction to heat. These reactions are related to the amount of feed eaten. When cows with 80 per cent. black and 80 per cent. white coats were kept in direct sunlight, the respiration of the dark cows was significantly faster than that of the light, and it was concluded that this was due to greater absorption of solar heat.

Feeding trials were made with beef breeds of Brahman, Braford, Hereford and Hereford × Shorthorn steers and heifers. As was expected, the steers in each breed gained faster and more efficiently than the heifers. Herefords gained best in feedlot, but Brafords on pasture. Over the whole feeding period Herefords, though slightly smaller in measurements, gave heavier final liveweights, but the higher dressing percentage of Brafords compensated for this at slaughter, and there was little difference between the breeds in efficiency. The Brahman and Hereford × Shorthorn breeds were not satisfactory. Natural or constructed shade in the area is important.

Trials with alfalfa, fescue, and some tropical grasses showed alfalfa the best, then fescue. The tropical grasses were not suitable.—T. D. Bell.

4331

WEBER, F. Vergleichende klimatologische und physiologische Untersuchungen am Rind in einem Offenstall und in einem Stall konventioneller Bauart. [*Comparative climatological and physiological studies of cattle in an open stall and a stall of conventional structure.*] *Ztschr. Tierzücht. Züchtungsbiol.*, 1954, 64, 1-24. [Inst. Tierzucht, Eidg. Tech. Hochschule, Zürich.]

This experiment was designed for demonstration purposes and the stock in the open stall was a mixed group of 7 cows at different stages of lactation and 2 young animals, with which was matched a group in the closed stall. The stalls were planned to give the maximum "climatic" difference

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possible in one building. Details are presented. Mean temperature in the open stall was on the average 5.4° C. and in the closed stall 12.8° C. above external temperature, with which both varied closely; but the humidity in the open stall was only 60 per cent. of that in the closed.

Milk and fat yields were compared by averaging the yields of comparable weeks in lactation for paired animals and totalling the results. In the open stall there was a total of 4824.6 kg. milk with 194.09 kg. fat, compared with 4898.5 kg. milk and 180.55 kg. fat in the closed stall. There was no significant difference, therefore, in the long-term yield, nor was there any in the day-to-day variation or the reaction to extremes of cold. The young animals showed no difference in weight gain. Pairs were fed on the same standard allowances so adjusted to milk yield that there was little left over and what there was, was weighed and deducted. Feed consumption for one comparable pair in starch equivalent was 6190 kg. in the open and 6139 kg. in the closed stall. There was a small and barely significant difference in the amount of water drunk, 10.9 kg. more for the whole group per week. For a rise of temperature of 1° C. (average for a week) animals in the open stall drank 6.3 litres more, daily, and in the closed stall 11.9 litres per group.—I. Leitch.

4332

LABOUCHE, C. and MAINGUY, P. Aspects physiologiques et nutritionnels de l'alimentation du bétail en Afrique tropicale. [Physiological and nutritional aspects of cattle feeding in tropical Africa.] *Rev. Élevage Méd. vét. Pays trop.*, 1954, 7, 221-307. [Fed. Lab., Élevage Dakar.]
A review.

4333

BURT, A. W. A. Some effects of seasonal changes in dairy herd management upon milk yields. *Proc. Brit. Soc. Animal Prod.*, 1954, 27-28. [Dept. Agric., Univ. Coll. Wales, Aberystwyth.]

4334

STOCKKLAUSNER, FR. Bericht über die Forschungen auf dem Gebiet der Höhengviehzucht von 1945 bis 1954. [Studies of the breeding of Highland (Germany) cattle from 1945 to 1954.] *Züchtungskunde*, 1955, 26, 237-257. [Weihenstephan.]

The mean length of life of this breed is about 9 to 12 years; the mean herd life about 7 years. The main reason for disposal is infertility, estimated at from 25 to 35 per cent. of disposals. The incidence is much higher in some families than in others. Mean age at first calving is about 33

months, the mean interval between calvings 13 months.

The 3 races, Spotted Mountain, Brown Mountain and Hinterwald, have similar milk yields, the first 2 with a maximum in the third lactation and the last in the sixth lactation. The Hinterwald is much more efficient than either of the others, requiring 22 per cent. less starch equivalent per kg. milk. Several studies of the feeding and production of different herds are quoted; some of these include studies of working cows.—I. Leitch.

4335

TAYLOR, J. I., ROLLINSON, D. H. L. and HARKER, K. W. Studies in the habits of Zebu cattle. 2. Individual and group variation within a herd. *J. Agric. Sci.*, 1955, 45, 257-263. [Animal Health Res. Centre, Entebbe, Uganda.]

For part 1 see Abst. 5400, Vol. 24.

2. Observations were made of a herd of 10 cows during a total of 336 hr. in 2- and 3-day periods from September to February. The animals were moved to 3 different pastures. The times spent grazing and ruminating by each individual were noted. There was less than 10 per cent. difference between the longest and shortest times recorded for either grazing or ruminating on different days or paddocks. Between individuals most did not differ more than 5 per cent. in times spent on any one day, and the individual patterns were the same. It was concluded that in herd studies of behaviour at least 4 cows should be used for accuracy, and the accuracy will increase in proportion to the number of animals over that number.
T. D. Bell.

4336

RAGAB, M. T., ASKER, A. A. and HILMY, S. A. Milk yield in the Egyptian cow as affected by age, dry period and month of calving. *Indian J. Dairy Sci.*, 1954, 7, 171-177. [Dept. Animal Breeding, Fac. Agric., Univ. Cairo.]

The data comprised 520 lactations of 177 Egyptian cows collected over a period of 20 years. Only complete records of animals free from disease were used. The data were statistically analysed.

The average age at first calving was 34.3 months, range 20 to 44 months. There was no significant effect of age at first calving on milk yield. Maximum total milk yields were attained at the fifth and sixth lactations. No statistically significant effect of month of calving on milk yield was found. Animals which calved in November, however, generally showed the highest yields. The length of dry period declined with advancing age; its average length was 193 days. A negative and highly significant regression of length of preceding dry period on milk yield was obtained.

J. N. Aitken.

4337

DAVEY, G. P. and ALEXANDER, G. I. **The accuracy of estimation of a dairy cow's production of milk and butterfat.** *Queensland J. Agric. Sci.*, 1954, **11**, 75-77. [Cattle Husb. Branch, Queensland Dept. Agric., Brisbane.]

Milk yield was estimated on the basis of weekly, fortnightly and monthly records of 89 Jersey cows, and the results were compared with the actual yield. Butterfat production and percentage of 53 cows estimated on weekly and monthly tests were compared with the actual values. The degree of accuracy was greatest in the most frequent sampling. For practical use, when only a few animals are involved, weekly samples would be necessary, but monthly tests might be sufficient when large numbers of animals are used.—T. D. Bell.

4338

USUELLI, F. **Alimentazione e sviluppo della mammella.** [Nutrition and udder development.] *Riv. Zootec.*, 1955, **28**, 8-12.

A review.

4339

RIGOR, T. V. **Notes on the Murrah buffalo.** *Philippine J. Animal Indust.*, 1951, **12**, 61-63. [Bur. Animal Indust.]

Post-war records of Murrah buffalo cows at Alabang were examined. The average length of lactation was 217 days, average milk yield 948.25 litres (212.42 gal.) and average daily milk yield 4.23 litres (0.95 gal.). The conditions and management under which these results were obtained are described.—T. D. Bell.

See also Absts. 3304, 3339-41, 3594, 3726.

REPRODUCTION

4340

DODI, B. **La necessità di un controllo del potere oitocico di talune farine di pesce destinate all'alimentazione delle femmine gravide.** [The necessity for a test of the oxytocic value of some fishmeals destined for the feeding of pregnant females.] *Riv. Zootec.*, 1953, **23**, 43-45. [Ist. Zootec. Gen., Univ. Cattolica del Sacro Cuore, Milan.]

Extracts of poor quality fishmeal in alcohol, alkali or acid had an oxytocic effect on the uteri

of rats and guineapigs, causing rhythmic contractions. This was thought to be the reason for abortion which had been seen in a herd of cattle. The effect depended on the freshness of the fish and the speed at which it had been dried. A simple method of detecting oxytocic action with a myograph is described, and it is suggested that such a routine test of all fishmeal, especially when destined for breeding females, would be desirable.

T. D. Bell.

4341

HANSEN, K. **Afkomsprøver med tyre. 9. [Progeny testing with bulls. 9.] Forsøgslab. København Beretn.**, 1954, No. 276, pp. 230. English and German summaries.

In general heifers received in late pregnancy were not in good condition. Details are presented of the feeding plans before and after calving, winter and summer rations. Before calving the allowance was 4 feed units of roots, 1 feed unit as beet tops and 2 kg. concentrates. Winter rations after calving were of 1.5 feed unit swedes, 1 feed unit silage or beet tops, 2.5 kg. hay and beets and concentrates graded to milk yield. The rations are given also in terms of total feed units, g. digestible true protein and g. Ca and P. The scheme for allowance of concentrates during summer in accordance with milk yield and quality of pasture is shown.—I. Leitch.

4342

HICKMAN, C. G. **A new era of dairy cattle breeding.** *Agric. Inst. Rev., Canada*, 1955, **10**, 11-12; 49. [Animal Husb. Div., Exp. Farms Serv., Ottawa.]

Artificial insemination has started a new era in the improvement of dairy cattle. For success a balance must be struck between the use of bulls already proved and of animals under test for future use. Progeny testing should embrace as wide a range of conditions as possible. A method for the selection of bulls is suggested and discussed. Apart from the general improvement of stock which is made possible by artificial insemination, there is an advantage to be gained by the elimination of hereditary abnormalities. The discovery that semen can be stored by refrigeration makes it easier to extend the use of artificial insemination.

T. D. Bell.

SHEEP

4343

GILL, J. C. and THOMSON, W. **Some aspects of the nutrition of the in-lamb ewe.** *Proc. Brit. Soc. Animal Prod.*, 1954, 35-44. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

4344

BURRIS, M. J. and BAUGUS, C. A. **Milk consumption and growth of suckling lambs.** *J. Animal Sci.*, 1955, **14**, 186-191. [Univ. Arkansas.]

Daily milk consumption of 18 single lambs and

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5 sets of twins was measured at weekly intervals from 1 week to 12 weeks of age. Lambs were weighed before and after each of 4 sucklings on the day of recording. Milk production was highest during the first 4 weeks, fell rapidly during the next 4 weeks and then declined slowly to weaning. A positive correlation was found between total milk production and weight of ewe ($r = 0.74$), birthweight of lambs ($r = 0.50$) and udder width at lambing ($r = 0.47$). Daily milk production of ewes suckling singles was very similar to that of ewes suckling twins. Average daily gain of lambs was highly correlated with milk consumption in the first 4 weeks. The correlation decreased rapidly and was not significant from 12 to 16 weeks. Total milk production and growth of lamb to 16 weeks were highly correlated ($r = 0.83$).

J. C. Gill.

4345

CATE, H. A., LEWIS, J. M., WEBB, R. J., MANSFIELD, M. E. and GARRIGUS, U. S. The effect of pelleting rations of varied quality on feed utilization by lambs. *J. Animal Sci.*, 1955, **14**, 137-142. [Univ. Illinois, Urbana.]

Rations of alfalfa and maize; timothy, maize, molasses and soya bean meal; and timothy and maize, each in either meal or pelleted form, were given to one of 6 groups of lambs. Rate of daily liveweight increase was significantly increased by pelleting both the timothy rations, and these rations pelleted were better than the higher quality alfalfa and maize ration as meal. Feed intake also was increased by pelleting the timothy rations, and on all 3 rations efficiency was better when the feed was pelleted, the improvement being greater the lower the quality of the ration. Higher carcass grades were obtained with pelleted timothy but not alfalfa rations, as compared with the corresponding meal. Before the feeding trial began all the lambs were vaccinated with *Clostridium perfringens* type D against enterotoxaemia; this did not affect liveweight gains. Mortality was low, only 5 out of the total of 307 lambs, and death was due to enterotoxaemia.—T. D. Bell.

4346

CLARKE, E. A. Early weaning of lambs on hill country. *N.Z. J. Agric.*, 1954, **89**, 471-476. [Dept. Agric., Animal Res. Stat., Ruakura.]

Two hundred Romney ewes were used in a trial in which half the ewe lambs were weaned at 12 weeks and the other half at 17 weeks. After the late weaning all the lambs were run together and no difference was found between weight gains or worm burdens of the groups. Small differences between groups in similar trials over the next 2 years appeared to be due to feed conditions, not to time of weaning. Pasture can be more efficiently utilised, weed control more effectively

achieved and shearing simplified by the practice of early weaning.—J. C. Gill.

4347

DAVIES, G. M. Wintering ewe lambs. Some Welsh trials. *Scot. Agric.*, 1954-55, **34**, 149-153. [Univ. Coll. N. Wales, Bangor.]

Groups of about 50 ewe lambs were away-wintered at 4 farms in the first year of the trial described, and 5 in the second and third years. Results showed that the less weight gained by the lambs during winter the greater the gain on the hill during the summer, but under the conditions of the trial a winter gain of at least 6 lb. was desirable. Poor wintering led to lower fertility in the first breeding season and was responsible for a drop of 1 lb. in fleece weight at first shearing when compared with good wintering.—J. C. Gill.

4348

MCCLYMONT, G. L. Minerals and licks for sheep. *Agric. Gaz. N.S.W.*, 1954, **65**, 646-651 (continued). [Nutrit. Res. Lab., Vet. Res. Stat., Glenfield, N.S.W.]

4349

NOBLE, R. L., POPE, L. S. and GALLUP, W. D. Urea and methionine in fattening rations for lambs. *J. Animal Sci.*, 1955, **14**, 132-136. [Dept. Animal Husb., Oklahoma Agric. Exp. Stat., Stillwater.]

In 3 trials supplements of methionine, urea and soya bean meal to a basal ration for fattening lambs were compared. Neither methionine nor urea alone consistently raised daily liveweight gain, but in combination there was a small, though not statistically significant, increase. This may have been due to an improved ratio of N:S, which was reduced from 59:1 to 15:1. Lambs given a supplement of soya bean meal with or without methionine did best; the methionine gave no advantage. The basal ration had approximately 8.5 per cent. protein, and the supplements of urea or soya bean meal raised the protein equivalent to 11 per cent. The rations were all equal in total digestible nutrients. There was no difference between any of the groups in dressing percentage or carcass grade.—T. D. Bell.

4350

REPP, W. W., HALE, W. H., CHENG, E. W. and BURROUGHS, W. The influence of oral administration of non-protein nitrogen feeding compounds upon blood ammonia and urea levels in lambs. *J. Animal Sci.*, 1955, **14**, 118-131. [Iowa Agric. Exp. Stat., Ames.]

Toxicity to 30 lambs of urea, ammonium formate, ammonium acetate, ammonium propionate and propionamide given by mouth was investigated by

testing 350 blood samples for ammonia and urea N. Further tests on 15 lambs were made with ammonium succinate, formamide, biuret, glycine and guanidine carbonate. With the exception of the last, toxicity was associated with large increases in blood ammonia N, 1 mg. per 100 ml. blood being the critical level. Amounts of the first 4 compounds listed equivalent to 40 g. urea proved fatal. Non-significant increases in blood ammonia and urea N resulted from the other compounds.

J. C. Gill.

4351

ALBERT, W. W., GARRIGUS, U. S., FORBES, R. M. and HALE, W. H. Modified urea supplements with corn silage for wintering ewe lambs. *J. Animal Sci.*, 1955, 14, 143-152. [Dept. Animal Sci., Univ. Illinois, Urbana.]

Four groups of 23 western crossbred ewe lambs were given maize silage and soya bean oilmeal. In 3 groups two-thirds of the N of the soya bean was replaced by urea plus cerelose and in 2 groups elemental sulphur was added. Weight gains did not differ significantly between groups, but the wool yield of the urea and cerelose group was significantly less than the average yield of the other 3 groups. In a second trial with 36 lambs supplements to silage of cerelose and starch plus urea, and yellow maize plus urea, both with and without sulphur, were compared with soya bean meal. Lambs receiving the soya bean meal supplement made significantly greater gains than those on the modified urea supplements. Addition of sulphur to the urea supplements increased gains. Ground maize produced significantly greater gains than cerelose and starch.—J. C. Gill.

4352

LUCIFERO, M. Contributo sperimentale allo studio della influenza degli ormoni estrogeni sull'ingrassamento degli agnelli. [Experimental contribution to the study of the influence of oestrogenic hormones on fattening in lambs.] *Riv. Zootec.*, 1954, 27, 358-363. [Centro Gen. Animale Cons. Naz. Ricerche, Ist. Zootec., Univ. Florence.]

The literature is briefly reviewed.

Experiments were made on 8 ram lambs of the Vicentina breed, a triple-purpose type. Four were twins, 2 were singles and the other 2 had female twins not used in the experiment. They were equally divided into 2 groups, those untreated and those which had a tablet of 12.5 mg. stilboestrol implanted subcutaneously. The experiment lasted 60 days, beginning when the lambs were 70 days old. They received hay and concentrates to appetite.

The mean weight increase was 11.18 kg. in controls and 12.89 kg. in treated lambs; the mean daily increments were 186 and 214 g. The total

feed intake was almost identical, but the treated animals ate rather more concentrates and less hay. Treated and untreated sheep ate, per kg. live-weight gain, 1.7 and 2.2 kg. hay, 3.1 and 3.5 kg. concentrates, 4.27 and 4.87 "forage units", 0.74 and 0.85 kg. protein; the former thus gave better utilisation.

The differences did not reach statistical significance, but experiments on a larger scale are planned.—D. Duncan.

4353

CLEGG, M. T., ALBAUGH, R., LUCAS, J. and WEIR, W. C. A comparison of the effect of stilboestrol on the growth response of lambs of different age and sex. *J. Animal Sci.*, 1955, 14, 178-185. [Dept. Animal Husb., Univ. California, Davis.]

Twelve trials were made, in which a total of 318 lambs were treated, with about the same number of untreated controls. The lambs were of both sexes, ranging in initial liveweight from 20 to 60 lb., and were treated by implanting 12 or 15 mg. stilboestrol in the ear, in all except one trial, in which there was a group implanted with 36 mg. The length of the trials ranged from 65 to 130 days. In some trials supplementary feed was given, in others all feed was supplied by pasture. In all trials treatment raised the rate of liveweight increase, with no difference between sexes, and there was no difference between the types of feeding or the age at which treatment was given. In the trial in which treatments with 12 and 36 mg. stilboestrol were compared there was no difference between these groups. The treated animals in this trial had heavier pituitaries and adrenals. There were only 3 cases of vaginal prolapse and one of rectal prolapse in all the trials.

T. D. Bell.

4354

ROBERTSTAD, G. W., SULLIVAN, R., TUCKER, J. O. and GLENN, M. W. Subcutaneous implantation of antibiotics in pellet form to stimulate the growth of range lambs and range calves. *Vet. Med.*, 1955, 50, 142-143. [Laramie, Wyo.]

Subcutaneous implantation of 400 units bacitracin in the neck region of 58 newborn Hereford calves did not give any growth response compared with 63 untreated controls at 2 or 6 months of age. At 2 months the treated animals were heavier, but the difference was not significant.

With lambs 1 to 3 weeks old, 141 were given implantations of 6000 units bacitracin, 114 had 3000 units bacitracin and 4000 units neomycin, 119 had 2500 units each of bacitracin and penicillin, and 122 were untreated controls. No growth response was obtained with any of the treatments. Animals in both trials were kept under normal range conditions.—T. D. Bell.

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4355

WALLACE, L. R. Factors influencing the efficiency of feed conversion by sheep. *Proc. Nutrition Soc.*, 1955, 14, 7-13. [Ruakura Animal Res. Stat., Dept. Agric., N.Z.]

4356

CARENA, A. Influenza dell'alimentazione con gusci di semi di cacao su la produzione latte delle pecore e la fabbricazione della robiole. [Effect of cocoa pods on the milk production of ewes and on cheese making.] *Ann. Sper. agrar.*, 1954, 8, 1857-1879. [Ist. Zootec. Cascar. Piedmont, Turin.] English summary. Cocoa pods had a nutritive value two-thirds that of bran. They could form up to 30 per cent. of the ration of ewes. No alkaloid poisoning was observed, but milk yield was slightly reduced when the pods replaced bran. Cheese made from the milk of ewes fed on cocoa pods ripened more slowly than usual, but there was no other effect on the quality.—T. D. Bell.

4357

BIELIŃSKI, K., SZYFTER-ZIOŁECKA, A. and BIELIŃSKA, K. Opas skopów na kiszonych wysłodkach buraczanych. [Fattening of wethers on sugar beet pulp silage.] *Rocz. Nauk rol.* [B], 1954, 68, 217-233. [Inst. Zootech., ZD Kohna Wielka.] Russian and English summaries.

The addition of 0.5 kg. barley daily to a ration of sugar beet pulp silage, hay and straw for fattening wethers reduced the fattening period by 2 to 3 weeks but had an unfavourable effect on feed utilisation and cost of liveweight gain. The addition of the concentrate slightly improved carcass quality. Up to 8 lb. sugar beet pulp silage daily could be given without detriment to health. (From summary.)—J. S. Thomson.

4358

BLAKESLEE, L. H., HENNEMAN, H. A. and NELSON, R. H. A comparison of hay, hay-crop silage and corn silage for ewes during gestation. *Quart. Bull. Michigan Agric. Exp. Stat.*, 1954, 37, 72-80. [Dept. Animal Husb.]

Sixty-five and 60 ewes were used in 2 trials to compare different rations during pregnancy. Ewes fed on hay, and their lambs, made better gains than those on hay-crop silage, although the latter as the sole roughage, when supplemented with Ca and P, can produce good lambs. When the hay-crop silage was given with maize silage or dry roughage gains in ewes and lambs were better. For comparable results with other roughages hay-crop silage would require a grain supplement.—J. C. Gill.

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4359

BRITON, N. W. and PALTRIDGE, T. B. A study of liveweight increments in ewes and of carcass quality and maturity rates in lambs grown on sown pastures in south-eastern Queensland. *Queensland J. Agric. Sci.*, 1954, 11, 43-59. [Queensland Agric. High Sch. Coll., Lawes.]

Sown pastures of alfalfa, paspalum grass and alfalfa, paspalum grass, and paspalum grass and *Phaseolus lathyroides* were compared. The weight changes of dry ewes and ewes in lamb with singles and twins, and fattening lambs on these pastures, and the carrying capacity of the pastures, were observed.

Highest weight gains of all the ewes were recorded on the alfalfa pasture, but the rate of stocking was lower than on the grass pastures. Alfalfa and grass was the best, but was difficult to maintain.

The rate of liveweight increase and the quality of the carcasses of lambs was highest on alfalfa; alfalfa and grass gave almost as good results. The other pastures did not allow quick enough growth of the lambs. A close correlation was found between the age at maturity, and therefore the rate of growth, and the carcass quality.

T. D. Bell.

4360

SCHOLZE, F. Die Junglämmernast beim Leineschaf unter besonderer Berücksichtigung von Milchleistung und Futtermittelverwertung. [Fat lamb production in the Leine sheep with special reference to milk production and feed utilisation.] *Ztschr. Tierzücht. Züchtungsbiol.*, 1954, 64, 25-46. [Inst. Tierzücht, Univ. Göttingen.]

The Leine sheep is found mostly in the south part of Lower Saxony along the Leine River, and on the southwest slopes of the Harz Mountains. It was at one time almost a distinct breed but has recently been crossed with foreign breeds to improve mutton qualities.

Mutton is unpopular in Germany as soon as the sheep is so old that the fat has a tallowy taste. What demand there is, is for lamb, and so quick fattening of milk lambs is important. To test the suitability of Leine sheep for this purpose, 15 ewes of the stud flock of the experimental farm Friedland were chosen as having lambed twice and having ram lambs. Each ewe was stalled separately and each lamb had a box in which it was kept except when allowed to suckle. Milk yield was estimated by weighing the lambs before and after suckling and milk was sampled for analysis when the lamb shifted from one teat to the other; approximately equal amounts were taken from each udder. Feed consumption, by ewe and lamb separately, was accurately recorded. The experiment continued until the lambs weighed 35 to 40 kg.

Lactation lasted for from 105 to 140, mean 129 days. At the end of lactation fat and protein rose steeply and sugar fell. Milk yield was from 99.7 to 135.0, average 118.1 g. daily, with 7.89 per cent. fat, 5.53 per cent. protein and 5.03 per cent. sugar. This is compared with other published data. Data are also given for feed consumed and its computed energy value and for the energy of the milk, from which it is reckoned that 24.82 per cent. of feed energy was recovered in milk.

Data are then presented for total feed consumed by the lambs and for their growth. The mean birthweight was 4.80 kg.; it was doubled in 18 days; the 3-week weight was 10.40 kg. and the 100-day weight 31.40 kg. Other data are quoted for comparison. Mean liveweight of 10 lambs at movement to the slaughterhouse was 37.0 kg., at slaughter 35.0 kg., and carcase weight was 17.8 kg., i.e., killing-out percentage was 50.7. Details are given for weight of the chief cuts. Finally costs of production and value of the lambs are discussed. For profitable production, a lamb crop of at least 106 per cent. would be needed.

I. Leitch.

4361

KOVAL'SKIĬ, V. V. and PADUCHEVA, A. L. O rezhime vodopoya karakul'shikh ovets v Ukraine. [The regime of giving water to Karakuls in the Ukraine.] *Karakul. i Zver.*, 1954, 7, No. 3, 44-50. [All-Union Sci. Res. Inst. Animal Husb.]

The amount and frequency with which water should be supplied to sheep should be varied in the different climatic zones of the U.S.S.R. and according to the time of year. In winter, for instance, to ewes under cover receiving dry feed, water should be supplied daily during the warm hours of the day and be followed by the daily exercise. Pastured ewes should be given water immediately after the morning supplementary meal before letting them out to pasture. In spring when the air is moist and there is heavy dew on the grass, watering the ewes may be limited to once in 3 days or even less. In summer ewes with lambs should be supplied with water daily and given as much as they can drink. For barren ewes the frequency of the supply of water will depend on the state of the pasture. On dry pastures they should be given water daily. The normal amount drunk by a ewe during the hot period of the year in the U.S.S.R. is about 5 litres daily. The amount of water needed depends also on the breed of sheep.—H. Scherbatoff.

4362

KING, J. W. B. and YOUNG, G. B. A study of three breeds of sheep wintered in four environments. *J. Agric. Sci.*, 1955, 45,

331-338. [Animal Breeding Res. Organiz., Edinburgh.]

Forty-eight ewe hoggs of 3 breeds, Blackface, Cheviot and Wiltshire, were wintered in either a warm or a cold environment, in each on a high or a low plane of nutrition. Little difference was found between breeds in the small growth made on the low plane, but on the high plane the Blackfaces showed relatively greater rate of growth and wool production. Results suggest that certain genotype-environment interactions may exist.

J. C. Gill.

4363

MORLEY, F. H. W., LOCKART, L. W. and DAVIS, E. C. The value of production from a clipped measured area as an index of fleece weight. *Austral. J. Agric. Res.*, 1955, 6, 91-98. [N.S.W. Dept. Agric., Wool Res. Lab., Agric. Exp. Stat., Trangie.]

In a trial with 66 Merino rams and 82 ewes a correlation of 0.58 was found between greasy fleece weight at shearing and wool production of a midside area of 100 sq. cm. Production from this area over 11 months gave little additional information to production over $7\frac{1}{2}$ or $8\frac{1}{2}$ months. Between greasy fleece weight and production per unit area and bodyweight at 11 months the multiple correlation coefficient was 0.79 in rams and 0.71 in ewes. Inclusion of fold score did not add significant information. A table for prediction of greasy fleece weight from the equation

$$W = P_3/100 + B_1/12,$$

where W = greasy fleece weight (lb.) at shearing, P_3 = fleece production up to 11 months after lamb shearing (mg. per sq. cm. skin at 11 months) and B_1 = bodyweight (lb.) at 11 months, is presented for values of P_3 ranging from 250 to 1000 and of B_1 from 50 to 140.—J. C. Gill.

4364

HUTCHINGS, S. S. Managing winter sheep range for greater profit. *U.S. Dept. Agric. Farmers' Bull.* No. 2067, August 1954, pp. 46. [Intermountain Forest and Range Exp. Stat., Ogden, Utah.]

4365

JONES, J. G. W. The efficiency of mutton production in crossbred sheep. *Proc. Brit. Soc. Animal Prod.*, 1954, 29-34. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

4366

EPSTEIN, H. The fat-tailed sheep of East Africa. *East African Agric. J.*, 1954, 20, 109-117. [P.O. Box 7011, Jerusalem.]

See also Absts. 3444, 3477, 3656, 3827.

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PIGS

4367

TRIBE, D. E. **The nutrition of the baby pig.** *Vet. Rec.*, 1954, **66**, 867-870. [Sch. Vet. Sci., Univ. Bristol.]

4368

DE JUANA SARDON, A. **Problemas de la cría del cerdo. El período de lactancia. [Problems in pig rearing. The lactation period.]** *An. Inst. Invest. Vet., Madrid*, 1953, **5**, 33-47. [Cuerpo Nac. Vet.]

This is chiefly a review, but contains some original observations on Spanish conditions. Sows of the black, Negra lampiña, and red, Colorada extremeña, races are good milkers. In Extremadura and generally in Andalusia and other parts where pigs are bred extensively, the supplementary food supplied to suckling pigs is whole barley, sometimes with a proportion of peas or black chickpeas. Meal is not used, though an experiment is described which showed that 3 litters made much better weaning weights on a balanced meal supplement than comparable litters on barley. The latter is used for practical reasons.

Among Large White \times Colorada extremeña or Negra lampiña pigs the mean number of young born per litter was 6.79, 6.72 live births and 5.57 weaned in spring, summer and autumn, but in winter there were losses from anaemia and diarrhoea. The condition was similar to that described by Howie *et al.* (Abst. 4213, Vol. 19).—D. Duncan.

4369

REID, J. W. **Rearing pigs.** *Vet. Rec.*, 1954, **66**, 863-867. [Nat. Agric. Advisory Serv., South-West Sub-Centre.]

4370

BERGE, S. and INDREBØ, T. **Composition of body and weight gain of suckling pigs.** *Meld. Norges Landbruksforsk.*, 1954, **34**, 481-500. [Inst. Animal Breeding, Agric. Coll. Norway, Vollebekk.] Norwegian summary.

Pigs were taken from 3 litters at birth and at 1, 2, 3, 4, 6, 8 and 10 weeks old and were analysed for dry matter, ash, crude fat, crude protein, sugar, N, Ca and P. The entire body of each pig from one litter was ground, sampled and analysed; in the other 2 litters the bodies were separated into offal and carcass and these were ground and analysed separately. Milk production of the 3 sows was recorded for the first 4 weeks.

Between birth and 10 weeks old the dry matter content of the entire animals rose steadily from 19 to 34.6 per cent., the fat content from 1.4 to

15.0 per cent., most of the increase being in the first 2 weeks, the energy content per kg. liveweight from 924 to 2330, and the crude protein content from 12.4 to 14.7 per cent.; the percentage of ash, Ca and P remained nearly constant.

The percentages of dry matter and crude protein in the weekly gain remained reasonably constant between birth and 10 weeks old, but the percentage of fat decreased.

In the first 2 to 3 weeks after birth the pigs gained about 0.25 kg. liveweight per kg. milk consumed, but only 0.14 kg. by the fourth week. In the first and second week 60 per cent. of the energy content of the milk was used for liveweight gain, but by the fourth week only 28 per cent.

The dressed carcass percentage fell from 79.6 at 1 week to 77.3 at 8 weeks. The pluck constituted about one-half of the dressing loss of pigs at birth, but the proportion was only one-fourth at 8 weeks old.

During growth from birth to 8 weeks the kidneys and heart were constantly related to liveweight. The proportion of head dropped from 19 to 8.8 per cent., liver from 3.6 to 3.0 per cent. and lungs from 3.0 to 1.2 per cent. The chemical analysis of the offals (the head, feet and kidneys remained on the carcass) was reasonably constant between birth and 8 weeks. They contained 4.0 to 4.5 per cent. crude fat and 12 to 13 per cent. crude protein. During growth 88 per cent. of the gain of energy was in the carcass, about 12 per cent. in the offals.

The material did not allow a statistical comparison of uncut males with females, but the data suggested that the differences were small.

I. A. M. Lucas.

4371

GAWIENOWSKI, A. M., MAYER, D. T. and LASLEY, J. F. **The serum protein-bound iodine of swine as a measure of growth potentialities.** *J. Animal Sci.*, 1955, **14**, 3-6. [Dept. Animal Husb., Univ. Missouri, Columbia.]

A trial with 20 purebred Hampshire gilts and barrows (castrated males) fattened to 215 lb. slaughterweight showed a significant correlation between the serum protein-bound iodine (P.B.I.) and the rate of daily liveweight gain, the latter increasing as the former grew less. There was a similar correlation between P.B.I. and body length. There was a tendency for length of hind leg to be greater and back fat to be less thick as P.B.I. increased, but statistically the differences were not significant. The average P.B.I. value was 3.08 $\mu\text{g.}$ per 100 ml., range 1.2 to 5.4 $\mu\text{g.}$

T. D. Bell.

4372

HEADY, E. O., WOODWORTH, R., CATRON, D. V. and ASHTON, G. C. New procedures in estimating feed substitution rates and in determining economic efficiency in pork production. 1. Replacement rates of corn and soybean oilmeal in fortified rations for growing-fattening swine. *Iowa Agric. Exp. Stat. Res. Bull.* No. 409, May 1954, pp. 895-976. [Ames, Iowa.]

A theoretical study was made of the way in which the weight gain of pigs from weaning onwards depends on the amounts of the 2 main constituents of their diet in Iowa, maize and soya bean oilmeal. There tends to be a decline in the weight gains obtained from successive equal increments in level of feeding and, although it is possible to increase the amount of one dietary constituent and reduce the amount of the other and still obtain the same weight gain, the equivalent amounts of the 2 constituents for this purpose are not constant but depend on their initial proportions in the diet. Several types of non-linear regression equation would provide for this situation in relating weight gain to total feeds of maize and of protein, and equations of 3 of these types have been fitted to the results from 3 separate feeding experiments, for rations with and without aureomycin supplements. The most suitable equation was found to be one in which the logarithm of the weight gain was made a linear function of the maize and protein intakes. Livestock product isoquants are defined as the loci of feed combinations giving constant weight gains, and are derivable from the regression equations. In conjunction with information on the relative costs of the 2 constituents these give the ration combination to produce a given weight gain at minimum cost. In general the least cost ration will vary with the weight of the pig.

The regression equations were used to compile tables intended to be of practical use to the farmer in making decisions on feeding. These are for the most part restricted to the diets containing aureomycin, since the cost of this supplement is very small relative to total feeding costs. They include (1) a table giving the weight gains for varying amounts of diets of varying protein content, with the additional or marginal gains per additional pound of feed; (2) a table showing the weight gains for fixed amounts of protein with varying amounts of maize; (3) a table giving the varying feed combinations which will add 100 lb. weight to pigs of 60, 110 and 175 lb.; and (4) a table giving the food combination to produce a fixed gain at least cost for different possible price ratios of soya bean oilmeal and maize and for 3 different ranges of weight of pig.

The time taken to fatten the pigs was also considered. Non-linear regression equations were

derived which give the time taken to consume given amounts of maize and soya bean oilmeal. These lead to tables showing the time required to take pigs from one given weight to another when fed on diets differing in protein content. The rations which will produce a pig of 225 lb. in minimum time are compared with those which will do it at minimum cost, previously obtained. Fluctuations in the market price of pigs will determine whether a minimum time or a minimum cost ration will be most profitable, and this point is discussed in relation to experience in the United States between 1937 and 1952.—I. McDonald.

4373

BRAUDE, R. Efficiency of food utilization in pigs. *Proc. Nutrition Soc.*, 1955, 14, 14-23. [Nat. Inst. Res. Dairying, Univ. Reading.]

4374

WENIGER, J. H. Untersuchungen über den Nährstoff- und Energieansatz verschiedener Schweinerassen im Hinblick auf Lebendgewicht, Tageszunahme und Ernährung. [Storage of nutrients and energy in different breeds of pigs in relation to liveweight, daily gains and diet.] *Arch. Tierernährung*, 1955, 4, 293-331. [Inst. Tierzucht, Martin Luther Univ., Halle, Wittenberg.]

The 102 pigs were mostly Deutsches Edelschwein, improved Landschwein, Cornwall and German Saddleback, with a few Berkshires in the last experiment.

Five newborn pigs had a mean composition of dry matter 18.51, protein 12.37, fat 1.91, ash 4.23 and water 81.49 per cent. The protein : fat ratio was 1 : 0.15.

Nine pigs of the first 3 breeds named, after weaning at 8 weeks, were brought to 30 kg. liveweight on a cereal and potato ration high in protein and were then killed and analysed. The mean daily intakes of protein, fat, minerals and water and the number of calories from each source are tabulated. The third study was similar, but the 11 pigs were brought on the same diet to 40 kg. liveweight. In both studies together the mean intake of 270 g. feed daily contained 35 g. protein and 79 g. fat, and the tissue deposited, obtained by difference between the composition of these pigs and that of the newborn, exactly reflected this ratio. Relative to total weight gain the protein composition rose linearly, and fat deposition was twice that of protein. The mean body composition of the 20 pigs at 30 to 40 kg. was dry matter 41.56, protein 13.01, fat 25.42 and ash 3.13 per cent. There was no breed difference at this stage.

In the fourth experiment, 47 pigs were brought from 40 to 106 kg. liveweight on a standard ration

or one poor in protein. On the normal ration the Edelschweine and Landschweine differed in rate of weight gain, 610 and 639 g. daily, but they continued to deposit protein and fat in much the same ratio, 1:2.8. The Cornwalls and Saddlesbacks, although they received the same amounts of protein, laid down less protein, and variations in feed intake were reflected in variations in fat deposition. Breed differences in body composition became considerable. Pigs on the low-protein diet took a month longer to reach the required weight, so the utilisation of the ration was much reduced. At the low protein intakes of 40 to 50 g. daily, growth became a function of the fat intake, and the tissue deposited had a protein:fat ratio of 1:3.8 in Edelschweine and 1:4.5 in Landschweine. The carcasses therefore had a greater energy content per kg. gained.

Lastly, 30 pigs were brought from 30 to 136 kg. liveweight on a ration of 3 parts barley meal to 2 parts potato flakes, with a protein supplement decreased by stages from 12 to 5 per cent. In Edelschweine and Landschweine in this group the daily weight gain was closely related to fat intake and only indirectly to protein deposition. The optimum protein intake was between 87 and 95 g., with weight gains of 600 to 700 g. daily. When weight gains exceeded 700 g. daily the proportion of fat deposited increased. In the breeds with more tendency to fatten, the change from protein to fat deposition occurred at lower levels.

It is concluded that the profit from producing meat of high quality is to be increased not by increasing daily gains, but by reducing the feed requirement per kg. liveweight gain.—D. Duncan.

4375

ARMSTRONG, D. G. and MITCHELL, H. H. **Protein nutrition and the utilization of dietary protein at different levels of intake by growing swine.** *J. Animal Sci.*, 1955, 14, 49-68. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Six Hampshire pigs initially weighing 20.6 to 25.7 kg. were used in N balance studies. There were 5 experimental periods and during the first and last diets almost free of protein were used. During the remaining 3 periods the diets contained 4, 10 and 16 per cent. of protein from soya bean oilmeal. The pigs gained weight on the low-protein diets and developed only slight hypoproteinaemia.

By extrapolation to zero of the straight line regression relating faecal N to level of protein in the feed the metabolic faecal N was estimated to be 0.91 g. per kg. dry matter consumed. The value estimated from the use of an almost protein-free diet was 1.14 g. per kg. dry matter consumed. By extrapolation to zero of the straight line regression relating output of urinary N to truly

absorbed N the minimum daily output of endogenous urinary N was estimated to be 106 mg. per $W^{0.754}_{kg}$. The mean value determined from the use of an almost protein-free diet was 133.1 mg. per $W^{0.754}_{kg}$.

The relation of N balance to truly absorbed N up to a level of 10 per cent. protein in the diet was rectilinear, the slope of the regression line expressed as a percentage being 76. This was taken as the biological value of the dietary protein.

Data from other publications indicated that the metabolic utilisation of dietary proteins is similar in rats, pigs and dogs. The biological values of a number of proteins and their essential amino-acid indices were highly correlated.—I. A. M. Lucas.

4376

HANSON, L. E. and FERRIN, E. F. **The value of urea in a low protein ration for weanling pigs.** *J. Animal Sci.*, 1955, 14, 43-48. [Univ. Minnesota, St. Paul.]

In a trial with 69 pigs fattened from weaning to 200 lb. liveweight urea was added to a low-protein ration so that the estimated protein level was that of a normal-protein ration. There was no improvement in growth rate in groups receiving the urea ration compared with those on the low-protein ration, and efficiency was less. The normal-protein ration gave gains 16 per cent. better than the other 2 rations and the pigs were 5 per cent. more efficient than those on the low-protein ration. There was no evidence that urea was toxic, so that no harm would be done by using cattle feeds with 1 to 1.5 per cent. urea in them for pigs, if this should be necessary.—T. D. Bell.

4377

STOLZMAN, M. **Wpływ penicyliny podawanej w paszy na rozwój psiat rasy wielkiej białej angielskiej chorych na grype.** [Effect of an addition of penicillin to the feed on the development of Large White piglets suffering from cold.] *Rocz. Nauk rol. [B]*, 1954, 68, 409-415. [Inst. Zootech., Dziś. Biol. Hodowlanej.] Russian and English summaries.

In 15 Large White piglets $2\frac{1}{2}$ to 3 months old "suffering from cold", weight gains to bacon weight were maintained at almost normal and mortality was decreased by giving 100,000 units non-crystalline penicillin daily in the feed. The treatment did not significantly increase the daily liveweight increase of similar healthy piglets. (From summary).—T. D. Bell.

4378

SMITH, D. M. **Use of antibiotic supplements with separated milk in pig feeding.** *N.Z. J. Agric.*, 1955, 90, 85-88. [Dept. Agric., Animal Res. Stat., Ruakura.]

When penicillin was added to the creep feed of suckling pigs they ate more of this feed and were slightly heavier at weaning than controls, but efficiency of feed conversion was not improved.

With pigs fattened on skimmed milk the addition of penicillin, aureomycin or streptomycin had no effect on growth or efficiency.—T. D. Bell.

4379

JENSEN, A. H., ACKER, D. C., MADDOCK, H. M., ASHTON, G. C., HOMEYER, P. G., HEADY, E. O. and CATRON, D. V. Different protein levels with and without antibiotics for growing-finishing swine: effect on growth rate and feed efficiency. *J. Animal Sci.*, 1955, 14, 69-81. [Iowa Agric. Exp. Stat., Ames.]

In 2 trials involving 288 pigs, rations with 10, 12, 14, 16, 18 and 20 per cent. protein with or without antibiotics were compared. The pigs were fattened from weaning at 31 lb. liveweight to 200 lb. In both trials the protein level affected the rate of gain, the best being 18 per cent. With aureomycin or terramycin the best rate of gain was on the 14 per cent. protein ration. In the first trial efficiency was not affected either by protein level or by antibiotics, but in the second efficiency improved with the improved rate of gain due to protein level. During the early period, 31 to 75 lb. liveweight, in the first trial terramycin increased the rate of gain significantly, but when the fattening period was taken as a whole this advantage disappeared. Over the whole period in the second trial aureomycin increased rate of gain and efficiency, although this was not apparent in the early period.—T. D. Bell.

4380

ASHTON, G. C., KASTELIC, J., ACKER, D. C., JENSEN, A. H., MADDOCK, H. M., KLINE, E. A. and CATRON, D. V. Different protein levels with and without antibiotics for growing-finishing swine: effect on carcass leanness. *J. Animal Sci.*, 1955, 14, 82-93. [Iowa Agric. Exp. Stat., Ames.]

Carcass measurements were made on 2 castrated male pigs from each of 15 groups under different dietary treatments. The pigs were fed from 36 to 200 lb. on fortified maize and soya bean oil-meal rations containing 10, 12, 14, 16 or 18 per cent. protein, each protein level being given alone or with aureomycin or terramycin. The antibiotics were included at 5 mg. per lb. diet. In a second experiment carcass measurements were made on one castrated male and one female pig from each of 12 treatments. The treatments were similar to those in the first experiment except that there was a 20 per cent. protein group, and none of the diets contained terramycin.

The results from both experiments failed to

indicate that antibiotics affected backfat thickness, percentage of lean cuts or sp. gr. of the carcasses. In the first experiment the error variances were large but in the second they were smaller. In the second experiment there were indications that the antibiotics affected the area of loin muscle, but this effect was not consistent between protein levels.

In the first experiment sp. gr. increased linearly with increases of protein in the diet. This was also evident in the second experiment when the figures for backfat thickness, area of loin muscle and percentage lean cuts also indicated that with increases of protein in the diet the carcasses carried less fat and more lean. These changes were of such small magnitude, however, as to be of minor importance when choosing between 2 adjacent protein levels.—I. A. M. Lucas.

4381

HANSON, L. E., FERRIN, E. F., ANDERSON, P. A. and AUNAN, W. J. Growth and carcass characteristics of pigs fed antibiotics for part or all of the growing-fattening period. *J. Animal Sci.*, 1955, 14, 30-42. [Univ. Minnesota, St. Paul.]

One experiment was with 8 groups each of 9 pigs starting at 8 weeks old, and a second was with 8 groups each of 10 pigs, some being started on experiment at 10 weeks and some at 7 weeks. In both experiments the pigs were self-fed on a diet based on maize, soya bean oilmeal and tankage, and in both there were 8 treatments, including one group on the basal meal only. Treatment 2 was with supplementary vitamin B₁₂ and the remaining 6 treatments were with vitamin B₁₂ and either aureomycin, terramycin or procaine penicillin. In 3 treatments the antibiotic was given until slaughter at 200 to 225 lb. and in 3 it was removed from the diet after 125 lb. liveweight. Carcass data were obtained for all pigs in the second experiment.

Before 125 lb. liveweight supplementary vitamin B₁₂ improved growth rate by 10 per cent., but this was not quite significant. The inclusion of antibiotic resulted in a further and significant improvement of 14 per cent. in growth rate, there being no significant difference between the effects of different antibiotics. No treatment had a significant effect on efficiency of feed conversion.

During growth from 125 to 200 lb. supplementary vitamin B₁₂ significantly improved growth rate by 24 per cent. over that of the controls. Pigs receiving aureomycin or terramycin plus vitamin B₁₂ grew slightly faster than those receiving only vitamin B₁₂, but those receiving procaine penicillin did not. However, those receiving only vitamin B₁₂ grew significantly faster than groups which had had terramycin or

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penicillin removed from the diets at 125 lb. This removal of antibiotic from diets after 125 lb. had a more marked adverse effect in experiment 1 than in experiment 2. There was no significant effect of treatment on efficiency of feed conversion during this period.

There was no significant difference between treatments for moisture, fat or protein contents of the boned carcasses, although the control pigs were the longest and had the smallest backfat measurements. There was no difference between treatments for quality of cured and smoked wholesale cuts.

It is concluded that antibiotic should be given from weaning to market weight if maximum gains are desired.—I. A. M. Lucas.

4382

WUSSOW, W., WENIGER, J. H. and FUNK, K. Beitrag zur Verfütterung von Streptomycin- und Penicillinmycel an wachsende Schweine. [Streptomycin and penicillin mycelium for growing pigs.] *Arch. Tierernährung*, 1954, Beihefte, No. 5, 223-233. [Inst. Tierzucht, Martin Luther Univ., Halle.]

In a pilot study with 8 pigs streptomycin mycelium had no adverse effect, except that more than 25 g. daily reduced appetite; penicillin mycelium was accepted at levels of up to 200 g. daily.

With 3 groups of pigs, 18 in all, 25 g. streptomycin mycelium daily was given with different protein feeds, fishmeal, yeast and soya bean meal. Two control groups received no protein feed but one had streptomycin; a third control had fishmeal, yeast and skimmed milk but no streptomycin. The mycelium alone was better than no protein supplement, and each of the 3 protein supplements increased its value to about the same extent, but never to that of the high-protein control ration.

It is concluded that vitamin B₁₂ in which the supplements were rich, is not of great value alone, but only when antibiotics are present also.

D. Duncan.

4383

TAYLOR, J. H. and GORDON, W. S. The effect of feeding a diet containing stilboestrol and thyroxine to growing pigs with special reference to the toxicity of stilboestrol. *Vet. Rec.*, 1955, 67, 48-52. [Agric. Res. Coun. Field Stat., Compton, Berks.]

Groups of 6 pigs of liveweight about 50 lb. were fed to 200 lb. liveweight on a basal ration, with no supplement for the control group, or with supplements of stilboestrol (6.0 mg. per lb. feed) and thyroxine (0.3 mg.), aureomycin (0.8 mg.), penicillin (0.8 mg.) or combinations of stilboestrol, thyroxine and one or other of the antibiotics.

Only the antibiotics improved growth rate and efficiency of feed conversion, and this improvement was prevented by stilboestrol and thyroxine.

Toxic signs were produced by the stilboestrol and thyroxine supplement, in some cases proving fatal. The same signs were produced in pigs given a supplement of stilboestrol of 20 mg. per lb. feed without the thyroxine. The signs and post-mortem findings are described. Stilboestrol residues were detected in the urine and flesh of the experimental pigs when preparations were injected into rats or given them to eat.

T. D. Bell.

4384

SCHENDEL, H. E. and JOHNSON, B. C. A study of "growth stimulants" using the baby pig. *J. Animal Sci.*, 1955, 14, 19-23. [Div. Animal Nutrit., Dept. Animal Sci., Univ. Illinois, Urbana.]

In 3 small-scale experiments pigs aged from 48 to 96 hr. were fed on a synthetic milk diet containing 19.5 per cent. solids and 6 per cent. fat.

In experiment 1, which lasted 28 days, aqueous solutions of arsenilic acid, sulphisoxazole and ethomeen C/15 were added to the diet separately or in combination. In experiment 2, also lasting 28 days, a surfactant combination of arquad S, ethomid C/15, ethofat C/15, aerosol CS, aerosol SE and ultrawet K was added to the diet. In experiment 3, lasting 49 days, an antibiotic concentrate No. 802 was added to the diet.

Arsenilic acid significantly increased feed consumption and growth, but ethomeen C/15 and sulphisoxazole given separately did not. Arsenilic acid and sulphisoxazole together tended to increase feed consumption but arsenilic acid and ethomeen C/15 depressed it. In experiment 2 the surfactant combination did not affect performance and in experiment 3 the antibiotic significantly increased feed consumption and growth.

Tissue analysis indicated that the baby pig retains about 3 times as much arsenic in the liver as chicks receiving the same amount of arsenilic acid.—I. A. M. Lucas.

4385

BELLER, K. Zur Frage der Komplettierung der Leistungsfütterung mit Wirkstoffgemischen. [Supplementing production rations with stimulants.] *Arch. Tierernährung*, 1954, Beihefte, No. 5, 216-222. [Inst. Tierheilk., Landwirtschaftl. Hochsch., Hohenheim.]

In 45 practical feeding trials with about 400 pigs in South Germany fattening was successful on reduced rations when yeast extract was supplied; the protein intake could not be reduced, but pla protein could be used to replace animal protein especially in late stages of fattening lard pigs. 33 per cent. reduction in starch value was possib

with a shorter fattening time. There was no adverse effect on quality of carcase.

Two groups of 7 pigs were fattened for 170 days from a total weight of 212 and 219 lb. The experimental group received 24 per cent. less meal and 16.25 per cent. less potato silage than the controls, but with liver and yeast extract [the amount not specified]. For 140 days the weight gains were almost identical, but in the last month the experimental group went ahead and gained at 170 days 1571 lb., against 1445 lb. for the controls. The total consumption of the controls was 4886 lb. meal and 6400 lb. potato silage, and of the experimental group 3711 and 5390 lb.—D. Duncan.

4386

TURMAN, E. J. and ANDREWS, F. N. **Some effects of purified anterior pituitary growth hormone on swine.** *J. Animal Sci.*, 1955, 14, 7-18. [Dept. Animal Husb., Purdue Univ. Agric. Exp. Stat.]

In 3 experiments 11 pigs each weighing about 110 lb. were injected daily with anterior pituitary growth hormone. Seven animals served as controls. Four pigs receiving 4.5 or 6.0 mg. purified growth hormone per 15 kg. liveweight died during the experiment. The remaining animals were slaughtered at 210 to 230 lb. liveweight.

Pigs receiving growth hormone grew slightly, although not significantly, faster than the controls, but their average daily feed consumption was significantly reduced and their efficiency of feed conversion was significantly improved by 19 per cent. They had a lower dressing percentage and their carcasses were longer and carried less fat than the controls. Samples of the edible meat of pigs receiving hormone contained significantly more protein and moisture and significantly less fat than that of the controls.

The pituitaries of pigs receiving hormone contained more thyrotropic and gonadotropic hormones than the control pituitaries. The hormone injections also caused significant increases in blood glucose, but the decreases in blood N.P.N. and slight increases in blood inorganic P were not significant. The inorganic P of the blood of all groups declined with increasing age.

I. A. M. Lucas.

4387

HAVERMANN, H. and RÜTER, H. **Versuche über den Einfluss grenzflächenaktiver Stoffe bei der Fütterung von Schweinen.** [Effect of surface-active substances in pig feeding.] *Arch. Tierernährung*, 1954, Beihefte, No. 5, 60-76. [Inst. Tierzucht, Univ. Bonn.]

Four pairs of pigs were selected from 2 litters so that they were matched in weight and each pair was a male and a female. They received a

practical ration of potatoes, beet pulp, barley meal, oatmeal and fishmeal. For 3 groups surface-active agents, alkylbenzol sulphate and primary alkyl sulphate, were introduced into the diet in gradually increasing quantities. Group 1 received none, group 2 each received about 740 g. of the agents in 206 days, group 3 got 1850 g. in 206 days and group 4 about 180 g. in 66 days, after which they were restored to the control diet.

During the experiment animals of groups 2 and 3 gained on the average 8.0 and 10.5 kg., or 7 and 9 per cent., more than the controls, but those of group 4 gained 6 kg. or 5 per cent. less weight. The effects of the supplement increased with time and were greatest when the pigs had passed 40 kg. bodyweight. The total feed intake was the same in the first 3 groups, slightly less in the fourth, so that weight gain per kg. feed was increased in groups 2 and 3 to the same extent as the absolute weight gain, and the decrease in group 4 was reduced to 4.6 per cent.

At slaughter the losses in all groups were similar. The percentage of fat in the carcase was highest in groups 2 and 3, and so was the yield of meat. The livers were 25 per cent. heavier in group 3 than in controls, and contained some 3 per cent. less water. There was no significant effect on chemical composition or flavour of the meat.

It is concluded that surface-active substances in the concentrations used are harmless to pigs and may be beneficial to older fattening animals.

D. Duncan.

4388

MÜLLER, R. and MASSEBERG, J. **Der Einfluss von Methionin und Lysin auf den Eiweißwert einer Gerste-Magermilchration bei wachsenden Schweinen.** [Effect of methionine and lysine on the protein value of a ration of barley and skimmed milk for growing pigs.] *Arch. Tierernährung*, 1954, 4, 241-257. [Inst. Anat. Haustiere, Univ. Bonn.]

The protein value (N retained/ N absorbed $\times 100$, where N retained = N absorbed - urinary N and N absorbed = N in feed - faecal N) of the basal ration used on pigs (1750 to 2000 g. barley and 100 g. dried skimmed milk) averaged 61.5 for animals between 40 and 53 kg. in weight, and the biological value 72.2, which is considerably higher than that for barley alone (54 to 58). The experiments thus confirmed the value of milk protein in enhancing the value of cereal protein. Addition of methionine was without effect on protein value or biological value of the given ration in the weight class 30 to 40 kg. Addition of lysine increased the protein value from 61.5 to 71.9 in the weight class 30 to 40 kg., and from 61.9 to 68.2 in animals of about 50 kg. With pigs of 30 kg. the optimum result was attained with 13 g. of DL-lysine sulphate, and with 40-kg. animals

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with 10 g. The lysine requirement diminished with increasing bodyweight. In pigs of 60 kg. no improvement in protein value was attained by giving 10 g. lysine.—M. B. Richards.

4389

MINER, J. J., CLOWER, W. B., NOLAND, P. R. and STEPHENSON, E. L. Amino acid supplementation of a corn-cottonseed meal diet for growing-fattening swine. *J. Animal Sci.*, 1955, 14, 24-29. [Univ. Arkansas, Fayetteville.]

Two trials were made to test the value of amino-acid and fishmeal supplements to a basal ration of maize and cottonseed meal, free from gossypol, given to pigs for 4 weeks from weaning. There was a significant growth response to 3 per cent. DL-lysine alone, but in conjunction with 3 per cent. fish solubles, 1 per cent. DL-lysine was better than 3, 2 or 0.5 per cent. or the amino-acid alone. DL-Tryptophan and fish solubles together also produced significant growth response. The response to DL-methionine was not significant. In all cases of growth response there was an increase in efficiency also.—T. D. Bell.

4390

ALDEN, W. G., SANGSTER, R. M. and JONES, M. D. Condensed whale solubles. The evaluation of this by-product of the whaling industry when fed as the animal protein supplement to the rations of pigs and poultry. *J. Dept. Agric. S. Austral.*, 1954, 58, 158-161. [Kybybolite Res. Centre.]

The composition of condensed whale solubles, a pleasant-smelling thick syrup, is given as: moisture 47.3, crude protein 43.1, crude fat 1.3, ash 4.1 and N-free extract 4.1 per cent.

In a feeding trial with 16 weaner pigs, fattened to 160 lb. liveweight, whale solubles were compared with meatmeal, which they replaced on an equivalent protein basis in the rations of 8 of the pigs. Up to 90 lb. liveweight there was no significant difference between the meatmeal and whale solubles groups, but from 90 to 160 lb. liveweight the meatmeal was better.

A further trial was made with 3 groups of 8 weaner pigs fed to 90 lb. liveweight. The groups received rations with the animal protein supplied by 14, 11 or 8 per cent. condensed whale solubles. It was shown that satisfactory growth and efficiency was obtained only at the 14 per cent. level.

With laying pullets 8 pens of 10 birds had the standard meatmeal wet mash, and 8 pens had the meatmeal replaced by condensed whale solubles on an equivalent protein basis. There was no difference between groups in size or number of eggs produced.

The problem of incorporating the solubles in a pre-mixed ration is discussed.—T. D. Bell.

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4391

SEIDLER, S. Siano w żywieniu trzody chlewnej. [Hay as a food for swine.] *Rocz. Nauk. rol. [B]*, 1954, 69, 105-128. [Inst. Zootech. ODZ, Bydgoszcz.] Russian and English summaries.

The results of experiments on the use of hay for pig feeding are reported, and rations based on these results are suggested. The method of getting the best hay and the most suitable means of feeding are discussed. (From summary.)—T. D. Bell.

4392

SEIDLER, S. Ziarno słodkiego łubinu w żywieniu trzody chlewnej. [Sweet lupin seed in swine feeding.] *Rocz. Nauk. rol. [B]*, 1954, 69, 129-151. [Inst. Zootech. ODZ, Bydgoszcz.] Russian and English summaries.

Experiments showed that sweet lupins were a useful feed for pigs and could take the place of two-thirds of the animal protein usually given. The composition and nutritive value of different varieties of lupins are reported. Methods of removing the toxic principle from bitter lupins and methods of feeding are discussed. A list of concentrates which have been shown experimentally to be suitable for pigs is given. (From summary.)—T. D. Bell.

4393

FAGAN, V. J. The suitability of fodder beet as a pig food. *Tasmanian J. Agric.*, 1954, 25, 350-357.

Six short-term trials were made in Tasmania. The crop was excellent for the nutrition of breeding stock, but weaners could make good use of it only after they reached 50 to 60 lb. liveweight. An interim recommendation for growing pigs was to give fodder beet plus 1½ lb. crushed wheat and from ¼ to ½ lb. meatmeal per pig daily. In feeding value 4 lb. fodder beet were equivalent to 1 lb. wheat. For weaners the roots had to be sliced or quartered, but this was unnecessary for older pigs. At one farm the beet caused scouring, which may have been associated with either the presence of nitrates in the roots or a high dry matter content.

I. A. M. Lucas.

4394

BIELIŃSKI, K. and BIELIŃSKA, K. Suszona pulpa ziemniaczana jako pasza w tuczu trzody chlewnej. [Dehydrated potato pulp as a feed for fattening pigs.] *Rocz. Nauk. rol. [B]*, 1954, 68, 297-308. [Inst. Zootekh., ZD Kolumbia Wielka.] Russian and English summaries.

Tests were made on 2 groups of pigs of average weight 40 kg. fattened to 90 kg. on a ration of barley, wheat bran, fodder yeast, fishmeal, lucerne hay, potato flakes and dehydrated potato pulp.

The potato pulp constituted 15 per cent. of the ration to start with and was later increased to 20 and to 25 per cent. at the expense of the potato flakes. Average daily weight increases in the groups were 556 and 607 g., showing that daily amounts of 350 g. potato pulp, rising to 800 g., could be given with good results. Of 9 slaughtered animals 7 were graded as class 2 and 2 as class 3. (From summary.)—J. S. Thomson.

4395

HOVORKA, F. Krmení žirných prasat silážovanými brambory ad libitum. [Feeding fattening pigs to appetite on ensiled potatoes.] *Šborn. Čsl. Akad. Zéměd.*, 1954, 27, 597-604. Russian and English summaries.

Experiments showed that when pigs were fed to appetite on steamed potatoes, silage or similar bulky feeds, it was better not to give the concentrates mixed with them, but to give them first, to ensure that none was wasted. The composition of the concentrates should be changed as the pigs grow.

When feeding to appetite it was found that the pigs did not overeat, but satisfied their needs and used the feeds to the best advantage. (From summary.)—T. D. Bell.

4396

WHITING, F. and BEZEAU, L. M. The nutritional value of fire-damaged wheat for swine. *Canad. J. Agric. Sci.*, 1954, 34, 635-638. [Exp. Stat., Lethbridge, Alta.]

Wheat from a burnt grain storage elevator was put through a fanning mill which removed nails, glass, charred wood, charcoal dust and weed seeds, accounting for 14 per cent. of the total weight. The wheat remaining was separated into a sample of grain severely damaged by fire and one of grain less severely damaged. These 2 samples were included in rations and digestion and N balance experiments were made with them, with 4 pigs. The digestibilities of dry matter, organic matter, protein and total energy of the severely damaged wheat were considerably and significantly less than those of less severely damaged wheat and normal wheat. The digestibility of the protein of the less severely damaged wheat was considerably less than that of normal wheat, but otherwise the differences were small. There was little difference between the net utilisation of the protein of the damaged wheats, the values for both being less than for normal wheat. The fire-damaged grain was unpalatable, but the pigs became accustomed to it in a fortnight.—I. A. M. Lucas.

4397

WHITING, F. and BEZEAU, L. M. The nutritional value of frost-damaged and early-harvested

cereal grains for swine. *Canad. J. Agric. Sci.*, 1954, 34, 624-634. [Exp. Stat., Lethbridge, Alta.]

Frost damage significantly reduced the digestibility for weanling castrated pigs of the dry matter, organic matter, ether extract, N-free extract and total energy of wheat. The reduced digestibility of the damaged wheat could partly be accounted for by a higher crude fibre content. Although the digestibility of the protein of severely frosted wheat was lower than in other wheat the utilisation of digested protein was better, and under the conditions of the experiment frost damage did not impair the value of the grain in meeting the protein needs of the body. These results were confirmed in a second experiment in which frost-damaged oats were also tested. The digestibility of the protein of oats, unlike that of wheat, was not reduced by frosting. In a third balance experiment the dry matter, organic matter, true protein, crude fibre, N-free extract and gross energy of early-cut wheat were better digested than the same constituents in frosted wheat, although, with the exception of protein, they were not so well digested as the constituents of wheat cut one week later. The effect of severe frost damage in reducing digestibility was not the same as that of harvesting at the same stage of maturity, probably because the early-cut wheat filled out after cutting and had a lower crude fibre content. There was a significant linear relation between the weight of wheat per bushel and its digestible energy.—I. A. M. Lucas.

4398

GOERTTLER, V. Schädigungen durch von Milben befallenes Futter beim Schwein. [Damage to pigs from mite-infested feedingstuffs.] *Arch. Tierernährung*, 1954, Beihefte, No. 5, 31-34. [Vet. Anst., Friedr. Schiller Univ., Jena.]

Feedingstuffs that have become heavily infested with mites are usually considered toxic and are discarded. Little experimental work is on record. Experiments are described in which a fattening mixture for cattle was cultured in a warm moist atmosphere until it was heavily infested and loaded with mite faeces. From part of this a kg. of clean, live mites was collected (method described).

Six healthy weaned pigs, weighing from 18 to 23 kg. were fed, 2 on potatoes, barley meal and skimmed milk, 2 with the addition of mites, 75 g. from the first to the third day, 20 g. from the fourth to the twelfth day and 123 g. on the 31st day, and 2 with the heavily infested feed in place of barley meal for 32 days. Of the third pair, one had diarrhoea and both had a slight rise of temperature for a few days. Otherwise there was no effect.—I. Leitch.

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4399

SEIDLER, S. Wykorzystanie gitii w żywieniu trzody chlewnej. [Use of sarpapel in swine feeding.] *Rocz. Nauk rol. [B]*, 1954, 68, 309-324. Russian and English summaries.

Experiments were made with 32 pigs in 4 groups on a ration of skimmed milk, concentrates, potato flakes, fishmeal and hay meal. On the assumption that 1 kg. sarpapel [lake sludge] was equivalent in feeding value to 100 g. concentrates, fresh sarpapel was given to groups 2, 3 and 4 at the rate of 0.5, 1.0 and 1.5 kg. daily per head, replacing equivalent amounts of concentrates. The highest rate of growth and the best feed utilisation were obtained in group 3. There was no difference between groups in carcase quality. The meat of the pigs given sarpapel took up water slowly and difficulty was experienced in the production of sausage. (From summary.)—J. S. Thomson.

4400

GONZÁLEZ-CHAPEL, A. and CARLO, I. Control of factors increasing the preweaning mortality of swine in Puerto Rico. *J. Agric. Univ. Puerto Rico*, 1954, 38, 205-224. [Dept. Animal Husb., Agric. Exp. Stat., Univ. Puerto Rico, Río Piedras.]

A survey was made of pre-weaning mortality in a herd of 158 sows which produced 382 litters totalling 3841 pigs, of which 35.72 per cent. died before weaning or were born dead. Of the 1372 pigs which died 22.74 per cent. were born dead, 47.52 per cent. died within 1 week of birth, and only 10.06 per cent. died during the second month of the pre-weaning period. Stillbirths and congenital weakness accounted for 61.96 per cent. of the deaths, and 14.66 per cent. were killed by the sows. Of the classifiable diseases scour was the most prevalent, accounting for 4.4 per cent. of the deaths.

Mortality was lower in summer litters because the sows killed more pigs in autumn and winter, and more pigs died during the first week of life in spring, when scouring was an important cause of higher mortality.

Duroc sows farrowed more pigs and more dead pigs and also killed more pigs than Native sows, but the latter lost more pigs during the first week of life. Crossbred litters were more vigorous than purebred Durocs and fewer pigs were farrowed dead, but this hybrid vigour was not so noticeable in the Native crossbreds.

Sows that were 16 to 23 months old farrowed the smallest litters, which also had the lowest mortality. For Duroc sows the numbers of pigs farrowed increased from the first to the sixth litter, but the mortality decreased from the first to the second litter, then increased steadily in subsequent

litters and more than counterbalanced the increase in numbers born. The second litters thus gave the greatest number of pigs weaned.

In most cases the birthweight of pigs that subsequently died was smaller than the average for all pigs. Litters containing 12 or more pigs had a greater mortality during the first 4 weeks of life, not counterbalanced by a lower mortality from the fifth to eighth week. Lower birthweights may have caused the higher overall mortality in larger litters.

Multiple regression coefficients indicated that birthweight exerted relatively the most important direct effect on mortality. For Duroc sows litter number was positively correlated with litter size, which in turn was negatively correlated with birthweight. Age of dam, litter number and litter size were considered to influence pre-weaning mortality through their effect on birthweight.

I. A. M. Lucas.

4401

ALEXANDROWICZ, S., BENEDYKCIŃSKI, S. and KRAUPE, W. Produkcja prosiąt od macior-piervviastek, jednorazowo użytých do rozplodu. [The production of pigs from inipig sows used for reproduction once only.] *Rocz. Nauk rol. [B]*, 1954, 68, 283-296. [Central Board of State Fattening Centres, Lawica, Poznan.] Russian and English summaries.

It is claimed that the breeding of pigs only once, after which they can be rapidly fattened, results in increased production of meat and fat. In this way an average of 8.04 well developed pigs per sow was obtained and the amount of feed used was smaller than in farms producing pigs all the year round. This method is recommended for state farms where there is a lack of proper buildings and staff. (From summary.)

J. S. Thomson.

4402

FREDEEN, H. T., BOWMAN, G. H. and STOTHART, J. G. Appraisal of certain methods for evaluation of ham quality. Relationships between certain measurements of ham and carcass quality. *Canad. J. Agric. Sci.*, 1955, 35, 91-94; 95-99. [Dominion Exp. Stat., Lacombe, Alta.]

Data from 181 hams were used to ascertain the most accurate and practicable method of assessing their leanness and quality.

The correlation coefficients between the percentage area of lean on the proximal (open) face of the ham and the percentage lean and percentage fat in the ham were 0.933 and -0.905, respectively. These correlations were higher than others between the percentage lean and percentage fat in the ham and the percentage area of lean from a cross-section of the ham 3 inches distal to the forward

edge of the aitch bone. The percentage area of lean on the open face of the ham was of more value than the absolute area in assessing leanness. Sp. gr. was of less value.

The data strongly suggested that a tapered ham that is more evenly fleshed down to the hook is of a leaner and more desirable type than the present ideal of a plump ham, well filled in the upper portion.

Long hams, which are the leanest, carry the greatest weight of bone. The percentage area of bone on the open face of the ham was highly correlated with the percentage bone of the ham.

The gross correlations between 9 carcass measurements from 181 pigs with the scores and lean, fat and bone contents of the hams are tabulated.

The correlation coefficients between the area of the loin muscle from a cross-section taken at the level of the last rib and the percentage lean in the ham and percentage fat in the ham were 0.794 and -0.723, respectively. The correlation coefficients between measurements of backfat thickness at the shoulder, middle of the back and loin with the percentage fat in the ham were 0.375, 0.508 and 0.464, respectively. The correlations between these 3 backfat measurements with percentage lean in the ham were -0.356, -0.451 and -0.420, respectively. These 3 backfat measurements were more highly correlated with the percentage area of lean on the proximal (open) face of the ham than with the area of the loin muscle, and this was taken to indicate that the percentage area of lean on the open face of the ham is a better indication of general carcass leanness than is the area of loin muscle.

The score for the proportions by weight of the main cuts in the carcass, i.e., "balance", was not a useful measure of ham quality and accounted for only 13 per cent. of the variance in ham weight. However, the predictability of the percentage lean in the ham was 51 per cent. from loin area and 57 per cent. from the percentage lean on the open end of the ham, and a combination of these 2 measures by a multiple correlation technique raised the predictability to 72 per cent.

It is suggested that the inclusion of a measure of ham leanness in routine carcass evaluation would serve the dual purpose of providing an

objective measure of ham quality and of placing greater emphasis on the quantity of lean meat in the entire carcass.—I. A. M. Lucas.

4403

PALACIOS REMONDO, J. Ganado porcino "Baztán". Resumen de los resultados de una experiencia de alimentación controlada, llevada a cabo en un lote aborigen en "habitat" de aclimatación. [The Baztán breed of pigs. Summary of the results of a controlled feeding experiment on an aboriginal group in an adopted habitat.] *An. Inst. Invest. Vet., Madrid*, 1953, 5, 55-59. English and German summaries.

Five pigs of the Baztán breed, 2 months old and weighing 24 to 27 kg., were selected as of average type from a herd of 30. They were fed on a ration containing, per cent., whole wheat meal [salvado-harina de trigo] 40, barley 22, wheat bran [salvado-trigo] 10, beans 15, fishmeal 9, bonemeal 2, and vitamin and mineral supplement 2; the digestible protein content was 10.7 per cent.

The mean feed consumption per 100 kg. live-weight gain was 360 kg. The daily consumption per kg. gain was 2.6 kg. in the first 3 weeks, rising to 4.75 kg. between the 42nd and 70th days and then falling to 4.0 kg. up to the 92nd day. The mean daily live-weight gains in the same 3 periods were 540, 640 and 840 g., and for the whole experiment 700 g. The final liveweights were 85 to 94 kg., and the carcass yield in 3 pigs was 82 per cent.

D. Duncan.

4404

SALENO, A. Le rese alla mattazione in alcune razze suine italiane. 1. 2. [The slaughter yield of some Italian breeds of pigs. 1. 2.] *Ann. Sper. agrar.*, 1954, 8, 51-75; 401-430. [Int. Sper. Zootec., Rome.] English summary.

A brief account of the pig industry in Italy is given. Tables and histograms are presented of the liveweight, dressing percentage, carcass weight, percentages of fat, lean and bone and viscera and some carcass measurements of 13 breeds most commonly found in Italy. The breeds, sexes and grades are compared.—T. D. Bell.

See also Absts. 3443, 3673, 3997.

GOATS, RABBITS AND OTHER MAMMALS

4405

THÉRET, M. Influence de l'administration d'oligo-éléments minéraux à des chiennes gestantes et à des chiots avant le sevrage, sur la lactation des mères et la croissance des jeunes. [Effect on lactation and on the growth of the young

of giving mineral trace elements to pregnant bitches and to the puppies before weaning.] *Bull. Acad. vét. France*, 1954, 27, 397-401.

In young German mastiffs a tendency to rickets was often seen, the relation of which to mild mineral deficiency was investigated by giving a solution

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containing in mg. per litre Fe 0.1, Mn 1.5, Cu 0.01, Mg 0.02, Zn 0.001 and Ca 0.05 to 3 bitches and to some of their young. No notable change was seen during gestation, but lactation was improved and prolonged. The pups which had the mineral mixture grew rapidly between the third and fourth week. The improvement in both mother and young which resulted from giving the trace elements was considered highly important for successful rearing of these large dogs.

A. M. Copping.

4406

VVEDENSKAYA, A. E. Sezonnnye izmeneniya v ispol'zovanii korma serebristochernymi lisitzami. [Seasonal changes in the utilisation of feed by silver foxes.] *Karakul. i Zver.*, 1954, 7, No. 4, 35-38.

Foxes utilise protein better in the summer and fats and carbohydrates in the autumn, since they need to lay up a store of fat for the winter when they may have to endure long periods of starvation. This accumulation of protein in the summer and fat in the winter was independent of the level of nutrition and the protein content of the ration. A decrease in the protein content of a ration providing adequate energy reduced the digestibility of all nutrients at all seasons.

H. Scherbatoff.

4407

ROMANOVSKII, D. M. Krolikovodstvo (iz opyta raboty nauchno-issledovatel'skogo instituta krolikovodstva i zverovodstva). [Rabbit rearing (from the experience of the Scientific Research Institute of Rabbit and Animal Rearing).] *Priroda*, 1954, No. 5, 56-62. [Sci. Res. Inst. Rabbit and Animal Rearing.]

The most valuable components of rabbit meat are the nitrogenous compounds. The protein content of rabbit meat is 21.47 per cent.; that of average beef is 20.58, fat mutton 16.36, poultry 19.3, fat pork 14.54, lean pork 20.08 per cent. The fat content of rabbit meat varies between 8 and 19 per cent. The quality depends on the time of year, the best being after the end of the autumn moult and before the onset of the winter frosts. Carcase weight is about 50 to 60 per cent. of liveweight and in well fed rabbits is up to 70 per cent. and more.

Rabbit's milk contains 10 to 20 per cent. protein, 14 to 26 per cent. fat and about 2.5 per cent. mineral matter.

A doe of 4 kg. liveweight should receive during the winter 135 feed units (1 feed unit being the

feeding value of 1 g. oats) and 10 g. digestible protein; during the lactation period these amounts should be increased up to 345 feed units and 35 g. digestible protein. Young rabbits of 1 to 5 months should receive 100 to 200 feed units and 10 to 19 g. digestible protein. The daily ration is worked out according to these standards. Thus an adult rabbit of 4 kg. liveweight would receive in winter 150 to 200 g. hay, 200 to 250 g. succulent foods, i.e., carrots, beet, turnips, potatoes, 30 to 40 g. concentrates. During lactation the amounts of succulent foods and concentrates would be doubled. Young rabbits of 1 to 5 months are given hay in winter, 50 to 200 g. according to age, 110 to 300 g. succulent foods and 30 to 40 g. concentrates. Green food (good leafy grass) is the best food for rabbits in summer, hay in winter. Rabbits also eat twigs such as those of acacia and maple. The best concentrates are oats; maize, barley, peas, soya and bran can also be given.

Adults should be fed 3 to 4 times a day, young rabbits 5 to 6 times. Bran should be moistened or, better, mixed with root vegetables. Vitamins, such as are found in green food, are important for rabbits, particularly those in legumes, red carrots, good hay which has retained its green colour, and sprouted oats.—H. Scherbatoff.

4408

HUANG, T. C., ULRICH, H. E. and McCAY, C. M. Antibiotics, growth, food utilization and the use of chromic oxide in studies with rabbits. *J. Nutrition*, 1954, 54, 621-630. [Dept. Animal Husb., Animal Nutrit. Lab., Cornell Univ., Ithaca, N.Y.]

Neither terramycin, nor aureomycin with vitamin B₁₂, as a supplement at the levels usually given to other animals stimulated the growth of rabbits given a standard pelleted ration, or a purified ration with 25 per cent. casein or 24.7 per cent. soya protein plus 0.5 per cent. methionine. Even when the casein was reduced to 10 per cent., with or without nicotinic acid, a diet insufficient to meet the requirements for growth, terramycin did not give any improvement.

Chromic acid was a suitable indicator for digestibility trials when a 5-day preliminary period was allowed.

The utilisation of protein and dry matter was improved by refection. Crude fibre was digested and vitamin B₁₂ synthesised in the caecum.

In these trials rabbits required 2.7 g. dry matter intake to produce 1 g. liveweight increase from weaning to 6 weeks of age or 3.7 g. from weaning to 12 weeks.—T. D. Bell.

POULTRY

GROWTH AND FATTENING

4409

BOLTON, W. Factors affecting the efficiency of food conversion in poultry. *Proc. Nutrition Soc.*, 1955, 14, 23-32. [Poultry Res. Centre, Edinburgh 9.]

4410

BENTON, D. A., HARPER, A. E. and ELVEHJEM, C. A. The need for supplemental tryptophan in semi-purified diet for chicks. *Poultry Sci.*, 1954, 33, 1279-1280. [Dept. Biochem., Univ. Wisconsin, Madison.]

In earlier studies (Abst. 3015, Vol. 25) it was demonstrated that chicks on a semi-purified diet containing 18 per cent. casein and 10 per cent. gelatine as the protein sources and sucrose as the sole source of carbohydrate grew at a sub-optimum rate, and that growth could be improved either by increasing the proportion of casein in the ration or by using dextrin in place of sucrose.

In further trials chicks receiving the "sucrose plus 18 per cent. casein" diet weighed 279 g. at 4 weeks of age, and others that received the same ration supplemented with 0.2 per cent. of DL-tryptophan had a significantly higher mean weight of 333 g. Chicks that received a "sucrose plus 25 per cent. casein" ration alone, and with added tryptophan, weighed 352 and 339 g., respectively.

It is concluded that biological estimations of "unknown growth factors" in crude materials may be invalidated by the contribution of tryptophan from the materials where basal rations of the "sucrose plus 18 per cent. casein" type are used.—K. J. Carpenter.

4411

KLAIN, G. J., HILL, D. C. and SLINGER, S. J. Supplementation of poult diets with lysine. *Poultry Sci.*, 1954, 33, 1280-1282. [Dept. Nutrit., Ontario Agric. Coll., Guelph.]

Four groups, each of 10 poults, were fed from hatching to 4 weeks of age on a ration of soya bean oilmeal 19, fishmeal 2.5, meatmeal 2, dried buttermilk 2, minerals 5.26, tallow 1, vitamin supplements, procaine penicillin, 3-nitro-4-hydroxy-phenylarsonic acid, DL-methionine 0.115, maize-meal 15 and ground wheat to 100. Their mean finishing weight was 473 g., and 70 per cent. showed the white feathering believed to be characteristic of lysine deficiency. Parallel groups received the same ration supplemented with 0.68 per cent. L-lysine hydrochloride and their mean weight was 587 g.

These rations contained 21.8 per cent. crude

protein; similar rations containing additional soya bean meal to raise the crude protein content to 25.5 per cent. and with only 0.065 per cent. added methionine gave birds weighing about 600 g., both when no lysine was added and when a supplement of 0.29 per cent. was included. Finally, poults on a ration containing sufficient soya bean meal, added at the expense of wheat, to raise the crude protein content to 28.8 per cent. and with only 0.025 per cent. of added methionine, had a mean weight at 4 weeks of 625 g. This high-protein ration was found on analysis to contain approximately 1.75 per cent. lysine, which was also the level of total lysine in the 2 rations of lower protein content that were supplemented with this amino-acid.—K. J. Carpenter.

4412

MILLER, E. C., SUNDE, M. L., BIRD, H. R. and ELVEHJEM, C. A. The isoleucine requirement of the laying hen. *Poultry Sci.*, 1954, 33, 1201-1209. [Dept. Poultry Husb., Univ. Wisconsin, Madison 6.]

Four White Leghorn pullets were housed in laying cages and given a ration of bloodmeal 23, glycine 1, L-arginine 0.25, DL-methionine 0.1, condensed fish solubles 1, minerals 5, oil 3, vitamins and dextrin to 100, which was calculated to contain 0.28 per cent. L-isoleucine. This group stopped laying completely within 2 weeks. A second group that received the same ration supplemented with 0.6 per cent. DL-isoleucine continued to lay for 8 weeks, but only at a much reduced rate.

In further trials, groups of birds received another ration, of bloodmeal 11.75, ground wheat 20, ground maize 20, wheat bran 10, lucerne meal 4, glycine 0.8, L-tyrosine 1, L-arginine 0.2, oil 3.5, minerals 5, vitamins and dextrin to 100, calculated to contain 0.4 per cent. L-isoleucine (although only 0.33 per cent. was found by microbiological estimation). These birds also showed a severe decline in egg production over a 7-week experimental period. Yet, 2 groups that received the same ration supplemented with 0.4 per cent. DL-isoleucine continued to give 70 per cent. production, and they did not lose weight heavily, as did the groups that received the ration without supplement; 0.3 per cent. isoleucine appeared to be only slightly less effective, but 0.2 per cent. was inadequate.

All the pullets were artificially inseminated and a study of hatchability indicated that this was not significantly reduced when the rations were inadequate for a normal rate of egg production. The chicks grew normally after hatching.

K. J. Carpenter.

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4413

HOHLS, H. W. Über Küken-Fütterungsversuche zur Bestimmung der biologischen Wertigkeit von Eiweiss und deren Abhängigkeit vom Alter der Versuchstiere. [Chick feeding experiments to estimate the biological value of protein and its dependence on the age of the experimental animals.] *Arch. Geflügelk.*, 1955, 19, 1-12. [Bundesforschungsanst. Kleintierzucht, Celle.] English summary.

In all, 35 groups each of 20 day-old chickens were fed for 5 to 8 weeks on 12 different diets. Two diets contained 16 per cent. plant protein with or without 2 g. penicillin per ton; 3 contained 14 per cent. plant and 2 per cent. animal protein, with 0, 2 or 5 g. penicillin per ton; 4 contained 11 per cent. plant and 5 per cent. animal protein, with 0, 2, 5 or 8 g. penicillin per ton; and 3 contained 8 per cent. plant and 8 per cent. animal protein, with 0, 2 or 5 g. penicillin per ton. The biological value of the protein in each ration was estimated at intervals.

With all the proportions of plant and animal protein the biological value was less after 8 weeks than initially, but the fall was not always continuous. The initial value was sometimes as high as 100 per cent., but the data for the first week were omitted because of the utilisation of yolk sac protein at that time.—D. Duncan.

4414

BRELY, J. and MARCH, B. Fat studies in poultry. 2. Fat supplements in chick and poultr rations. *Poultry Sci.*, 1954, 33, 1220-1227. [Poultry Nutrit. Lab., Univ. British Columbia, Vancouver.]

New Hampshire chicks were reared to 6 weeks of age on a control ration of fishmeal 9, dried liver 3, dried brewer's yeast 2, soya bean oilmeal 18, mineral, vitamin and antibiotic supplements and equal parts of ground maize and wheat to a total of 93 parts. The mean finishing weight of these birds (males and females) was 702 g. Further groups that received 93 parts of the control ration and 7 parts of either cellulose, tallow or maize starch had mean weights of 679, 698 and 687 g., respectively. The feed to gain ratios on the control and the supplemented rations were 2.21, 2.22, 1.90 and 2.06, respectively.

In a second trial where the birds were reared to 7 weeks of age, groups that received the supplemented rations containing either maize starch or tallow finished at 784 and 796 g., respectively. Parallel groups received similar rations but with the protein content raised from 24 to 29 per cent. by the addition of 6 parts of soya bean oilmeal and 3 parts of fishmeal at the expense of the maize and wheat. These groups had mean finishing weights of 817 g. with maize starch and 850 g.

with tallow. In further groups where the protein content of the rations had been reduced to 19 per cent. the addition of tallow appeared to have a depressing effect on growth.

In a further experiment turkey poults were fed from hatching to 10 weeks of age on a series of experimental rations. The control diet contained 28 per cent. protein: it was of a type similar to that used with the chicks but contained 23 per cent. of animal by-products. The males receiving this ration had a finishing weight of 2550 g. and the females 1860 g. Parallel groups that received a 32 per cent. protein ration for the first 2 weeks and were changed to 29, 26, 23 and 20 per cent. protein rations at 2, 4, 6 and 8 weeks of age finished only 4 per cent. lighter in weight than those on the first ration. The addition of 2, 4, 6 and 8 per cent. tallow to the latter rations in the successive stages did not result in any stimulation of growth, but was accompanied by a 5 per cent. improvement in feed conversion efficiency. The incorporation of tallow at these levels in a series of rations all containing 32 per cent. protein, and in another experiment in rations containing 28 per cent. protein, had no consistent effect in improving either growth rate or efficiency of feed conversion.

K. J. Carpenter.

4415

WILGUS, H. S. (Jr.), GASSNER, F. X., PATTON, A. R. and HARSHFIELD, G. S. The iodine requirements of chickens. *Colorado Agric. Exp. Stat. Tech. Bull.* No. 49, May 1953, pp. 81. [Fort Collins, Colo.]

A series of experiments were made through successive generations. Growth, efficiency of feed utilisation, mortality, egg production, egg weight, egg quality, fertility, hatchability, behaviour of offspring and thyroid weight, histology and iodine content were studied.

Goitre, which was most critically indicated by thyroid histology, was the main effect of I deficiency, but even severe goitre did not necessarily cause impaired behaviour, appearance or efficiency of feed utilisation.

The minimum requirements for I were 0.5, 0.1 to 0.5 and 0.5 mg. per lb. feed for growing chickens, laying hens and breeding hens, respectively, but the tolerance for I was high, at least 227 mg. per lb. feed for growth to 6 weeks, 81.8 mg. for growth to maturity and for egg production, and 22.7 mg. for hatchability. The use of iodinated casein in excessive amounts stimulated feather development, but impaired hatchability, efficiency of feed utilisation and the quality and viability of the chickens hatched.

As a practical recommendation it is suggested that rations should contain at least 0.5 mg. and preferably 0.75 to 1.0 mg. I per lb.—T. D. Bell.

4416

FRÖLICH, A. Effectiveness of DL-methionine in overcoming the deleterious effects of insufficiently heated soybean oil meal to growing chicks. *Acta Agric. scand.*, 1954/55, 5, 3-10. [Nat. Animal Exp. Stat., Upsala.]

Two rations used for a chick feeding trial were each made up of soya bean oilmeal 16.6, sunflower seed oilmeal 4, lucerne meal 4, minerals 4.1, oils rich in vitamins A and D, vitamin supplements rich in riboflavin, nicotinic acid and vitamin B₁₂, maize meal 20.5, wheat bran 11 and grits (barley and oats) to 100; they differed in the type of soya bean meal used. Meal B had been fully heat-treated and showed no urease or antiproteolytic activity in laboratory tests; the other meal, C, had received less heating during manufacture and gave positive results in both tests.

Duplicate groups, each of 20 chicks, that had received meal B from hatching to 4 weeks of age had a mean weight gain of 200 g., those that had received meal C of 157 g. Corresponding groups that had received the rations containing either meal B or C supplemented with 0.15 per cent. DL-methionine had mean weight gains at 4 weeks of 206 and 197 g., respectively. At 8 weeks of age the chicks receiving meal C plus methionine were as heavy as those receiving meal B with or without the addition of methionine; those receiving meal C alone were significantly lighter.

In a further trial in which the meals were compared as ingredients at a lower level (10 per cent.) in a ration that also contained 6.3 per cent. fish-meal, the group receiving meal B was only 5 per cent. heavier, at 8 weeks of age, than the group that had received meal C.—K. J. Carpenter.

4417

AUXILIA, M. T. Effetto del metiltiouracile associato all'aureomicina nell'ingrassamento di giovani polli "New Hampshire". [Effect of methylthiouracil with aureomycin on the fattening of young New Hampshire chickens.] *Ann. Sper. agrar.*, 1954, 8, 1239-1245. [Centro Avicolo Sper., Turin.] English summary.

As a supplement to increase the efficiency of feed utilisation of chickens, methylthiouracil reduced appetite, so that no advantage was gained. An experiment was made with 22 New Hampshire chickens 35 days old. Half of the birds received a supplement of Aureofac and methylthiouracil. After 4 weeks these birds had reached a liveweight of about 1 kg. and had eaten 14 per cent. less feed than the control birds, which then weighed only 890 g. and took another week to reach the required weight of 1 kg.

The experimental birds had slightly more internal fat and their livers were larger and paler.

T. D. Bell.

4418

WAIBEL, P. E., ABBOTT, O. J., BAUMANN, C. A. and BIRD, H. R. Disappearance of the growth response of chicks to dietary antibiotics in an "old" environment. *Poultry Sci.*, 1954, 33, 1141-1146. [Dept. Poultry Husb., Univ. Wisconsin, Madison.]

In a series of trials over an 18-month period, groups of chicks were fed from hatching to 3 weeks of age on a ration of soya bean oilmeal 32, wheat offals 10, lucerne meal 5, minerals 2.5, choline chloride 0.2, an oil rich in vitamins A and D 0.2, riboflavin, vitamin B₁₂ and yellow maize meal to 100. The mean finishing weights of the group ranged from 132 to 221 g. Parallel groups that received the same ration supplemented with 15 mg. procaine penicillin G per kg. were from 3 to 38 per cent. heavier than the corresponding unsupplemented group.

Other groups received these rations supplemented with mixtures of the known vitamins, condensed fish solubles, a dried liver preparation, yeast and whey; but these did not affect growth significantly, and the response to penicillin was of the same order as with the less complex ration.

Rather faster growth was obtained with a semi-purified ration containing casein, gelatine and dextrin with mineral and vitamin supplements, the mean finishing weight being about 240 g. without penicillin, and 2 to 22 per cent. higher with it.

Over a further period of 12 months in which generally similar, though not exactly corresponding, rations were given in the same room and with the same equipment, there was no consistent tendency for procaine penicillin to stimulate growth. In general it seemed that the rations without penicillin at this time gave mean weights of the order of those previously obtained only with the addition of the antibiotic. It is suggested that this may have been due to a modification of the microbial flora of the room over the period of the trials. The results contrast with those reported elsewhere in which the response to antibiotics in a house not previously used for poultry has generally increased as successive trials were carried through.

K. J. Carpenter.

4419

HOHLS, H. W. Die wachstumsfördernde Wirkung des Penicillins bei der Kükenaufzucht. [Growth-accelerating action of penicillin in chicks.] *Arch. Geflügelk.*, 1954, 18, 304-326. [Bundesforschungsanst. Kleintierzucht, Celle.] English summary.

Four trials are reported, over periods ranging from 37 to 57 days, with, in all, 35 groups of 20 Leghorn chicks, reared on wire floors. In the first, 2 or 14.5 g. penicillin per metric ton was added to a basal all-vegetable ration, with crude protein

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content 12.6 per cent., of ground sweet lupins 25, ground sugar beet slices 20, finely ground oats 20, wheat bran 12, ground wheat 10, ground barley 10, and minerals, including trace elements Fe, Cu, Mn and Co, 3 per cent. In the second, the basal ration was the same except that sugar beet slices were replaced by potato slices, reducing the crude protein to 11.3 per cent., and vitamins A and D were added as 9 g. Dohyfral A + D₃ per 50 kg. feed. To this was added 2 g. penicillin with or without 2 mg. vitamin B₁₂, or twice these amounts, per metric ton. In the third, there were 4 basal rations, with crude protein contents ranging from 16.8 to 15.4 per cent., an all-vegetable one of ground soya grits 23, ground husked oats 15, ground maize 15, ground husked barley 15, ground wheat 13, wheatfeed 10, lucerne meal 4, wheat germ 2, minerals 3 and vitamins as in series 2, and 3 with 2, 5 or 8 per cent. animal protein from cod meal and less soya grits and more wheatmeal and ground wheat. To these were added, respectively, 2; 2 or 5; 2, 5 or 8; and 2 or 5 g. penicillin per metric ton. Trial 4 was a repeat of trial 3. In all trials there was a control group on commercial feed.

The final weights are tabulated. None of the groups equalled those on commercial feed; only those with the 2 highest levels of animal protein were comparable. Penicillin improved the all-vegetable rations, less when vitamin B₁₂ was added. With rations containing animal protein the results were variable and in some groups the effect was nil or even adverse. The effect of penicillin was less, but more consistent, as the proportion of animal protein increased. As was found by workers in the U.S. (see e.g., Absts. 2506, 5294, Vol. 23) the variations were associated with differences in feed intake. The differences in feed intake were partly ascribed to chance and partly to different amounts of animal protein in the ration (Hohls, *Deutsch. Kleintier-Züchter*, 1954, No. 5, 3) but it was thought that there was a real effect of penicillin on feed intake.

More careful study pointed to an effect of penicillin also on intermediary metabolism through an increase in the biological value of protein. Respiratory quotient measurements made twice a week by the author's method (Abst. 4702, Vol. 24) showed a reduction of net energy required per g. weight gain when 2 g. penicillin per ton was added to the ration with 2 per cent. animal protein and a greater reduction with 5 g. penicillin; with 5 per cent. animal protein this effect was not found. The data also showed an increase in biological value of the protein as the proportion of animal protein increased. Since neither effect increases indefinitely, it is considered that this explains why the effect of penicillin decreases as the proportion of animal protein increases.—W. M. Deans.

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4420

WHITE-STEVENS, R. and ZEIBEL, H. G. The effect of chlortetracycline (aureomycin) on the growth efficiency of broilers in the presence of chronic respiratory disease. *Poultry Sci.*, 1954, 33, 1164-1174. [Res. Div., American Cyanamid Co., Pearl River, N.Y.]

In a series of practical trials, with about 1000 birds per group, meat-type chicks were reared to 12 weeks of age under conditions where chronic respiratory disease was established.

In one case, when the control birds received a practical ration containing 4 g. procaine penicillin per ton, mortality was 11 per cent. and the mean finishing weight of the survivors was 2.9 lb. Birds in groups that had received the same ration supplemented with 100 g. aureomycin hydrochloride per ton had only 3 per cent. mortality and weighed 3.1 lb.

In another, when high levels of aureomycin began only at 6 weeks of age after an outbreak of disease had become evident, control birds had 11 per cent. mortality and a finishing weight of 3.3 lb. Others that received 100 or 200 g. aureomycin hydrochloride per ton mash had 6 and 5 per cent. mortality, and weighed 3.3 and 3.5 lb., respectively. Similar or slightly better results were obtained with 400 g. per ton mash for 14 days and then continuing at the level of 100 g. per ton, or alternatively of adding aureomycin to the drinking water only at the rate of 250 mg. per gal. for 14 days.

In other trials there was no outward sign of the disease until the birds were 10 weeks old. Up to this time birds receiving the ration supplemented with 50 g. aureomycin per ton of their ration and in addition having their drinking water fortified with 250 mg. aureomycin per gal. were no heavier than those that received aureomycin only in their ration; but when the disease became epidemic those receiving the fortified drinking water were the less affected.—K. J. Carpenter.

4421

MILLER, I. C. Antibiotics in poultry nutrition. A review of recent research work. *J. Agric. W. Austral.*, 1954, 3, 695-699.

4422

ABBOTT, O. J., BIRD, H. R. and CRAVENS, W. W. Effects of dietary arsanilic acid on chicks. *Poultry Sci.*, 1954, 33, 1245-1253. [Dept. Poultry Husb., Univ. Wisconsin, Madison.]

Over a period of 17 months successive trials were made in the same rearing house, with cleaning and disinfection in the intervals. In each trial control chicks were reared to 3 weeks of age on a constant basal ration of soya bean oilmeal 36 parts, mineral supplements 6.5, vitamins and maize meal to 100.

In the first trial the control chicks finished with a mean weight of 129 g.; those that received the basal ration supplemented with 10 mg. procaine penicillin per kg. were 19 per cent. heavier, and those that received the basal ration supplemented with 30, 60 and 90 mg. arsenilic acid per kg. were, respectively, 21, 32 and 11 per cent. heavier than the controls. The same order of response to these supplements was not obtained in later trials, and in the second half of the series the mean weights of the groups receiving either procaine penicillin or arsenilic acid were always within the range of 97 to 105 per cent. of the weight of the control birds.

In a separate series of chick growth trials, in which a semi-purified diet was used, with casein and gelatine as the protein sources and dextrin as the source of carbohydrate, it is stated that the addition of either 20 or 90 mg. arsenilic acid per kg. to the ration reduced to some extent the vitamin B₁ deficiency of chicks receiving the ration unsupplemented, i.e., with a vitamin B₁ content of only 1.2 mg. per kg. Procaine penicillin had the same effect as arsenilic acid.

Lastly, in toxicity trials, arsenilic acid was given as a supplement, at different levels, to a soya bean and maize meal ration of the type used in the first series of trials. A level of 500 mg. per kg. in the ration had no effect on chick growth in 70 days, although there was no evidence of the growth stimulation observed with lower levels of the drug. With 1500 mg. arsenilic acid per kg. ration growth was severely depressed and with 2000 mg. per kg. there was high mortality, mostly in the first fortnight. The toxic signs resembled those seen in vitamin B₁ deficiency, except that the chicks retained their appetite.—K. J. Carpenter.

4423

LORENZ, F. W. Effects of estrogens on domestic fowl and applications in the poultry industry. *Vitamins and Hormones*, 1954, 12, 235-275. [Dept. Poultry Husb., Univ. California, Davis.]

4424

KLIESCH, J. and BORMANN, G. Untersuchungen über die Wirtschaftlichkeit der Hähnchenkastration bei Anwendung der hormonalen Kastration. [Economics of rearing cockerels when hormonal castration is used.] *Arch. Geflügelk.*, 1954, 18, 469-486. [Inst. Tierzücht., Tech. Univ., Berlin.] English summary.

World literature is reviewed. An 8-week experiment made in 1952 is described, with 3 groups of 90 Leghorn cockerels, 8, 10 and 12 weeks old, each divided into 3 sub-groups for comparison of 3 different hormone preparations, and an untreated group of 30. They were self-fed on commercial

poultry meals, with grain, carrots and a daily wet mash of cooked potatoes, wheat bran, ground oats, chopped green feed and sour skimmed milk, but were not specially fattened.

Weight gains were only slightly increased by treatment, but breast development and tenderness of flesh were improved. Studies on the nature of the effect of hormone treatment on the flesh are in progress. The average feed consumption per bird over 16 weeks was 4.6 kg. mixed feed and grains and 2.4 kg. potatoes, and the average final live-weight was 1395 g. in the group treated at 8 weeks. The day-old cockerels cost 0.20 DM., feed 2.76 DM., electric heating 0.12 DM. and labour 0.30 DM., and hormone treatment 0.50 DM. per bird. The selling prices in Berlin were 4.55 and 5.50 DM. and profits per bird 1.17 and 1.62 DM. for untreated and treated birds, respectively. It is concluded that hormone treatment is commercially worth while in feeding the 15 to 18 million cockerels, mainly of the Leghorn and Italian breeds, yearly produced in Western Germany.

W. M. Deans.

4425

HELDER, J. F., FRINGS, H. M. K. and UBBELS, P. Zetmeelhoudend weipoeder in opfokvoeder voor kuikens. [Starchy dried whey in a chick starting mash.] *Rijksinst. Pluimveeteelt, Beekbergen, Med.* No. 55, pp. 8. English summary.

To make use of whey from which lactose has been removed, an equal weight of barley meal is added and the mixture is dried on rollers and ground. To equalise protein intake when it is compared with dried whey, 0.6 per cent. herringmeal is added to the ordinary whey.

The test was made with 18 groups of 20 North Holland Blue chicks in batteries on mesh floors. The starting mash was of meals, buckwheat, barley, yellow maize, oats, wheat, sesame and sunflower seed, herringmeal, dried whey of the different sorts, brewer's yeast, vitamins A and D₃, minerals and iodised salt. Mean weights at 10 weeks were for cocks on ordinary whey, 1291 ± 13.5 g., on starch-whey 1306 ± 13.5 g. and for hens 1173 ± 13.9 and 1193 ± 14.3 g.—I. Leitch.

4426

KLEIN, F. W. and BARLÖWEN, G. v. Tapiokamehl im Aufzuchtfutter. [Tapioca meal in the rearing ration.] *Arch. Geflügelk.*, 1954, 18, 415-428. [Lehranst. Kleintierzucht, Ki.-S.] Steenbek.] English summary.

Two trials were made with tapioca meal of Eng.-following percentage composition: moisture ash 1.3, crude protein 1.3, crude fat 0.1 ranging fibre 1.4, nitrogen-free extract 81.7. aps of 20

Four groups of 30 day-old chicks were. In the 8 weeks on a basal all-mash ration 0 was added ground maize 30, ground wheat 30, wide protein

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15, lucerne meal 3, dried yeast 3, cod meal 8, soya grits 8, calcium carbonate 1.2, calcium phosphate 1.2, salt 0.6, Dohytral extra A + D₃ 0.02, manganese sulphate 0.025 per cent., or the same with the maize and wheat equally reduced and 10, 20 or 40 per cent. of tapioca meal replacing them. The digestible protein contents of the rations were 16.54, 15.77, 14.98 and 13.42 per cent. The mean weights at 8 weeks were 529.7, 474.3, 409.1 and 431.0 g., respectively. Feed intake and efficiency of feed utilisation were reduced by the tapioca meal.

In the second trial New Hampshire chicks had a basal ration as before except that the bran was replaced by wheat feed, and in the experimental groups more wheat feed was given so as to compensate for the low protein content of the tapioca meal. This time the weights at 8 weeks were 676.0, 634.0, 588.5 and 456.0 g., respectively. Feed intake was reduced in the groups given 20 or 40 per cent. tapioca meal; efficiency of feed utilisation was only slightly affected.

It is concluded that tapioca meal contains something which reduces feed intake and that not more than 10 per cent. should be included in chick rations and special care should be given to the balancing of the ration.—W. M. Deans.

4427

WEETH, H. J. and ROSENBERG, M. M. Effect of cane final molasses on certain cations in the serum and bones of chicks. *Poultry Sci.*, 1954, **33**, 1135-1140. [Dept. Animal Husb., Univ. Hawaii, Honolulu.]

Tests are reported on the effects of feeding to chickens a sample of blackstrap molasses containing 9.9 per cent. ash, 0.22 per cent. Ca, 0.39 per cent. Mg and 3.30 per cent. K.

Control chicks received either ration 1, of herringmeal 7, soya bean oilmeal 22.5, lucerne meal 3, bonemeal 1.5, salt 0.5, vitamins, aureomycin and yellow maize meal to 100; or ration 2, of similar composition, but with 0.5 per cent. ground oyster shell and an additional 0.5 per cent. bonemeal to give a higher level of Ca. The test ration, 3, was of herringmeal 9, soya bean oilmeal 24, lucerne meal 3, blackstrap molasses 23, bagasse pith 2.3, bonemeal 0.5, vitamins and aureomycin (as before) and yellow maize meal to 100. Ration 4 was similar but had the extra mineral supplements described for ration 2. All 4 rations were fed to appetite to duplicate per cent. of chicks under constant illumination from The egg for 21 days.

The weight gains on the 4 rations were 226, protein and 219 g., respectively. Serum samples indefinite on the 4 rations gave 2.3, 2.3, 2.7 and the effect per cent. Mg, 2.3, 2.2, 2.5 and 2.5 p.p.m. of animal 1.3, 10.6 and 10.8 mg. per cent. Ca.

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At the end of the trial the right tibiotarsus bone was dissected from each bird, dried, ashed and analysed for Ca. The overall mean dry weight was 840 mg. with 47 per cent. of ash and 17 per cent. of Ca, and the use of molasses had no effect on these values.

It was concluded that the use of molasses, as in this experiment, had no harmful effect on Ca metabolism, despite the slight rise in serum Mg and K.—K. J. Carpenter.

4428

ACKERSON, C. W. and MUSSEHL, F. E. The utilization of food elements by growing chicks. 15. The substitution of Korean lespedeza seed for soybean oil meal in chick rations. *Poultry Sci.*, 1954, **33**, 1228-1229. [Dept. Biochem., Univ. Nebraska, Lincoln.]

A group of 16 chicks was fed from hatching on a 900-g. batch of a pelleted ration made up of soya bean oilmeal 22, meat scraps 5, lucerne meal 2, condensed fish solubles 2, maize gluten meal 10, mineral and vitamin supplements and yellow maize meal to 100, and containing 23.5 per cent. crude protein. The birds ate this quantity of feed in just over 5 weeks and then had a mean liveweight of 453 g.

Two further groups received similar rations with 10 and 20 per cent., respectively, of raw ground Korean lespedeza meal, added in each case at the expense of soya bean oilmeal. Their performance did not differ significantly from that of the birds in the first group.—K. J. Carpenter.

4429

DOW, D. S. and ALLEN, C. E. Rapeseed oil meal in broiler rations with observations on the nature and control of its metabolic inhibitors. *Canad. J. Agric. Sci.*, 1954, **34**, 607-613. [Chem. Div., Sci. Serv., Canada Dept. Agric., Ottawa.]

Chicks fed from hatching to 12 weeks of age on a control ration of soya bean oilmeal 11, fishmeal 8, meat-and-bone meal 8, minerals 0.5, choline, nicotinic acid, vitamins A, B₁₂ and D, sulphaguanoxaline, procaine penicillin, ground wheat 32 and maize meal to 100, finished with a mean weight of 1915 g. Further birds that received an experimental ration of similar composition, but with rapeseed oilmeal in place of soya bean oilmeal, finished with a mean weight of 1868 g., which was not significantly different from that of the control birds. There was no difference in the grading for carcass quality of the birds from the 2 treatments, nor was thyroid function affected by the use of rapeseed meal, so far as could be judged by laboratory tests.

The 2 rations used each contained 3 p.p.m. of iodine, mostly from the fishmeal. Other trials

were made in which higher levels of I were included in rations containing rapeseed meal, but there was no evidence that this had any beneficial effect.—K. J. Carpenter.

4430

JACOBS, R. L., ELAM, J. F., FOWLER, J. and COUCH, J. R. An unidentified chick-growth factor found in litter. *J. Nutrition*, 1954, **54**, 417-426. [Dept. Biochem., Texas Agric. and Mech. Coll. System, College Station.]

Chicks were reared from hatching to 10 weeks of age on a basal ration of soya bean oilmeal 35, mineral supplements 4, riboflavin, nicotinic acid, pantothenic acid, choline chloride, vitamins A, B₁₂ and D₃ and yellow maize to 100. Their mean finishing weight was 1114 g. Others that received the same ration supplemented with 3 per cent. condensed fish solubles weighed 1255 g.

Further groups received the basal ration supplemented with 8 ml. per lb. of an autoclaved "litter extract" that had been prepared by filtering a 35 per cent. aqueous suspension of old poultry litter through cheesecloth and then autoclaving the filtrate for 15 min. at a pressure of 15 lb. per sq. in. These chicks finished with a mean weight of 1308 g. No further stimulation of growth was obtained when fish solubles and "litter extract" were given together. Growth was, however, faster with all treatments when antibiotics were added to the rations as an additional stimulant.

The droppings from the chicks that had had antibiotics showed a lower content of clostridia than those from chicks that had had the basal ration alone. The autoclaved "litter extract" did not have this effect, nor did the extract show antibiotic activity in tests with sensitive micro-organisms.—K. J. Carpenter.

4431

OLLIVERI PETIVA, C. Influenza della lettiera permanente su l'accrescimento e la mortalità dei pulcini. [The effect of deep litter on the growth and mortality of chickens.] *Ann. Sper. agrar.*, 1954, **3**, 1415-1430. [Ist. Zootec. Cascar. Piedmont, Turin.] English summary.

Four groups of White Leghorn chickens were reared on deep litter. For 2 groups the litter was renewed every week. One group in each pair had a ration containing fish and meatmeal, and the other skimmed milk powder. The permanent litter was better for growth, particularly in the group getting skimmed milk, but mortality was higher on the permanent than on the renewed litter.—T. D. Bell.

4432

MORIMOTO, H., YOSHIDA, M., HOSHII, H. and KUBOTA, D. [Nutritive value of wood yeast

for poultry feeding.] *Bull. Nat. Inst. Agric. Sci. Japan* [G], 1954, No. 9, 133-140. In Japanese: English summary.

Wood yeast, *Mycotorula japonica*, when given as 2 per cent. of the diet of laying hens had no effect on egg production or on digestibility of the feed. Normal growth in chickens was obtained when 12 or 20 per cent. of the yeast was incorporated in the ration at the expense of soya bean meal. (From summary.)—J. S. Thomson.

4433

MORIMOTO, H., YOSHIDA, M., HOSHII, H. and KUBOTA, D. [Nutritive value of Koji feed for poultry feeding.] *Bull. Nat. Inst. Agric. Sci., Japan* [G], 1954, No. 9, 125-131. In Japanese: English summary.

Koji feed is a product of the cultivation of *Aspergillus oryzae* on starch pulp, a by-product in the manufacture of starch from sweet potato, with the addition of ammonium sulphate as a source of N. It contains about 11 per cent. crude protein and up to 60 per cent. N-free extract and has a composition similar to that of wheat bran. Chickens grew well when up to 35 per cent. was substituted for cereal brans. With 25 per cent. of Koji feed in the laying ration egg production was good. (From summary).

J. S. Thomson.

4434

HØIE, J. and SANDVIK, Ø. Forsøk med ulike mengder koksalt i føret til kyllinger og høner. [Experiments with different levels of common salt in the rations of chicks and laying hens.] *Meld. Norges Landbrukshøgsk.*, 1954, **34**, 501-524. [Inst. Poultry Fur Animals, Agric. Coll. Norway, Vollebekk.] English summary.

In 1951 a group of white Italian chicks grew slowly, were small at 2 weeks and later unthrifty. They had digestive disturbances and many died. Feathering was slow and the development of secondary sex characters late, so that the sexes could not be distinguished at 4 weeks. Addition of NaCl to the ration, which contained only 0.18 per cent., gave an immediate response.

After this, 7 experiments were made with day-old chicks and 1 with 6-week-old cocks. The chicks had a normal starter meal except that it contained only 0.2 per cent. NaCl, as computed from Na and Cl. Weight increase improved with added salt up to 0.59 and 0.94 per cent. but there may have been retention of water at these levels. The basal diet, containing 0.2 per cent. NaCl, produced pica. In another trial, 4 per cent. salt caused thirst and produced soft droppings but no other evidence of damage. In a third trial 6.2 per cent. salt gave high mortality and oedematous

carcasses, in a fourth, 2.5 per cent. salt gave better weight gain than 0.5 per cent. but 5.5 and 8.5 per cent. were too high.

In 6-week-old chicks given 6.3 per cent. salt appetite was below normal but there was no sign of damage with 4.3 per cent.

Two further trials showed that deficiency of NaCl is deficiency of Na, not of Cl nor of both, and that the higher percentages of NaCl do reduce the dry matter of carcasses.

The final trial was with 6 groups each of 2 laying hens. Salt in feed varied from 0.5 to 6.5 per cent. Most eggs were laid at 3.5 per cent. At all levels above 0.5 per cent. droppings were soft and water consumption was high.—I. Leitch.

4435

MORRISON, M. A., SAUTER, E. A., McLAREN, B. A. and STADELMAN, W. J. **Some factors affecting yield and acceptability of chicken broilers.** *Poultry Sci.*, 1954, **33**, 1122-1125. [Washington Agric. Exp. Stat., Pullman.]

Sample 12-week-old broilers from 8 different breeds or crosses were killed, dressed, eviscerated and autoclaved to allow separation of meat and bone. The mean eviscerated weight was 80.5 per cent. of the dressed weight, and edible meat formed 68.5 per cent. of the eviscerated carcass. There was no difference between the different types of birds examined.

Further birds were roasted and examined for tenderness and flavour by a consumer panel. Tenderness was also measured mechanically in terms of the force needed to shear a 1-cm. square of flesh. Again there was no significant difference between the types of birds examined.

K. J. Carpenter.

4436

SCHAIBLE, P. J., LIBBY, D. A., EVANS, R. J. and BANDEMER, S. L. **Dehydrated lettuce meal pigments broilers.** *Quart. Bull. Michigan Agric. Exp. Stat.*, 1954, **37**, 273-277. [Dept. Poultry Husb.]

See also Absts. 3296, 4008.

EGG PRODUCTION

4437

GRIMINGER, P. and SCOTT, H. M. **The effect of different cereals on feed efficiency, egg quality and shell thickness.** *Poultry Sci.*, 1954, **33**, 1217-1219. [Illinois Agric. Exp. Stat., Urbana.]

Four groups, each of 17 to 20 White Leghorn pullets, were fed in a reversal type of trial, in which they received 4 experimental rations in successive 3-week periods. In each ration 27.5 parts were made up of soya bean oilmeal 16, lucerne meal 5 and mineral, vitamin and antibiotic supplements. The remainder of the ration consisted of yellow

maize meal, ground oats, ground wheat, or a mixture of the cereals.

In the second and third weeks of each period the weights of eggs produced on the different diets were 73, 41, 79 and 72 lb., respectively. The quantities of each ration eaten were similar, being 250, 251, 268 and 264 lb., respectively, but these corresponded to calculated productive energy intakes of 235, 166, 228 and 217 lb., respectively. The low egg production on the oat ration was therefore associated with a lower intake of productive energy. The birds also lost weight while on this ration.

There was no detectable effect of diet on quality, shell thickness or weight of the eggs laid.

K. J. Carpenter.

4438

MANTEL, K. Einfluss von verschiedenen hohem Getreideanteil im Mischfutter auf Legeleistung, Züchterfolg und Wirtschaftlichkeit der Fütterung. [Effect of different levels of grains in a mixed ration on egg yield, breeding and economics of feeding.] *Arch. Geflügelk.*, 1954, **18**, 428-437. [Geflügelzüchtelanst. Erding, Obb.] English summary.

A preliminary experiment with laying hens, which is described, suggested that feed utilisation was best when the percentage of grain in the total ration was highest. Since, however, the rations differed widely, another experiment, over 350 days, was made with 4 groups each of 30 Leghorn and 30 Italian pullets. All groups had 20 g. oats in the morning and 30 g. mixed wheat and barley at night and a wet mash at mid-day. The basal mash was wheat bran 25, wheatmeal 25, Maizena 15, meatmeal 8, herringmeal 5, dried milk 2, dried yeast 2, linseed meal 5, lucerne meal 6, sugar beet shreds 5 and Vitakalk 2 per cent. The experimental groups had 15, 30 or 50 per cent. ground grain (barley and oats) and less bran, wheatmeal and Maizena. The Leghorns, but not the Italians, had artificial lighting to give a 12-hr. day in winter.

Feed intake, number of eggs produced, egg weight and efficiency of feed utilisation rose steadily with increase of the proportion of grain in the ration, with both breeds. The Leghorns did better than the Italians. The number of eggs produced in winter also rose, and the respective costs of production per 100 g. egg were 20.0, 18.8, 19.0 and 16.8 Pf. Moreover, the groups receiving more grain included more birds fulfilling the conditions for recording (175 eggs of at least 55 g.). Hence a laying mash containing 50 per cent. ground grain is recommended both for breeding and for egg production.—W. M. Deans.

4439

DYMSZA, H., BOUCHER, R. V. and MCCARTNEY, M. G. **Influence of dietary fiber and energy**

levels on reproductive performance of turkey pullets. *Poultry Sci.*, 1954, **33**, 1159-1163. [Dept. Agric. Chem., Pennsylvania State Univ., State College.]

Four groups, each of 20 turkey pullets, in colony houses with outside porches were inseminated artificially at 3-week intervals and trap-nested, and the eggs were incubated. Each group received a different ration. Ration 1 was of fishmeal 5, dried brewer's yeast 3, dried whey 2, soya bean oil meal 8.5, choline chloride 0.05, mineral and vitamin supplements 5.3, ground oat hulls 6.5 and yellow maize meal to 100. Rations 2, 3 and 4 were of similar composition but contained 23.8, 40.8 and 58 per cent., respectively, of oat hulls and 11, 13.5 and 16 per cent. of soya bean oilmeal. These 4 rations were calculated to contain 5, 10, 15 and 20 per cent. of crude fibre and 882, 670, 460 and 249 Cal. per lb. of productive energy, respectively.

In 84 days each group had a mean production of 48 eggs per head, but feed consumption was greater with the rations of lower energy content so that for rations 1 to 4 the feed conversion efficiencies (lb. feed per dozen eggs) were 11.1, 13.3, 16.3 and 21.7, respectively.

Approximately 50 per cent. of the eggs from each group proved to be fertile. Of fertile eggs the proportions hatching were 61, 49, 44 and 21 per cent. for the birds receiving rations 1 to 4, respectively.

It is concluded that although turkeys may be able to increase their consumption of a low-energy diet so that egg production is unaffected, such a ration may still be unsuitable if the eggs are to be used for hatching.—K. J. Carpenter.

4440

SKALLA, E. Der Einfluss der Fütterung auf die jahreszeitliche Verteilung der Eierproduktion. [Effect of feeding on the seasonal incidence of egg laying.] *Arch. Geflügelk.*, 1954, **18**, 327-339. [Inst. Tierzucht., Landw. Hochsch., Hohenheim.] English summary.

In this extract from a thesis, data for White Leghorn and partridge-coloured Italian hens, 1756 in all, in their first laying year in 1937-38, 1946-47 and 1948-49 are compared. All were reared at the Institute and the environment was constant, but the rations differed in composition: animal protein 7.04, vegetable protein 10.01, N-free extract 56.75, ballast 27.29 g., per hen daily in 1937-38, corresponding figures for the later periods being 3.29, 6.16, 39.14, 30.30 and 4.48, 12.85, 57.75, 26.82.

The effects on egg production are illustrated by diagrams for White Leghorns hatched in March. Annual egg production, 200 per bird in 1937-38, fell to 116.2 with the inadequate feeding of

1946-47, but rose again to 175.9 in 1948-49. The fall in winter egg production was particularly marked and there was a tendency for the natural laying cycle to re-assert itself. Those hatched in April showed an even greater fall in winter egg production. The results indicate that March hatching is desirable when feed is scanty, April hatching when it is plentiful. Individual variations were much more marked in 1946-47, except during the natural laying period; hence for selection for winter egg production, a scanty ration is recommended. Comparison of flocks for winter egg production is futile unless the feeding is the same. The Italians showed similar effects; their lower total egg production was due to lower production in winter and their egg production was more affected by adverse conditions than that of the Leghorns, but on the other hand more of the Leghorns died.

In the Italians, but not in the Leghorns, egg weight was reduced by poor feeding; it was concluded that egg weight depends primarily on genetics and only secondarily on feeding.

W. M. Deans.

4441

ARSCOTT, G. H., SWEET, G. B. and COMBS, G. F. Effect of iodinated casein in a simplified oat diet on hatchability of chicken eggs. *Poultry Sci.*, 1954, **33**, 1283-1286. [Dept. Poultry Husb., Univ. Maryland, College Park.]

For 6 weeks pullets, housed in wire-floored pens, were fed on a ration (1) made up of oat groats 93.5, DL-methionine 0.08, mineral supplements, vitamins A and D feeding oil and all the known vitamins. The 200 birds were then divided into 4 groups.

In the next 16 weeks group 1, which continued to receive the same ration, gave eggs from which, on incubation, 86 per cent. of the fertile hatched. Groups 2, 3 and 4 received the same ration supplemented with 3 per cent. condensed fish solubles, additional vitamins or additional vitamins plus 0.0135 per cent. of a xanthophyll concentrate; the corresponding hatchability figures were 80, 83 and 83 per cent.

Over a further period of 8 weeks groups 1 and 2 gave fertile eggs with hatchabilities of 78 and 84 per cent., respectively. Group 3 was changed to ration 1 with a supplement of 50 mg. iodinated casein per lb., and gave fertile eggs with 58 per cent. hatchability. Group 4 received ration 1 supplemented with 5 µg. procaine penicillin G and 10 mg. chlortetracycline per lb. and gave fertile eggs with 85 per cent. hatchability.

It is concluded that the rations used were unsuitable for the study of "unidentified factors" necessary for hatchability, although the requirement for these might have been raised by the feeding of iodinated casein.—K. J. Carpenter.

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4442

O'ROURKE, W. F., BIRD, H. R., PHILLIPS, P. H. and CRAVENS, W. W. The effect of low phosphorus rations on egg production and hatchability. *Poultry Sci.*, 1954, **33**, 1117-1122. [Dept. Poultry Husb., Univ. Wisconsin, Madison.]

White Leghorn pullets that had been laying for a month and had shown a high rate of production were placed in individual cages and given an experimental mash, oyster shell grit and water to appetite; they were inseminated artificially at weekly intervals.

All the birds received a basal ration of soya bean oilmeal 19, maize gluten meal 16, methionine 1, soya bean oil 1.5, NaCl 0.25, vitamins and sucrose to 100. Supplements of $\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$ were given so that the 5 rations had contents of P ranging from 0.19 to 0.60 per cent.

In 12 weeks egg production, and hatchability of eggs, of birds receiving only 0.19 per cent. P in their ration declined greatly, but were maintained in groups receiving 0.3 to 0.6 per cent. P. For the next 6 weeks the birds receiving low-P rations were given higher levels, and vice versa, and their performance also changed accordingly. Most of the embryos failing to hatch in the low-P group died in the second week of incubation.

In the ration containing 0.3 per cent. total P, the non-phytin fraction was 0.18 per cent. and this appeared to be adequate for normal reproduction.—K. J. Carpenter.

4443

CHOMYSZYŃ, M. Wpływ paszy na jakość tłuszczu u gęsi. [The influence of feed on the quality of fat in geese.] *Roczn. Nauk rol.* [B], 1954, **69**, 91-104. Russian and English summaries.

Twenty-eight geese were given barley only for 12 days, then an addition of 40 ml. rapeseed oil daily for another 16 days and finally barley only for another 12 days. At the beginning of the rapeseed oil period, every 4 days during and at the end of the period, 4 geese were killed. When back on the exclusively barley ration 4 geese were killed after 8 days and 4 after 12 days. From all slaughtered birds samples of subcutaneous and internal (mesenteric and peritoneal) fat were tested for iodine value, saponification value, refractive index and melting-point.

Both subcutaneous and internal fat assumed the qualities of rapeseed oil in all characteristics tested and in consistency and smell when rapeseed oil was given. The changes were distinct only after 8 days on the oil diet, and disappeared after 8 days when oil was not given. Subcutaneous fat was softer than internal, having higher I value and refractive index and lower melting-point, whether oil was given or not. (From summary.)—T. D. Bell.

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4444

BIELY, J., MARCH, B. E. and SILVESTRI, D. A. Fat studies in poultry. 1. Herring oil, Santomerse-80 and thyroprotein in the laying ration. *Poultry Sci.*, 1954, **33**, 1130-1135. [Poultry Nutrit. Lab., Univ. British Columbia, Vancouver.]

Twenty-six White Leghorn pullets were housed in individual cages and fed from 6 to 17 months of age on a ration (1) of herringmeal 2.75, soya bean oilmeal 14, dried maize fermentation solubles 1, choline chloride 0.06, minerals 6.5, feeding oil 0.5, bran 5, yellow maize meal 10, ground barley 10, ground oats 10, maize starch 6 and ground wheat to 100. A second set of birds received a similar ration (2), but with 6 per cent. of herring oil replacing the maize starch of ration 1. On a hen-day basis the mean egg-production on rations 1 and 2 was 61.3 and 63.6 per cent., respectively, with feed conversions of 5.37 and 4.75 lb. of feed consumed per dozen eggs.

Further groups received rations 1 and 2 each supplemented with 0.1 per cent. of "Santomerse-80" (an alkyl aryl sulphonate used as a surface-active agent), and they gave 63.1 and 61.6 per cent. production with feed conversions of 5.10 and 4.67, respectively. Finally, groups that received rations 1 and 2 supplemented with 150 mg. iodinated casein per lb. gave 53.5 and 56.9 per cent. production, and used, respectively, 6.02 and 5.46 lb. of feed per dozen eggs laid.

On each of the 6 rations 6, 7 or 8 of the birds died during the pullet year. The birds that received ration 1 supplemented with iodinated casein showed a mean liveweight gain of 0.4 lb. over the experiment, those that received ration 2 with the same supplement gained 0.7 lb. The groups receiving rations 1 and 2 unsupplemented gained 0.9 and 0.8 lb., respectively.

It is concluded that 6 per cent. of herring oil may be included in a laying ration without adverse effect and with some improvement in feed conversion efficiency. This improvement may be enhanced by the feeding in addition of a surface-active agent, which may act by allowing more efficient absorption of fat from the intestine.

K. J. Carpenter.

4445

GAWĘCKI, K. and PONIKIEWSKA, T. Naświetlano drożdże pastewne w jesienno-zimowym żywieniu kur niosek. [Irradiated fodder yeast in the autumn and winter feeding of laying hens.] *Roczn. Nauk rol.* [B], 1954, **68**, 253-270. Russian and English summaries.

Fodder yeast as 10 per cent. of the ration was given during the autumn and winter to 2 groups of laying White Leghorns and Rhode Island Reds, one group having half of its yeast irradiated. No

difference between groups was found in health, egg production or chemical composition of the egg shells. It is concluded that under Polish conditions when 10 per cent. fodder yeast is included in the ration the addition of cod liver oil is unnecessary. (From summary.)

J. S. Thomson.

4446

GAWECKI, K., NEUMAN, M. and PONIKIEWSKA, T. Wpływ drożdży nasłiwianych na wylęgowość jaj kur różnych ras. [The influence of irradiated yeast on the hatchability of eggs of hens of different breeds.] *Rocz. Nauk rol.* [B], 1954, 68, 475-488. Russian and English summaries.

Yeast comprised 5 per cent. of the mash of 104 Rhode Island Red and 268 Leghorn hens. In the ration of half of the hens half of the yeast was irradiated. In 3 months the birds receiving irradiated yeast hatched 3044 eggs, compared with 2906 for the controls. This represented an increase of 4 per cent. in the Rhode Island Reds and 9 per cent. in the Leghorns. No influence of irradiated yeast on fertility was observed. (From summary.)

T. D. Bell.

4447

ZNANIECKA, G., WODZINOWSKI, J., CIECHANOWSKA, H., KORZENIEWSKA, H. and WĘKOWICZ, H. Wpływ suszonki z młodej pokrzywy na nieśność kur i wylęgowość jaj. [The effect of nettle meal on egg production and hatchability of hens.] *Rocz. Nauk rol.* [B], 1954, 68, 271-281. [Inst. Zootech., ZZD Pawłowie.] Russian and English summaries.

Replacement of 5 g. alfalfa meal by 5 g. nettle meal in the winter ration of hens slightly increased the number of eggs produced, but the average weight of eggs was reduced. There was no effect on egg fertility, but hatchability was slightly improved. (From summary.)—J. S. Thomson.

4450

SCOTT, M. L., HOLM, E. R. and REYNOLDS, R. E. Studies on pheasant nutrition. 2. Protein and fiber levels in diets for young pheasants. 3. Effect of antibiotics, arsenicals and thyroactive compounds upon growth and feathering in pheasant chicks. *Poultry Sci.*, 1954, 33, 1237-1244; 1261-1265. [Dept. Poultry Husband., Cornell Univ., Ithaca, N.Y.]

For part 1, see Abst. 2954, Vol. 19.

2. In a series of trials Ringnecked pheasants were reared, from hatching, in wire-floored battery cages in well lighted rooms and were fed on a

4448

MOORE, E. N., CHAMBERLIN, V. D. and CARTER, R. D. Safety of arsenic acid for turkey breeders. *Poultry Sci.*, 1954, 33, 1115-1116. [Ohio Agric. Exp. Stat., Wooster.]

A group of 36 breeding turkeys was fed for 2 weeks on a commercial ration supplemented with 900 g. arsenic acid (*p*-aminophenylarsonic acid) per ton, and for a further 3 weeks with a supplement of 100 g. per ton. A control group received the same commercial ration with no supplement.

In the 5 weeks of the trial the control group gave 64, 68, 54, 41 and 47 per cent. production; the corresponding figures for the supplemented group were 49, 31, 16, 33 and 55 per cent. The hatchability of the fertile eggs from the control group in the first 4 weeks was 61, 72, 74 and 58 per cent., respectively; the corresponding figures for the supplemented birds were 59, 26, 41 and 58 per cent. The general appearance of the supplemented group and the fertility of their eggs were not obviously affected.

It is concluded that turkeys can tolerate a high dose of arsenic acid for short periods, but that it can be expected that egg production and hatchability will be adversely affected.—K. J. Carpenter.

4449

SWART, L. G. Feeding systems for laying hens. *Farming in S. Africa*, 1954, 29, 542-543; 548. [Stellenbosch-Elsenburg Coll. Agric., Stellenbosch.]

Three different systems of feeding were tested for their effects on egg production, namely, mash plus scratch grain, all-mash, and mash and grain to appetite. There was little effect on egg production. Feed consumption was highest on the all-mash ration; in the other 2 groups consumption of grain was higher than that of mash. Mortality was somewhat higher in the group getting mash and grain to appetite.—J. S. Thomson.

See also Absts. 3465, 3585, 3587, 4390, 4415, 4433, 4434.

OTHER BIRDS

mash of soya bean meal 30, fishmeal 5, meat scrap 5, dried skimmed milk 5, dried distiller's solubles 5, minerals 3, fish liver oil 1, ground oats 10, standard middlings 18 and maize meal to 100. The birds grew well and had a mean weight of approximately 270 g. at 5 weeks of age, but they showed a high incidence of feather picking.

Equally rapid growth was obtained with similar rations containing higher levels of ground oats, or with the inclusion of 10 or 20 per cent. oat hulls, and they appeared to discourage feather picking. Under these conditions growth was not slowed significantly if the level of soya bean meal was

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reduced to 18 per cent., so that the total crude protein content of the rations was reduced from 28 to 24 per cent. When very coarsely ground oat hulls were used the birds picked these out of the feed troughs preferentially, and growth rate was then depressed.

3. In further trials the basal ration used was of soya bean meal 36.5, fishmeal 10, dried yeast 5, dried whey 5, lucerne meal 3, minerals 3, nicotinic acid, middlings 12.5, ground oats 10 and maize-meal to 100, and the pheasant chicks were reared in pens on floors covered with wood shavings. At 6 weeks of age chicks receiving this ration had a mean weight of 290 g.; others receiving the same mash supplemented with 22 p.p.m. terramycin were 18 per cent. heavier and had a lower death rate. Tests with bacitracin, procaine penicillin and aureomycin indicated that they also stimulated growth to about the same extent, but the use of antibiotics had no effect on the high incidence of feather picking that occurred in these trials. The use of 440 mg. iodinated casein, or 88 mg. 3-nitro-

4-hydroxyphenylarsonic acid per kg. as supplements to rations in addition to aureomycin also failed to reduce its incidence.—K. J. Carpenter.

4451

BALDINI, J. T., ROBERTS, R. E. and KIRKPATRICK, C. M. The reproductive capacity of bobwhite quail under light stimulation. *Poultry Sci.*, 1954, **33**, 1282-1283. [Purdue Agric. Exp. Stat., Lafayette, Ind.]

Three hens and one cock from a hatch of Bobwhite quail chicks were given continuous lighting in an indoor cage and fed on a standard poultry mash. One bird began to lay at 172 days of age and in the following 224 days the females had a mean production of 170 eggs per head.

As the birds were not of a specially selected strain it is considered that with improved diet, environment and management quails are capable of laying considerably more than the 70 eggs per season which is considered a good standard at present.—K. J. Carpenter.

FOOD ECONOMICS AND STATISTICS

4452

JONES, G. H. G. The development of natural resources for food production. *East African Agric. J.*, 1954, **20**, 104-108. [Agric. and Forest Res. Organiz.]

4453

PAWLEY, W. H. The possibilities of increasing world food supplies. 2. *World Crops*, 1955, **7**, 15-19. [FAO.]

4454

VAN BEUKERING, J. A. Lijnen van de agrarische ontwikkeling in Nieuw-Guinea. [Lines of agrarian development in New Guinea.] *Landbouwk. Tijdschr.*, 1954 (Nieuw-Guinea No.), 17-29. English summary.

A lecture review.

4455

FRENCH, M. H. Livestock feeds into human foods. *East African Agric. J.*, 1954, **20**, 84-91. [Joint Animal Indust. Div. E.A.A.F.R.O.]

4456

BENSON, E. T. American agriculture: productivity and problems. *Brit. Agric. Bull.*, 1955, **7**, 262-267. [U.S. Dept. Agric.]

4457

LEWIS, J. N. and SAXON, E. A. Agricultural output requirements for future population growth in Australia. *Quart. Rev. Agric. Econ.*, 1954, **7**, 151-155.

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It is estimated that even with no net immigration the population of Australia will reach 10.9 million by 1976, or with a net immigration of 100,000 a year, 13.9 million. Estimates of the corresponding production requirements for the main agricultural commodities, to cover home needs, present exports, and increased exports of wool, wheat and flour, mutton and lamb, and beef and veal to pay for the additional imports necessary, are given in a table along with production figures for 1952-53. These estimates are based on figures for present and past annual consumptions per head, which are tabulated for 1951-52 and periods in the 3 preceding decades, with certain assumptions about future changes in consumption and general economic conditions. In the aggregate, agricultural production will have to be expanded by 27 per cent. from the 1952-53 level, which itself is 20.5 per cent. above the pre-war one, or by 56 per cent. for the larger population estimate. For the latter, a rate of expansion of about 2 per cent. per annum would be required. This is within the limits of Australia's physical resources, but will demand a vigorous agricultural policy.—W. M. Deans.

4458

CAMPBELL, D. R. Neo-malthusianism. Its origin, decline and recent renaissance. *Agric. Inst. Rev., Canada*, 1955, **10**, 13-15; 50-51. [Dept. Agric. Econ., Ontario Agric. Coll., Guelph.]

Population growth and food production are discussed with particular reference to Canada.

Population is growing at the rate of about 2.6 per cent. per annum but food production at the rate of 3.1 per cent. The possibilities of still higher production are excellent. Only a small fraction of land receives fertiliser each year and much less is irrigated. Improvements in plant and animal breeding and in farm management will speed production. Indeed, in Canada, the chief worry is surpluses and neo-malthusian arguments have little place and little appeal.—I. Leitch.

4459

KORTRIGHT, F. H. **The conservation of natural resources.** *Agric. Inst. Rev., Canada*, 1955, 10, 19-20; 45. [Conservation Council, Ontario.]

The conservation of natural resources is the most important measure for the future wellbeing of mankind. The government should take an active part in developing consciousness of, and stimulating interest in, this urgent problem, and should advance some programme to assist the work that is already being done.—T. D. Bell.

4460

Agricultural extension in action: the story of 'AIA'. *Trop. Agric., Trinidad*, 1955, 32, 20-29. [Amer. Internat. Assoc. Econ. Social Development, New York.]

A summary is given of the work in Venezuela and Brazil of the American International Association in association with the respective governments.

D. Harvey.

4461

DE JONG, W. **Veeteelt in Nieuw-Guinea.** [*Animal husbandry in New Guinea.*] *Landbouwk. Tijdschr.*, 1954, (Nieuw-Guinea No.), 67-71. [Landbouwhogeschool, Wageningen.] English summary.

The stock population is assessed as about 1 thousand cattle, 500 to 600 horses, 500 pigs in Europeans' herds and some thousand belonging to the indigenous people, 2 to 2.5 thousand goats and not more than 100 sheep. There are 30 to 40 thousand poultry not including an unknown number in indigenous flocks. There is no likelihood of expansion without planning, the development of forage crops and the import of breeding stock. Fishing should be developed as an independent source of food and an incidental source of animal feed.—I. Leitch.

4462

EDWARDS, J. **Scientific trends in milk production in Great Britain.** *Vet. Rec.*, 1955, 67, 2-12 (with discussion 13-14). [Prod. Div., Milk Marketing Board.]

In the introduction the major changes in the milk production industry during the years 1939 to 1953 are discussed. It is shown that the weekly

consumption of liquid milk in Great Britain per head rose from 3 pints in 1939 to 5 pints in 1953. In England and Wales the amount of milk sold for liquid consumption increased from 760 million gal. in 1939 to 1342 million in 1953. Milk sold for manufacturing purposes fell from 363 million gal. in 1939 to 130 million in 1943 and rose to 293 million in 1953. The changes in Scotland over the same period followed a similar pattern. Future trends in milk production are discussed under the headings of breeding, management and disease control.

With regard to breeding it is shown that the proportion of cattle bred by artificial insemination in England and Wales is now (September 1954) 43.8 per cent. One of the main contributions of artificial insemination to increased productivity is considered to be the ease with which breed changes may be effected. It is estimated that 25 per cent. of the increase in yield over the past 10 years is due to change of breed. The possible benefits to be derived from the use of artificial insemination are discussed in the light of modern genetic theory. It is shown that estimates of the breeding value of a bull based on the yields of his daughters are of limited value, since the yields themselves depend on the management of the herd. The use of artificial insemination coupled with improvements in management would lead to greatly increased productivity.

In the field of animal health the author confines himself to a study of the problem of infertility in dairy herds and emphasises the seriousness of temporary infertility, but concludes on the whole that the cow is a member of a very fertile species.

J. N. Aitken.

4463

CLARK, J. and BESSELL, J. E. **Progress in milk production. A study of forty farms 1949 to 1952.** *Imperial Chemical Industries, Ltd., London, Agric. Development Dept. Bull.* No. 5, May 1954, pp. 91.

Higher and more economically efficient milk production has been obtained from greater reliance on, and better utilisation of, grassland, less feed being purchased. Thus the proportion of starch equivalent in the cow's ration provided by grazing and conserved grass increased from 55 per cent. in 1949 to 63 per cent. in 1952, and milk production per cow-feed acre (area of homegrown feeds plus the estimated acreage equivalent of purchased feeds, excluding the requirements of replacement stock) increased over this period from 207 to 239 gal., giving a higher profit per acre from the dairy herd. From the practical point of view an increase in production per acre is more easily achieved by increasing the density of stocking than by increasing the average herd yield, though this is an important long-term supplementary aim.

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Statistical analyses of the data show that reducing feed-area requirement by $\frac{1}{2}$ acre per cow gives a milk yield increase of 45 gal. per acre; an increase of 16 gal. per acre is obtained from raising yield by 100 gal. per cow. With each additional 1 cwt. sulphate of ammonia up to 3 applied per acre of grassland there was an associated average increment of 22 gal. milk per acre, though this probably arose to a considerable extent from concomitant improvements in pasture management.—J. L. Corbett.

4464

KAARLEHTO, P. Kysynnän hintajoustavuuden määrittäminen ja kysynnän kausivaihtelu. [Seasonal fluctuation of demand and the calculation of price elasticity from market statistics.] *Maataloust. Aikakausk.*, 1954, 26, 169-177. [Maatalouden Taloudellinen Tutkimuslaitos, Helsinki.] English summary.

A method of correction of the calculation of price elasticity according to the fluctuating demand is suggested, and its usefulness is demonstrated with figures taken from the marketing of butter in Finland in the period 1950 to 1953. (From summary).—T. D. Bell.

4465

ARNOLD, R. M. Growth of the dairy industry in Jamaica (1940-1953). *Trop. Agric., Trinidad*, 1955, 32, 38-44. [Livestock Serv., Jamaica.]

4466

ZUNDEL, G. Amélioration des conditions économiques de la distribution des produits laitiers. [Improvement in the economic conditions for the distribution of milk products.] *Lait*, 1954, 34, 627-645.

4467

WALKER, D. E. K. Increasing meat production per acre. *N.Z. J. Agric.*, 1955, 90, 61-64. [Dept. Agric., Animal Res. Stat., Ruakura.]

Two hundred and fifty lb. meat per acre have been produced by grazing 8 ewes with lambs or their equivalent of mixed sheep and beef cattle.

J. L. Corbett.

4468

MINISTRY OF AGRICULTURE AND FISHERIES (with UNIVERSITY OF NOTTINGHAM). Costs and efficiency of pig production. A comparison between England and Denmark. H.M.S.O., London, 1954, pp. iv + 45. Price 2s. net.

Large government subsidies are paid to British pig producers, and under completely free market conditions these producers would be at a considerable disadvantage unless they were able to bring their production costs down in line with those of

their Danish competitors. This publication attempts to establish why Danes can sell bacon more cheaply, and to suggest ways in which the British producers could increase efficiency.

During 1949-53 England had 100 per cent. more boars than Denmark and 25 per cent. more breeding sows and gilts, but only 15 per cent. more suckling and weaned pigs. In England and Denmark the numbers of pigs reared to slaughter per sow per year were 12.2 and 15.5, respectively. This difference in breeding herd productivity is accounted for by a lower number of farrowings per sow per year in England (1.8 against 2.0) and by a smaller number of pigs born and weaned per litter in England (9.4 and 7.4 against 10.7 and 8.3).

At costs prevailing in the last quarter of 1953 Danes produced bacon pigs at less than two-thirds of the costs of English production. The largest difference was in feed costs and was attributable to higher efficiency of feed conversion and lower feed prices in Denmark. In England it took 8.56 lb. meal per lb. liveweight increase to produce a 32-lb. weaner, this figure including the "overhead" of a proportion of the feed eaten by the sow. The comparable figure in Denmark was 5.70. During the fattening period it took 4.72 and 4.31 lb. meal per lb. liveweight increase in England and Denmark, respectively. Despite these figures, differences in prices of feedingstuffs accounted for almost two-thirds of the difference in feeding costs between the 2 countries.

Important contributions to the efficiency of Danish pig production are the establishment of élite herds, the progeny testing of both national and local élite herds, the publication of all results from the progeny tests and the large numbers of boars sold from élite herds. The average total boar population in Denmark is about 12,000 and the annual sale of boars from élite herds is over 8000.

A method of financing and establishing an élite herd and progeny testing system in Britain is suggested.

Details are given of costing systems and the methods of obtaining the data used. There is also a brief outline of the place of pig production in the agriculture of the two countries.

I. A. M. Lucas.

4469

HEIDA, J. Enkele gedachten over de organisatie van de varkenshouderij in Nederland. [The organisation of pigkeeping in the Netherlands.] *Tijdschr. Diergeneesk.*, 1955, 80, 261-263. [Beetsterzwaag.]

In 1954 about 4 million pigs were slaughtered in the Netherlands, one-tenth of them by self-suppliers. There were also 300,000 breeding sows. Of the 4 to 5 million pigs farrowed, it is reckoned that about 20 per cent. are lost. The value of the

pigs slaughtered is about 800 million gulden, compared with 400 million from poultry and about 1400 million from cattle.

The need for research into pig diseases and education in feeding and management is briefly discussed.—I. Leitch.

4470

NELSON, M. *Sheep farming in Waipukurau County, Hawkes Bay. Canterbury Agric. Coll. Tech. Publ. No. 10, October 1953, pp. 28.* [Lincoln Coll., Christchurch.]

An exhaustive survey of sheep farming conditions, management and production in the area is reported. It was found that the greater the carrying capacity of the land, the smaller was the farm and the less the production per unit of labour and per ewe-equivalent. Production per acre increased and more artificial fertiliser was used and more fodder crops were grown on the farms with higher carrying capacity.

The conditions ruling the type of management and the standard of production are discussed. Suggestions for increased production are made, and limitations existing are noted.—T. D. Bell.

4471

DUTHIE, W. B. *Economics of hill and upland farming. A report on the financial results of 58 East of Scotland farms for 1952-53. Group 1. 34 hill sheep farms. Group 2. 24 stock-rearing farms. Edinburgh and East of Scotland Coll. Agric. Bull. No. 45, June 1954, pp. 44.*

4472

LEASK, D. M. R. and ROWBOTTOM, J. D. *Report on financial results of 183 East of Scotland farms for 1952-53. 1. Group 3. 47 stock raising and feeding farms. Group 4. 78 arable farms. 2. Group 5. 58 dairy farms. 3. Average prices and returns. Edinburgh and East of Scotland Coll. Agric. Bull. No. 46, July 1954, pp. 68.*

4473

PIÑERO, M. and BAYRÓN, MONTALVO, H. *Estudio sobre los costos de producción de pollos para*

carne en Puerto Rico. [The cost of production of poultry for meat in Puerto Rico.] Univ. Puerto Rico Agric. Exp. Stat. Bull. No. 117, January 1954, pp. 21. [Río Piedras, Puerto Rico.] English summary.

An economic study of broiler production was made on 13 poultry farms in Puerto Rico, including large (over 20,000 broilers per year), medium (10,000 to 20,000) and small (up to 10,000) units. Average feed consumption to the broiler stage, 2½ to 2½ lb. weight, was 8.6 lb., ranging from 9.8 lb. on the large farms to 7.3 or 7.4 lb. on the medium and small units, and average feed consumption per lb. meat was 3.6 lb., with a range from 3.2 to 3.9 lb. Average gross return per 1000 broilers was \$1217 and average expenditure \$991, including \$517 on feed, so that net return per 1000 broilers was \$226. (From summary).—J. S. Thomson.

4474

WHITTLE, T. E. *Chicken for the table. Scot. Agric., 1954-55, 34, 126-131.* [W. Scotland Agric. Coll., Auchincruive, Ayr.]

Potentialities for the production of broilers in the United Kingdom are discussed and costs of production from some recent experiments made at Auchincruive are tabulated.—J. S. Thomson.

4475

EVANS, O. R. *Canada's poultry industry. Brit. Agric. Bull., 1955, 7, 278-282.*

4476

SCHUSTER, W. H. *Fish culture in conjunction with rice cultivation. 1. World Crops, 1955, 7, 11-14.* [FAO.]

4477

BLAICH, O. P. *Census 1953. Agric. British Guiana, 1954, 1, No. 2, pp. ii + 20.* [Dept. Agric. British Guiana, Georgetown.]

4478

Numeros indices agricolas. [Index numbers in agriculture.] Inst. nac. Invest. agronom., Madrid, 1953, Nos. 1, 2, 3, 4.

See also Absta. 4325, 4513.

DIET IN ETIOLOGY OF DISEASE

GENERAL

4479

SCHÜRMANN, E. and MÜLLER, R. *Zum Fragenkomplex der unspezifischen Sterilität des Rindes. 1. Grundsätzliches zu einem Forschungsvorhaben. [The problem of non-specific sterility in cattle. 1. The basis of a plan of research.]*

MÜLLER, R. and HÖHN, E. *2. Der Einfluss von Witterungsfaktoren auf die Fruchtbarkeit des Rindes. [2. The effect of weather on fertility in cattle.] Ztschr. Tierzücht. Züchtungsbiol., 1954, 64, 85-90; 91-102.* [Inst. Anat. Physiol. Haustiere, Univ. Bonn.]

1. This introduces a series of reports on an inquiry asked for by the Minister of Food,

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Agriculture and Forestry of Nordrhein-Westfalen in 1952.

Disturbances of fertility caused by specific disease have increasingly come under control, but non-specific sterility has no clinically recognisable sign and may arise from different causes. Heredity may be involved, or external environment. So far heredity has received little attention in this context, yet selective breeding has produced earlier maturity and more frequent oestrus; at the same time it has failed to increase resistance to unfavourable circumstances.

Of environment the most important component is feed, and the proper balance and use of feed still require a great deal of further investigation. There may be a delicate balance between diet and hormone balance, or it may be more important to study constitution. The present study is an attempt to record environment and to analyse its components in relation to non-specific sterility.

2. Literature is reviewed. The area studied, the Rhein-Bergischer Kreis, has a large artificial insemination centre and was otherwise chosen for its relatively simple and uniform feeding conditions. It is a farming area, mostly with small units of 5 to 15 hectares, on rolling or hilly country, devoted chiefly to dairy farming. The cattle are pastured all summer and autumn with extra clover or grass at the height of summer and beet leaves in autumn. Winter feed is hay and concentrates with little silage. The cows are black-and-white or occasionally red-and-white Niederungsvieh (Lowland breed). The meteorological data were collected from the local agricultural school and covered the years 1951 and 1952.

Disturbance of reproduction was measured by the proportion failing to conceive at first service (*Umrinderungsquote*). In accordance with general custom this index is plotted against month. Fluctuations were large. Taking both years together, results were possibly best in May. There was little effect of temperature in either year; fertility varied inversely with rainfall, but the closest correlation was with barometric pressure and the index rose and fell with it in both years.—I. Leitch.

4480

FOSTER, A. H. An emaciation syndrome in **Malayan cattle**. *Vet. Rec.*, 1955, **67**, 167-168; 169. [Vet. Div., Dept. Commerce and Indust., Singapore.]

Cows which had died showing an emaciation syndrome frequently seen in crossbred Zebu cattle in Malaya were examined. The livers were paler than normal, and friable, and the condition was described as "degenerative fatty infiltration". The pancreas was infested with *Eurytrema pancreaticum* flukes. The diet of the cattle had been

deficient in bulk; the grass they got was very low in protein and they had been given disproportionate amounts of concentrates. The similarity of the pathology to dietary diffuse hepatic fibrosis in rats, dogs and man, and the effects of pancreas removal on dogs, are discussed.—T. D. Bell.

4481

NEWBOLD, R. P. Preliminary note on the extraction of a bloat-promoting fraction from red clover. *N.Z. J. Sci. Technol.* [4], 1954, **36**, 285-286. [Grasslands Div., D.S.I.R., Palmerston North.]

The vacuolar fluid expressed from red clover plants, including stem and leaf, caused bloat when from 16 to 18 litres were given as a drench to dry dairy cows. The press cake with similar volumes of water or glucose solution had no deleterious effect. It is suggested that the substance causing bloat should be sought in the vacuolar fluid.

T. D. Bell.

4482

WHITE, W. J., GREENSHIELDS, J. E. R. and CHUBATY, W. The effect of feeding sweet clover silage on the prothrombin time of blood of cattle. *Canad. J. Agric. Sci.*, 1954, **34**, 601-606. [Dominion Forage Crops Lab., Saskatoon, Sask.]

Six herds were used, 3 on sweet clover silage and 3 on hay, chiefly alfalfa. After 8 to 10 weeks 2 of the silage group showed significantly higher prothrombin times than the third, for which values were normal. In both the affected herds the silage was mostly of inferior quality, being mouldy or dark brown from the outer edges of the silo; in the unaffected group the silage was dark green and of good quality from the interior of the silo. Stage of lactation or exposure to cold did not affect prothrombin time. Chemical analyses of the mouldy and dark brown silage showed the presence of dicoumarol.—J. S. Thomson.

4483

DALE, D. G. and CRAMPTON, E. W. Observations on chronic fluorosis in dairy cattle. *Canad. J. Comp. Med.*, 1955, **19**, 6-16. [Dept. Animal Pathol., Macdonald Coll., Que.]

Fluorine metabolism and the pathology and signs of chronic fluorosis are discussed. Three herds affected to different degrees by chronic fluorosis are described. The source of the fluorine was thought to be raw rock phosphate which had been used as a source of Ca and P in the mineral mixture. The widespread occurrence of chronic fluorosis in Canada is discussed; another possible cause in some areas is industrial contamination of pastures and grains.—T. D. Bell.

4484

FITCH, L. W. N. Osteodystrophic diseases of sheep in New Zealand. 2. "Bowie" or "bent-leg". *N.Z. Vet. J.*, 1954, 2, 118-122. [Animal Res. Stat., Dept. Agric., Wallaceville, N.Z.]

Bowie occurs in restricted areas distributed in 6 counties of the South Island, but has not been reported in the North Island. It has been known for some 50 years. The incidence varies from year to year, but is not known to be correlated with climatic conditions. Several breeds of sheep are affected.

Tenderness of the feet and a tendency for the legs to bend may be seen in lambs 3 or 4 weeks old, and by 6 or 8 weeks of age the fore legs are bandy, with toes turned in and elbows pushed out. The hind legs may or may not be affected. Sometimes the knees turn in instead of out. Some, but not all, of the affected lambs are lame, and all are usually unthrifty.

Macroscopically, the long bones appear to be well developed and not porotic. The epiphyseal cartilages may be greatly thickened in parts. There is no obviously rachitic metaphysis. The joints may contain much fluid, and articular surfaces may be eroded. In early stages the synovial membrane is congested, and in chronic cases there may be much thickening of the joint capsule.

As in rickets, the most striking histological feature is the persistence of mature cartilage cells at sites of endochondral ossification, but in contrast to rickets, no gross failure of provisional calcification has been found. The depth and extent of cartilage calcification is unusually variable and sometimes seems excessive. There is no osteoporosis and long bones are heavy and dense. Osteoid tissue, common in rickets, is absent in bowie. The metaphyseal lesion differs from that of rickets.

Blood Ca and P in samples from bowie lambs were within normal limits.

The clinical condition of the lambs and the histology of the lesions are shown in photographs. D. Duncan.

4485

DEPARTMENT OF AGRICULTURE, CANADA. Sheep disease in Canada. *Publ. No. 904*, July 1954, pp. 30. [Animal Pathol. Div., Ottawa.]

4486

MÜLLER, L. F. Fütterung und Kolik des Pferdes. [Diet and colic in the horse.] *Arch. Tierernährung*, 1954, No. 5, Beihefte, 23-30. [Med. Tierklin., Karl Marx Univ., Leipzig.]

A review with 15 references. It is concluded that chaff and straw are often to blame for obstruction and colic in horses.—D. Duncan.

See also Absts. 3411, 3412, 3420.

DEFICIENCY DISEASES

4487

EISMA, W. A., HOSKAM, E. G., DORSMAN, W. and WIERINGA, G. W. Enige waarnemingen over het zogenaamde kopergebrek bij runderen. [Some observations on so-called copper deficiency in cattle.] *Tijdschr. Diergeneesk.*, 1955, 80, 247-255. [Lab. Rijksseruminrichting.] English, French and German summaries.

Within recent years complaints have increased in frequency from farms on moor and fen of poor condition in cattle, with rough coats, brown or white depigmentation of black hair, low milk production and diarrhoea. On current accepted standards, blood Cu is usually low. Pasture Cu is normal, over 7 mg. per kg., and administration of CuSO_4 , up to 500 mg. per head daily, produces little or no benefit. This is in contrast to sand areas, where there is a real deficiency in soil and pasture and CuSO_4 gives direct response.

The Mo content of Netherlands soils is low. Wind and Deys (*Landbouwk. Tijdschr.*, 1952, 64, 23) are quoted for the view that the ratio of total base : total acid in pasture determines Cu requirement. A ratio of 1 means a requirement of 15 mg. Cu per kg. grass; with a ratio of 1.3, 11 mg. is enough. Other complications are quoted.

Claims to have deficiency of Cu were investigated on 4 farms. On the first there was depigmentation, young cattle were slow to breed and milk yield was low. Infestation with lung worms and *Trichostrongyles* was severe. Blood Cu in 29 cows was on the average 18 μg . per cent.; grass had 17.0, hay 11.1 and grassmeal 11.4 mg. per kg. CuSO_4 was given in the drinking water. Six young animals of average weight 200 kg. were moved to the Rijksseruminrichting (State Serum Institute) and fed, one group of 3 on hay and green feed from the farm, the other on Serum Institute hay with only 7.8 mg. Cu per kg., concentrates, salt and vitamin D. In both groups serum Cu rose. Later complaints disappeared when the manager changed and the cattle were given relatively more concentrates.

On a second farm there was depigmentation in cows and low milk yield. A supplement of 0.5 g. CuSO_4 and 5 mg. CoSO_4 per cow daily raised the average milk yield from 9 to 24 litres daily and blood Cu from 56 to 84, 33 to 65 and 63 to 77 μg . per cent. When the Cu supplement was omitted, milk yield fell. This is regarded as a farm with genuine deficiency. The vitamin B_{12} content of faeces was not affected by the Co supplement.

On 2 other farms, much the same signs, occurring on one in spite of giving 1 kg. concentrates, 1 g. CuSO_4 and about 5 mg. CoSO_4 per head daily, are attributed to heavy infestation with *Trichostrongyles*.

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gyles. Serum Cu varied on the first of these farms between 45 and 82 μg . per cent. and averaged 50 μg . on the second.—I. Leitch.

4488

AWAD, F. I. Pine (cobalt deficiency) in lambs. *Vet. Rec.*, 1955, 67, 59-60. [London Sch. Hyg. Trop. Med.]

Cobalt deficiency was produced in lambs fed on crushed oats, flaked maize and hay. The development of deficiency was prevented by a supplement of Co, and also in 4 lambs by a supplement of faeces collected from normal sheep.—D. Duncan.

4489

SOKOLOVA, L. M. Znachenie kobal'ta dlya selskokhozyastvennykh zhivotnykh. [Importance of cobalt for farm animals.] *Veterinariya*, 1954, 31, No. 5, 49-55.

In regions where animals develop anaemia, 1 g. tablets are recommended, 1 tablet per sheep every 10 days, of 0.96 g. sodium chloride and 0.04 g. cobaltous chloride, i.e., 40 mg. or 10 curative single-day doses for sheep. In the absence of tablets cobalt can be used in the form of cobaltous chloride powder. The following doses are recommended: prophylactic for sheep and goats 2 mg., lambs 1 mg., pigs and calves 5 mg., adult cattle 10 mg.; therapeutic for sheep and goats 3 mg., lambs 2 mg., pigs and calves 10 mg., adult cattle 20 mg.—H. Scherbatoff.

4490

GRASHUTS, J. Klinische lessen over sporenelementen. [Clinical lectures on trace elements.] *Tijdschr. Diergeneesk.*, 1955, 80, 199-213. [Inst. Moderne Veevoeding "De Schothorst", Hoogland.]

The first lecture deals with cobalt and vitamin B₁₂.

4491

BLAXTER, K. L. and SHARMAN, G. A. M. Hypomagnesaemic tetany in beef cattle. *Vet. Rec.*, 1955, 67, 108-115. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Mg and Ca were estimated in samples of blood serum from calves on 20 farms near Inverness, where muscular dystrophy was known to occur. All were beef-rearing farms where the cows were kept indoors throughout the winter and the calves, born in the first 3 months of the year, received until May little or no food except the milk of their dams. Serum Mg values at birth were within the accepted normal range of 2 to 2.5 mg. per 100 ml., but tended to fall slowly in the first 2 months of life, sometimes below 0.75 mg. per 100 ml. Serum Ca was normal or high. The fall in serum Mg was greater on some farms than on

others, but no abnormality was seen on many farms except muscular dystrophy, which was not correlated with the occurrence of low serum Mg. One calf in 1953 and 2 in 1954 had tetany, with serum Mg below 0.8 mg. per 100 ml., but some calves with lower concentrations had no clinical disturbance.

The tendency for serum Mg to fall was reduced in calves given 500 mg. Mg daily, but even so some calves had values of 1.2 to 1.39 mg. per 100 ml. In some calves with serum Mg below 0.8 mg. per 100 ml. serum Ca also fell.

It is considered that the neuromuscular disorder due to low blood Mg has an incidence of about 5 per cent. on these farms and that it is purely nutritional in origin. A high Ca:Mg ratio in the bones is useful in diagnosis of the condition.

D. Duncan.

4492

VAN REEN, R. and PEARSON, P. B. Manganese deficiency in the duck. *J. Nutrition*, 1955, 55, 225-234. [McCollum-Pratt Inst., Johns Hopkins Univ., Baltimore, Md.]

Ducklings were fed from 2 to 21 days of age on a simplified ration of casein 25, gelatine 5, maize oil 4, DL-methionine 0.3, purified vitamins and minerals (excluding manganese) and glucose to 100. Twenty-two birds received the ration and distilled water to appetite, and finished with a mean weight of 700 g. Parallel groups that received the same ration with a supplement of either 20 or 40 mg. manganese, added as the sulphate, per kg., weighed 890 and 960 g., respectively.

Perosis occurred among the unsupplemented birds, and to a less extent among those receiving the lower level of Mn. It is concluded that the Mn requirement of the duckling for growth and normal development is approximately 40 mg. per kg. ration.

In further trials ducklings were given the same basal ration with and without a supplement of 78 mg. Mn per kg. The birds were then killed and their livers were analysed for selected B vitamins. The control livers had a mean content of 13 mg. nicotinic acid, 1.6 mg. riboflavin, 0.6 mg. free pantothenic acid and 4 mg. bound pantothenic acid per 100 g. moist tissue, and the values for the supplemented group were not significantly different.

Assays of enzyme activity were also made on the liver samples. The Mn supplement apparently had no effect on the contents of diphosphopyridine nucleotidase, cytochrome oxidase, catalase and isocitric dehydrogenase, but the alkaline phosphatase activity of the Mn-deficient livers was only one-half that of the livers of the supplemented birds. Examination of other tissues showed a similar effect in plasma, heart and kidney tissues,

but no difference in brain samples. Further tests indicated that the reduction in enzyme activity could not be explained by the presence of an inhibitor in the deficient tissues.—K. J. Carpenter.

4493

SINCLAIR, D. P. and ANDREWS, E. D. Goitre in new-born lambs. *N.Z. Vet. J.*, 1954, **2**, 72-79. [Dept. Agric. Res. Stat., Manutuke.]

In 1952 a severe outbreak of goitre occurred with a high mortality in lambs from young ewes. The following year a trial was made in which ryegrass-clover pasture was compared with kale, half the ewes on each type of feed being given KI for 6 weeks. The ewes were older than in the previous year. The incidence of severe goitre was higher in the lambs borne to ewes on kale without KI than in other groups. The goitre was associated with longer duration of pregnancy. In the trial, mortality was not as high as in the previous year, but this may have been influenced by the age of the ewes and by the weather. Goitre in surviving lambs did not affect subsequent growth rate to weaning.—T. D. Bell.

4494

CARE, A. D. Goitrogenic activity in linseed. *N.Z. J. Sci. Technol.* [A], 1954, **36**, 321-327. [Canterbury Agric. Coll., Lincoln.]

Goitre was caused in mice by replacing 50 per cent. of the control ration by linseed meal, but did not occur when KI was added to the drinking water.

In an experiment with 5-year-old ewes given a diet containing 20 per cent. linseed meal from tupping to lambing, goitrous lambs were produced. The lambs of ewes receiving a similar diet, but with supplements of KI or L-thyroxine, were normal.

The action of cyanogenetic glucosides, in this case thought to be linamarin, in producing goitre is discussed.—T. D. Bell.

See also Absts. 3409, 3410, 3421 3496, 3916.

DISEASES OF METABOLISM

4495

THEME, E. Die Bedeutung des Stoffwechsels beim sog. Herztod der Schweine. [Metabolism in so-called heart failure in pigs.] *Arch. Tierernährung*, 1954, No. 5, Beihefte, 35-49. [Vet. Pathol. Inst., Karl Marx Univ., Leipzig.]

On the basis of a review of the literature, with special reference to post-mortem findings and differential diagnosis from anaemia and degenerative changes caused by vitamin deficiency, this sudden death, with enlarged heart, is attributed to a disturbance of carbohydrate and mineral,

especially K, metabolism, associated with excess production of insulin and defective adrenal function.—I. Leitch.

4496

ROGERS, J. A. A contribution to a better understanding of ketosis in dairy cows. *J. Amer. Vet. Med. Assoc.*, 1955, **126**, 129-130. [New Bolton Centre, Univ. Pennsylvania, Kennett Square.]

The "denko test" for ketone bodies is described. This test was found to be the best for the diagnosis and for following the progress of ketosis. From a study of 298 cases it was concluded that ketosis should be regarded as developing gradually and lasting for several weeks, not as a disease which comes quickly and is only of a few days' duration.

T. D. Bell.

4497

PUGH, P. S. Hyperketonaemia and foetal death in the sheep. *Vet. Rec.*, 1954, **66**, 645-652. [Sch. Vet. Med., Univ. Cambridge.]

Ketone body and sugar values were estimated in the blood of normal ewes and ewes with idiopathic pregnancy toxæmia, induced starvation ketosis, placental lesions or enzootic abortion. High ketone and low sugar values were found in the first 2 disorders. The presence of live lambs seemed to be connected with this blood condition. The results are discussed in relation to the survival of the foetus.—T. D. Bell.

4498

SAMPSON, J., TAYLOR, R. B. and SMITH, J. C. Hypoglycemic coma and convulsions in fasting baby lambs. *Cornell Vet.*, 1955, **45**, 10-15. [Coll. Vet. Med., Urbana, Ill.]

Blood sugar values in fasted and non-fasted lambs aged between a few hours and 4 days at the start of the observations were estimated. In the first trial there were 6 fasted and 3 control lambs. The second trial had 7 pairs of twins, one of each pair acting as control. Daily blood sugar values, body temperatures and bodyweights are recorded from the time when fasting was started till the fasted lambs were in a coma, convulsions or a stupor. The time taken for these signs to develop was usually about a week, 4 days being the shortest and 16 days the longest. Blood sugar values, body temperatures and bodyweights all decreased during starvation. Injection of glucose relieved the signs. The onset and recovery were similar to those in baby pigs, but took much longer.—T. D. Bell.

4499

BEGOVIĆ, S., SABLIJAN, I. and STERN, P. Die Curare-artige Wirkung des Acetylcholins in der Entstehung der Paralyse puerperalis bei

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Kühen. [The curare-like effect of acetylcholine in relation to puerperal paresis in cows.] *Naturwissenschaften*, 1955, 42, 21. [Pathophysiol. Inst., Vet. Fac., Univ. Sarajevo.]

The hypothesis is advanced that milk fever is caused by absorption of an excess of acetylcholine from the milk and possibly from the uterus. It is stated that milk is rich in acetylcholine and that neither the milk nor the serum of cows contains cholinesterase. Cows and calves treated with atropine responded to injection of acetylcholine with a syndrome resembling milk fever, which disappeared after injection of KCl.—D. Duncan.

4500

GALLINA, L. La prevenzione del collasso puerperale (c.p.) [Prevention of milk fever.] *Riv. Zootec.*, 1955, 28, 33.

4501

TARVER, W. J. Ovine pregnancy toxæmia. Its probable cause and a logical treatment. *Brit. Vet. J.*, 1955, 111, 68-72. [Preston, Lancs.]

The etiology of pregnancy toxæmia in sheep is discussed. It was thought that methionine, the function of which is described, could be used for treatment. A method of diagnosing the disease under field conditions is described. Brief reports of cases of pregnancy toxæmia in 6 flocks which were diagnosed by the method described and treated with methionine are given.—T. D. Bell.

See also Abst. 3447.

POISONS OCCURRING IN FOOD

4502

HARVEY, J. M. and MOULE, G. R. Fluorosis of Merino sheep in Queensland. 1. How the disease is caused. 2. Studies of transmission, water treatment and amelioration. *Queensland Agric. J.*, 1954, 79, 291-298; 357-359. [Animal Health Stat., Yeerongpilly.]

1. The signs of fluorosis in sheep are described briefly. They were first observed in Queensland in 1940, and investigations were started in 1945. Maps showing the location and distribution of water supplies containing less than 1, 1 to 2, 2 to 5, 5 to 10 and more than 10 p.p.m. fluoride are presented. Mild fluorosis could be detected in sheep getting 2 p.p.m. fluoride in their drinking water from birth, and as the amount of fluoride increased the disease became more severe, but dangerous proportions were reached only when water containing 10 p.p.m. fluoride was habitually taken.

2. When ewes with day-old lambs were given drinking water with 10, 5 or 2 p.p.m. fluoride there was no difference in the fluoride content of their milk, which remained less than 0.2 p.p.m.

During the next 12 months the same 3 groups

of ewes continued to receive the same drinking water as before, and after lambing they were given a ration poor in lime. Still there was no change in the fluoride content of the milk. The second crop of lambs were killed at 6 weeks of age. The bones and teeth of those from ewes getting 10 or 5 p.p.m. fluoride had much higher levels of fluoride than those of lambs from ewes getting 2 p.p.m. or no fluoride in their drinking water. The high fluoride level in bones and teeth did not seem to affect the young lambs. Abnormal lambs have been reported from ewes getting 15 to 20 p.p.m. fluoride in drinking water.

On a field scale it is difficult to eliminate fluoride from drinking water.

The provision of lime, protein and phosphate supplements for 3-month-old lambs getting a diet poor in these, and drinking water containing 5 or 10 p.p.m. fluoride, did not prevent signs of fluorosis developing. The fluorosis did not appear to affect wool production. Inability to graze or to chew hard feed may reduce meat production, but there is no build-up of fluoride in the edible carcass, so there is no danger to consumers.—T. D. Bell.

4503

TESINK, J. Fluorvergiftiging bij runderen en haar beïnvloeding door het toedienen van aluminiumsulfaat. [Fluorine poisoning in cattle and the effect of giving aluminium sulphate.] *Tijdschr. Diergeneesk.*, 1955, 80, 230-246. [Kockengen.] English, French and German summaries.

Industrial fluorine poisoning is discussed and experiments with cattle given fluorine alone or with aluminium sulphate are described, which confirm that aluminium sulphate prevents in part the absorption of fluorine and can render toxic concentrations non-toxic. The aluminium sulphate may be put in feeding cake.—I. Leitch.

4504

WAHLSTROM, R. C., KAMSTRA, L. D. and OLSON, O. E. The effect of arsenic acid and 3-nitro-4-hydroxyphenylarsonic acid on selenium poisoning in the pig. *J. Animal Sci.*, 1955, 14, 105-110. [Dept. Animal Husb., S. Dakota State Coll.]

The results of 2 experiments showed that complete protection against poisoning by diets containing up to 10 p.p.m. selenium could be given to pigs by including 0.02 per cent. arsenic acid or 0.005 per cent. 3-nitro-4-hydroxyphenylarsonic acid in the ration. Half these quantities gave partial protection. The effectiveness was judged by the comparative rates of gain and mortality. On rations free from Se the arsenic compounds slightly improved growth rates. There was some evidence that individuals and breeds varied in

their susceptibility to Se poisoning, Durocs being more susceptible than Hampshires or Spotted Poland Chinas in these experiments. In the second experiment the higher levels of both drugs increased blood clotting time slightly.—T. D. Bell.

4505

HANSEL, W., OLAFSON, P. and MCENTEE, K. The isolation and identification of the causative agent of bovine hyperkeratosis (X-disease) from a processed wheat concentrate. *Cornell Vet.*, 1955, 45, 94-101. [Cornell Univ., Ithaca, N.Y.]

Hyperkeratosis was caused in bull calves of about 250 lb. liveweight by giving them fractions of breadcrumbs from the slicing and packing department of a bakery. The fresh bread did not cause hyperkeratosis. The method of isolating the fractions is described. The cause of the disorder was found to be a highly chlorinated naphthalene, but the source of the impurity in the breadcrumbs is not known.—T. D. Bell.

4506

McCLYMONT, G. L. Paresis associated with spinal cord myelin sheath degeneration in new born pigs. *Austral. Vet. J.*, 1954, 30, 345-346. [Nutrit. Res. Lab., Vet. Res. Stat., Glenfield, N.S.W.]

The post-mortem examination of 2 baby pigs of a litter which died with clinical signs of paresis of the limbs revealed degeneration of the myelin sheath of the medulla and the thoracic spine. In the previous season the litters from all 6 sows of the herd had died with similar clinical signs. At that time the sows had recently been moved on to a white-clover pasture. When the later cases of paresis occurred 1 lb. meatmeal had been included in the ration. The cause of the myelin degeneration is obscure, but it is suggested that it may have been due to some toxic substance in the white clover, possibly a cyanogenetic glucoside.

T. D. Bell.

4507

BAGLEY, R. A. Toxic reaction to dihydrostreptomycin in young poults. *Poultry Sci.*, 1954, 33, 1276-1278. [Dept. Vet. Sci., Utah State Agric. Coll., Logan.]

Poults, 11-day-old, that received intramuscular injections containing 50 to 250 mg. dihydrostreptomycin showed an immediate toxic reaction, with leg weakness and the onset of a comatose condition; some birds died, but most recovered in 6 hr. The reactions occurred whether or not the birds had been receiving antibiotics in their diet. Chicks were less sensitive than poults, but 500 mg. dihydrostreptomycin were sufficient to produce inco-ordination in a chicken weighing 1.75 lb.

K. J. Carpenter.

4508

FOX, H. J. and FRANCE, W. H. Bracken poisoning in cattle. *Vet. Rec.*, 1954, 66, 711-712.

In 4 herds on hill-grazing bracken poisoning was treated with vitamin K or nicotinamide. Blood counts in affected animals showed low leucocyte counts and few thrombocytes or none. It is suggested that where there is a risk of bracken poisoning, or in herds where it has occurred, frequent blood counts should be made so that early treatment can be given before the obvious signs appear, when it may be too late to save the animals. The use of nicotinamide or vitamin K is recommended.—T. D. Bell.

4509

BULLINGTON, T. H., BYRD, C. E. and HARRIS, T. W. Urea poisoning in the bovine. *Nor. Amer. Vet.*, 1955, 36, 107-109. [Fayetteville, Tenn.]

Three cases of urea poisoning in dairy cows due to badly mixed feeds are reported.—T. D. Bell.

IMMUNITY

4510

ČERNÝ, L., DRAŽAN, J., MENŠÍK, J. and KLÍMA, D. Kolostrální imunita při brucellose skotu. [Colostrum immunity in brucellosis of cattle.] *Šborn. čsl. Akad. Zéměd.*, 1954, 27, 617-638. [Kat. Vet. Fak., Vysoké Škol. Zéměd., Brno.] Russian and English summaries.

Calves of cows infected with brucellosis have no antibodies but these appear in the blood after the calf has suckled for 2 hr., the concentration being similar to that in the colostrum. Antibodies were still found in the blood serum of the calf after 113 to 129 days. The antibody content could not be estimated from the amount of γ -globulin in the blood serum. The amount of γ -globulin in the blood serum of the calf which received colostrum at birth increased by 3 to 5 times in 24 hr. (From summary.)

J. S. Thomson.

4511

VEGORS, H. H., SELL, O. E., BAIRD, D. M. and STEWART, T. B. Internal parasitism of beef yearlings as affected by type of pasture, supplemental corn feeding, and age of calf. *J. Animal Sci.*, 1955, 14, 256-267. [Georgia Agric. Exp. Stat., Experiment.]

In 1950 and 1951 the effects of 3 types of pasture for winter grazing: a temporary pasture of oats, ryegrass and crimson clover; fescue and white clover; and crimson clover, on internal parasites of yearling beef calves were studied, some animals on each pasture also getting a supplement of maize. In 1952 and 1953 the same pastures were used, no supplements were given, but animals 11 and 8

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months old were compared. Calves on the fescue pasture, which was inadequate, had higher worm loads than those on the other pastures, and though there were large counts of parasitic larvae on the pastures, the better feeding provided by the temporary and crimson clover pastures checked the development and harmful effects of the parasites. When given maize supplements calves had fewer worms than comparable animals not getting supplements. Younger calves had more worms than older in similar conditions.—T. D. Bell.

4512

GERRIETS, E., WEENER, C. and STAHL, H. Experimentelle Untersuchungen über die gesundheitsfördernden Eigenschaften der Altstreuverfahren bei der Kükenaufzucht. 2. [Experimental studies of the beneficial effects of

deep litter in rearing chicks. 2.] *Arch. Geflügelk.*, 1954, 18, 459-468. [Abt. Geflügelk., Humboldt Univ., Berlin.] English summary.

A previous experiment (Abst. 4007, Vol. 24) was repeated with 2 groups of 50 chicks, one a control and the other infected with *Salmonella pullorum*, on sawdust litter changed frequently, and infected groups on built-up old horse manure and on built-up old poultry litter (a mixture of garden compost and poultry manure). Mortality from *S. pullorum* in the infected groups in the above order was 82, 77 and 89 per cent.; that is, built-up litter offered no advantage. The slightly better results with horse manure are ascribed to its warmth.

After a lapse of 35 days none of the litters transmitted the infection to fresh chicks.

W. M. Deans.

7. BOOK REVIEWS

4513

RUSSELL, E. J. *World population and world food supplies*. George Allen and Unwin, Ltd., London, 1954, pp. 513. Price 50s.

The well-chosen title of this book may be taken as an abridgement of the headings of its first and last chapters, the one which states the problem and the other which summarises the trends of supplies. Between these chapters Sir John Russell has brought together a mass of data drawn from official publications of FAO, the Commonwealth Economic Committee and Ministries of Governments and the result is an up-to-date compilation such as has not been equalled in other writings on the subject. In succession there come under review the production and, so far as the available information allows, the consumption of food in the United Kingdom, the Northern European intensive and the Mediterranean peasant areas, Africa with both native peasant and European farming, India and Pakistan with their population problems, the rice-exporting countries of the Far East and the food-exporting countries both actual in the North American and Australasian, and potential in the South American continents. The tables in the book are numerous and they are supplemented with 45 diagrams, many of which have been specially drawn, and with the same number of illustrations.

Such a compilation might easily have been dull and uninteresting but the former Director of Rothamsted Experiment Station has, from his own world-wide travels, introduced reminiscences and is able to emphasise to his reader what were his own personal impressions. On occasions which, unfortunately, are all too frequent, he has had to record the unwillingness and the failure of the

inhabitants of underdeveloped areas to co-operate in the work of improving their methods of agriculture. At the same time there does not pass unnoticed the impossibility of rushing development however well-intentioned may be the schemes for so doing.

From this objective analysis there are advanced neither gloomy prognostications nor cheerful prophecies. Rather is the reader left to draw his own conclusions, though the author does admit to possessing a tempered optimism. A conclusion of the greatest consequence is concerned not with the production or consumption of food but with the background of the training of the farmer. For the change from peasant agriculture as it exists over so much of the world to the complex systems attained, for example, in Scandinavia, Britain and New Zealand there will be required both a high standard of scientific attainment and a desire for the application of scientific methods to agriculture. This book tells clearly how many of the difficult problems have already been overcome and indicates many of those that await solution before the world's hungry population can be adequately fed.—D. Harvey.

4514

BLOCK, R. J., DURRUM, E. L. and ZWEIG, G. (with LESTRANGE, R., WINGERD, W. H. and WEISS, K. W.) *A manual of paper chromatography and paper electrophoresis*. Academic Press, Inc., New York, 1955, pp. 484. Price 64s.

This is a practical manual of paper chromatography and electrophoresis, although theoretical aspects of both techniques are considered in introductory chapters. About four-fifths of the book

is concerned with paper chromatography, all the major constituents of biological material being discussed. Amino-acids and their derivatives, aliphatic acids, steroids, bile acids, purines and pyrimidines and their derivatives, carbohydrates, phenols, aromatic acids, porphyrins, vitamins, antibiotics and plant growth substances are dealt with in some detail. Further chapters are devoted to the chromatography of a wide range of miscellaneous organic compounds and of inorganic substances. It is clearly impossible for any work of this size to be complete, but this account is certainly adequate in the range of compounds considered and in the detail in which basic manipulations are described to provide a starting-point for any worker wishing to extend his practical experience. A particularly satisfactory feature of the book is the large number of tests described for the detection of compounds on paper.

Although the section devoted to paper electrophoresis is much shorter than that on paper chromatography, it provides a timely account of this technique, which is being increasingly used in biochemistry. The emphasis is inevitably on the separation of proteins and amino-acids, but the experimental details given should provide an adequate basis for the application of the procedures to the separation of other types of material.

The book is excellently printed and contains a detailed index and an extensive bibliography. It should prove a useful addition to the library of any chemist or biochemist.—H. G. Bray.

4515

LOVERN, J. A. *The chemistry of lipids of biochemical significance.* Methuen & Co., Ltd., London, 1955, pp. xiii + 132. Price 8s. 6d.

This book, which is one of Methuen's series of "Monographs on Biochemical Subjects", is based on a series of lectures given by the author for the Department of Biological Chemistry of the University of Aberdeen in 1952. Four of the 5 chapters are modified versions of these lectures and include discussion of additional information published in 1953. These chapters give a comprehensive, yet succinct account of the chemical structure of the different classes of lipids, the nature of their physicochemical state in tissues, their dynamic condition, particularly as revealed by modern isotope studies, and a discussion of the biochemical functions of lipids. As can be appreciated even from this very brief summary of the main themes, the title of the book may be misleading in its suggestion of an over-riding emphasis on pure chemistry, which is far from the truth. The additional chapter gives an account of the preparation and analysis of lipids, a critical review which, in the light of the author's wide experience, is of especial value to the research worker in this

field, where there has hitherto been little guidance.

Although there are available many compendious modern books on the chemistry and biochemistry of lipids, most suffer from being mere catalogues of facts. This monograph, on the other hand, succeeds in giving the reader a clear, integrated, general picture of lipid biochemistry and, as such, can be commended both to the research worker and to the student.

Full references are given at the end of each chapter and a broad subject index at the end of the book.—G. A. Garton.

4516

ANSON, M. L., BAILEY, K. and EDSALL, J. T. (Eds.) *Advances in protein chemistry.* Volume 9. Academic Press, Inc., New York, 1954, pp. viii + 542.

4517

WOLFROM, M. L., TIFSON, R. S. and HIRST, E. L. (Eds.) *Advances in carbohydrate chemistry.* Volume 9. Academic Press, Inc., New York, 1954, pp. xviii + 426.

4518

HARRIS, R. S., MARRIAN, G. F. and THIMMANN, K. V. (Eds.) *Vitamins and hormones. Advances in research and applications.* Volume 12. Academic Press, Inc., New York, 1954, pp. xi + 305.

4519

BAILEY, A. E. (Ed.) *Cottonseed and cottonseed products. Their chemistry and chemical technology.* Interscience Publishers, Inc., New York, 1948, pp. xxiii + 936. Price 125s.

This is a survey by specialist authors of cottonseed and of the cottonseed industry, with chapters on the history, production and consumption of cottonseed, the biology of cottonseed, and the manufacture of cotton, cottonseed oil and cottonseed meal. The nutritional value of cottonseed meal for livestock is discussed by F. Hale and C. M. Lyman. In the United States cottonseed meal is most widely used in the rations of cattle and sheep and to a growing extent in the rations of chickens and turkeys. It is at present unsuitable for laying hens owing to discolouration of the eggs on storage. Cottonseed meal is also mixed with other protein supplements such as tankage and given to pigs.—D. H. Shrimpton.

4520

AXELSSON, J. *Foderkonserveringsnytt. [Fodder conservation.]* Bokförlaget Minerva, Upsala, 1954, pp. 92.

This small book is well printed and clearly and

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concisely written. It deals with techniques of harvesting green crops, ensiling, which occupies more than half the book, haymaking and artificial drying. The treatment is conventional. An interesting graph shows sales of A.I.V. fluid in Sweden to have reached a maximum of over 7000 tons in 1946, and to have fallen to about one-tenth of the maximum by 1953. It has been

replaced by other acids, *e.g.*, formic acid, and more commonly by molasses, potatoes and other proprietary preservatives, of which some appear to have little or no effect on the conservation process. There is a short chapter on the use of silage, and the final chapter compares the effects of artificial and field drying on the composition of the product. I. Leitch.

8. FOOD AND AGRICULTURE ORGANIZATION (AND OTHER ORGANIZATIONS) OF THE UNITED NATIONS

Monthly Bulletin of Agricultural Economics and Statistics.

Vol. 4, No. 3, March 1953, pp. 52. Price \$0.50.

Vol. 4, No. 4, April 1953, pp. 48. Price \$0.50.

Vol. 4, No. 5, May 1953, pp. 52. Price \$0.50. Economic aspects of cocoa consumption.

Yearbook of Fishery Statistics, 1952-53, Vol. 4, Part 1.

Production and catch. Rome, Italy, 1955. Price \$3.00.

Problems of food and agricultural expansion in the Near East.

Rome, Italy, 1955, pp. 53. Price \$0.50.

This publication is in 2 parts, the first the Report of the FAO Regional Consultation on the Selective Expansion of Production and Consumption in the Near East, the second a document prepared for and submitted to that Consultation. It was held at Beirut in September 1954 and attended by delegates from Egypt, France, Iran, Iraq, Lebanon, Syria and Yemen, and by observers from interested international organisations. With the rapid expansion of cereal production, the decline in cotton production and the failure of the livestock industry to increase output as the main trends in the period just before the meeting, changes in food consumption were towards the substitution of wheat for maize and increases in the uses of sugar and tea. The real need was for the greater production of foods rich in protein. Agricultural programmes towards this end are considered and the necessity is emphasised for the co-ordination of nutrition activities with these.

Methods of collecting current agricultural statistics.

Rome, Italy, March 1955. Price \$3.00.

The manual prepared under the direction of Dr. R. D. Narain describes the methods used in a large number of countries for the collection of current statistics on area, production of crops, livestock numbers and livestock products. The pattern is standardised under 8 headings: administrative division; agricultural statistics collected; collection of data, unit, type and method of enumeration; sampling methods; organisation for collection and tabulation; time schedule; processing of data; publications. The whole is included in a loose-leaf binder to permit incorporation of fresh material as it becomes available.

Report on the 1950 World Census of Agriculture Vol. 1.

Rome, Italy. First instalment, March 1955. Price \$2.00.

The first instalment of the Report gives the results obtained for 30 of the participating countries. The data are presented under 11 headings: holding and tenure, land utilisation, agricultural population, employment in agriculture, crops, livestock and poultry, agricultural technology, fertilisers and soil dressings, irrigation and drainage, fragmentation, wood and fishery products. For 10 of the countries it has been possible, in addition to giving the information regarding the total number of holdings, to provide a further classification according to their size. As the analyses for the remaining countries become available they can be incorporated in the loose-leaf binder which is provided.

9. DEPARTMENTAL AND OTHER REPORTS

UNITED KINGDOM.

Milk Marketing Board. Report of the Production Division, Thames Ditton, Surrey, 1954, No. 5, pp. 116.

CANADA.

Department of Agriculture, Ottawa. Fourth Annual Poultry Products Market Review 1954. Pp. 80.

Vol. 25, No. 3

GILBERT AND ELLICE ISLANDS COLONY.

Medical and Sanitary report for the Year 1953. Pp. 5 + xiv.

Preliminary report on nutrition survey. Symptoms of mild vitamin C and vitamin B complex deficiency were present in pregnant women and infants. The diet is based on coconut, fish, roots, pandanus and palm sugars. The symptoms were not present in the Gardner Island where the diet contains the vegetables te Boi, pumpkin, and birds' eggs.

INDIA.

Annual Report of the Indian Veterinary Research Institute, Mukteswar and Izatnagar for the Year 1949-50. Pp. 80.

Millet poisoning in man and animals.

Famine rations for livestock : use of bajra husk (*Pennisetum typhoides*), rain tree fruit (*Enterlobium saman*), tapioca roots (*Manihot utilissima*), sunn-hemp seeds (*Crotalaria juncea*), coffee husk, and mahua (*Bassia latifolia*) flowers.

Shed tree leaves as fodder (Mango, *Ficus infectoria*, *Eugenia jambolana*, *Dalbergia sissoo*).

Silage making : bhuira (*Saccharum munja*) and berseem and paddy straw silages.

Lipid content of cattle faeces.

Chemical composition of indigenous grasses and tree leaves.

Seasonal variation in feed and water intake of cattle.

Seasonal variation in pulse rate, respiration rate, body temperature and Hb in cattle and buffaloes.

Estimation of weight of cattle from heart girth measurement.

Nitrogen, iron, calcium and phosphorus requirements of sheep.

Nutritive value of cow ghee, vanaspathi and oils.

Effect of different levels of carotene intake on metabolism of calcium, phosphorus and protein by goats.

Nutrition and semen production in bulls.

Effect of feeding iodinated protein on semen characteristics in goats.

NEW ZEALAND.

Twenty-sixth Annual Report of the Dairy Research Institute, 1953-54. Pp. 27.

Influence of three planes of nutrition at the start of lactation on yield and composition of milk and effect of plane of nutrition on characteristics of butterfat.

Time taken for cows to respond to change in feed supply.

Feeding calves on dry meal.

Energy value of milk, effect of age of cow.

UNITED STATES OF AMERICA.

Report of the New York State Veterinary College at Cornell University for the Year 1953-54. Pp. 108.

Relationship of abomasal carbohydrate to the diet and blood glucose in the calf.

Use of ketogestin in the treatment of ketosis in dairy cows.

Utilisation of fructose in the ruminant and non-ruminant.

Cellulose digestion in the rumen of a steer on an alfalfa diet with and without an added carbohydrate supplement.

Physiological changes caused by insufflating the rumen of sheep with various gases.

Cineradiographic study of rumino-reticular motility and eructation.

Results of Research in 1952 by the Agricultural Experiment Station of the University of Kentucky. 65th Annual Report of the Director. Pp. 89.

Variations in buffering capacity of rumen juices as affected by the ration.

Forage extracts causing bloat or death when administered orally to sheep.

Toxic levels of cobalt and copper for sheep.

Effect of length of preliminary and collection periods in digestion trials with lambs fed on chopped hay.

Aureomycin and vitamin B₁₂ supplement for pigs on pasture.

Effect of discontinuing an aureomycin and vitamin B₁₂ supplement for pigs at 100 lb. weight.

Effect of pelleting on palatability of distiller's grains for fattening beef cattle.

Effect of kind of pasture on persistency of milk production.

Effect of barnyard manure on digestibility of pasture.

Distiller's grain solubles in calf starters.

Effect of bluegrass pasture or confinement on the length of six anatomical segments of the alimentary tract of chickens at different stages of growth and on the fibre content of the segments.

Effect of vitamin D on bone formation in keels of chickens and on rate of change of marrow to intra-osseous air spaces.

Effect of fibre in chick rations.

Breed, sex and age variations in response to antibiotic supplements for poultry.

Relation of riboflavin and choline to fat metabolism in rats.

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NUTRITION ABSTRACTS AND REVIEWS

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THE PHYSIOLOGICAL BASIS OF OBESITY AND LEANNESS

PART II

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(Continued from p. 611)

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METABOLIC AND REGULATORY DISTURBANCES OF FOOD INTAKE

METABOLIC AND REGULATORY FACTORS

In an earlier report (Mayer, 1953a) an attempt was made to classify forms of obesity on the basis of a characteristic etiological element: genetic, traumatic and environmental factors were thus distinguished. Such a classification is of pragmatic interest in that it identifies modes of production of obesity, particularly experimental obesity; thus, the hereditary obese-hyperglycaemic and yellow forms of obesity in mice are produced by breeding, the goldthiogluucose and hypothalamic obesities by traumatic intervention. This taxonomic approach, however, sheds very little light on the mechanism of the disturbance. In fact, the mechanisms underlying two forms of hereditary obesity may be entirely different, and a traumatic intervention may reproduce one of the hereditary disturbances. Consider, for example, two forms of "constitutional" obesity in mice: the hereditary obese-hyperglycaemic syndrome appears to be a genetically transmitted endocrine disturbance; "spontaneous" hypothalamic obesity in mice is due to an inherent tendency of the ventromedial nuclei to degenerate. One form of traumatic obesity, resulting from a hypothalamic lesion produced by surgery, will reproduce the

second form of constitutional obesity, yet, as will be readily apparent later on, have very little in common with the other genetic kind. Doubtless similar examples could be worked out for excessive thinness.

Furthermore, the distinction between genetic and traumatic factors on the one hand, and environmental factors on the other hand, is artificial in view of the interaction of constitutional and environmental factors. For example, even granted that the characteristic element in the etiology of a form of obesity is, say, hypothalamic, the obesity would still not develop if food were not available, or were too diluted, or too high in protein, if water were not freely available, or if the animals were exercised excessively. A multiplicity of factors always seems to be involved.

If one thus attempts to classify forms of obesity (or leanness)¹ according to the mechanism involved, it would appear that such a classification

¹ In this section, obesity and hyperphagia, excessive leanness and anorexia, are systematically associated. This equivalence does not correspond strictly to all observed facts. Reference has already been made to the fact that genetically obese mice, underfed to the point of being underweight, are still obese as regards body composition (Alonso and Maren, 1954). Mention has been made also of the interesting result of Fenton and colleagues (Fenton and Carr, 1951; Fenton and Dowling, 1953) that, in at least one strain of mice, changing the animals to a high-fat diet causes an increase in oxygen intake which limits the

should be based on consideration of the mechanism of regulation of food intake. It has been shown in Part I of this Review (p. 607) that two types of factor, metabolic and regulatory, intervene to modify the mode of action of this mechanism. One is thus led to divide abnormalities of food intake (and body fat) into two broad classes:

(a) Forms in which the central (nervous) mechanism for regulating food intake functions normally but in which there is a disturbance in tissue metabolism which abnormally promotes (or limits) the accumulation of fat ("metabolic" obesity or leanness);

(b) Forms in which metabolism is normal but in which central (nervous) disturbances (of physiological or psychogenic origin) modify the regulation of food intake so as to cause obesity or leanness.

Environmental conditions, apart from their permissive role, may intervene in two ways, corresponding to the regulatory and metabolic distinction between constitutional factors. They may cause metabolic disturbances, or place the organism in a situation where its usual metabolic response to a stimulus is eliminated, as may occur in obesity due to immobilisation (Ingle, 1949) or in nutritional obesity (Fenton and Carr, 1951; Fenton and Dowling, 1953). It thus seems legitimate to accept the general validity of the distinction between metabolic and regulatory disturbances, keeping in mind the possibility that there may be forms which would in part fall under both headings. For example, excessive cortisone-like secretion or administration may prove to be the cause of both regulatory and metabolic hyperphagia (Heinbecker and Pfeifferberger, 1950; Wolfson, 1954).

EXPERIMENTAL DIFFERENTIATION BETWEEN METABOLIC AND REGULATORY OBESITY

An illustration of the physiological significance of the new mode of classification is provided by recent experimental studies. Until recently, the different forms of obesity listed in Table 1, Part 1 (p. 608) had been established and examined in separate animal species or at least in separate strains or stocks, and the interpretation of observed metabolic differences was difficult, if not impossible, since deviations from the normal would vary according to the metabolic "substrate" on which hyperphagia and obesity were superimposed, and it was impossible to differentiate between non-specific sequelae of hyperphagia and obesity and

weight gain. Still, all in all, the association of hyperphagia and development of obesity (obesity in the "active" phase) is sufficiently universal to permit the use of the terms as almost equivalent. This seems even more legitimate for the opposite disorders.

idiosyncrasies of the syndrome of possible etiological significance.

In the course of the past two years, it has been found possible to induce goldthiogluconic obesity in thin littermates of genetically obese mice (Marshall and Mayer, 1954; Mayer and Zighera, 1954); obesity was also induced, again in mice and, in particular, in thin littermates of genetically obese mice, by hypothalamic lesions (Mayer, French *et al.*, 1955). Obesity induced by these two methods can reach a degree similar to that reached in the Mendelian recessive form. The order of magnitude of the rates of weight gain is similar.

All three types of obesity are characterised by a positive energy balance when the animals are allowed free access to food. However, the manner in which the positive energy balance is arrived at differs considerably in the different types. In the hereditary obese-hyperglycaemic syndrome, it is the result of a moderate (25 per cent. above normal) degree of hyperphagia (Mayer, Dickie *et al.*, 1951), an oxygen consumption which when related to body surface is very low (as much as 40 or 50 per cent. below normal) (Mayer, Russell *et al.*, 1952) and much reduced physical activity (Mayer, 1953b). Thyroid hypofunction can be excluded as a cause of the low oxygen consumption and activity (Goldberg and Mayer, 1952). In goldthiogluconic obesity, the positive energy balance is directly related to the considerable degree of hyperphagia (50 to 75 per cent.), associated with a basal oxygen consumption which follows the surface law, and normal spontaneous activity (Marshall and Mayer, 1954). In mice made obese by hypothalamic lesions, the surplus energy is due to marked hyperphagia (50 to 100 per cent.), normal basal oxygen consumption, and reduced activity (Mayer, French *et al.*, 1955).

The different types of obesity differ as regards reaction to caloric dilution of the diet and to composition of the diet. Goldthiogluconic obese mice show a poor adjustment to dietary dilution (Owen *et al.*, 1953). Their behaviour is similar to that of rats made obese by hypothalamic lesions (Kennedy, 1950). By contrast, mice with the hereditary obese-hyperglycaemic syndrome give a much more normal response to dietary dilution (Parson *et al.*, 1954). As regards diet composition, hypothalamic and goldthiogluconic obese mice show the greatest caloric intake and weight gain on a high-fat diet and a consumption greater than normal on a high-carbohydrate diet, while on a high-protein diet they gain least or even, in the case of goldthiogluconic obesity, lose weight (Marshall and Mayer, 1954; Mayer, French *et al.*, 1955). By contrast, mice with the obese-hyperglycaemic syndrome gain most weight on a high-carbohydrate diet, gain weight slowly on a high-protein diet and

gain least on a high-fat diet (Mayer and Jones, 1953).

Low environmental temperature again gives rise to two different types of reaction. Goldthioglucose obese (Davis and Mayer, 1954a) and hypothalamic obese (Barnett and Mayer, 1954) animals resist cold as well as normal animals, but mice with the obese-hyperglycaemic syndrome are unable to withstand exposure to cold (5°C.) and may die within from 1 to 3 hours. The obese-hyperglycaemic animals, incidentally, have been shown to exhibit normal "physical" reactions to cold (vasoconstriction, pilo-erection, shivering, poly-pnoea) but their "chemical" thermogenesis is impaired (Davis and Mayer, 1954a, b; 1955a). Exposure to electromagnetic waves, which has been shown to be a substitute for chemical thermogenesis (Davis and Mayer, 1955b), protects the genetically obese mice against exposure to cold (Davis and Mayer, 1954b).

The obese-hyperglycaemic animals generally show high blood glucose and glycosuria (Mayer, Bates *et al.*, 1951). In a small proportion of the animals the blood glucose level is within the normal range, but even in them it can be immediately raised to "diabetic" levels by a single injection of growth hormone, to which the mice with the obese-hyperglycaemic syndrome are extremely sensitive (Mayer *et al.*, 1953; Mayer and Silides, 1953). By contrast, goldthioglucose and hypothalamic obese mice show a normal blood glucose level which is as resistant to the diabetogenic effect of growth hormone as that of normal rodents¹ (Mayer and Zighera, 1954; Mayer, French *et al.*, 1955). A similar contrast is exhibited with cholesterol, the blood level of which is very high in the genetic syndrome but only slightly raised in the two other forms¹ (Mayer and Jones, 1953; Brobeck, 1946; Drachman and Tepperman, 1954). The hypercholesterolaemia of genetically obese mice also shows undue sensitivity to growth hormone. The same mice show a peculiar type of insulin resistance, characterised by absence of convulsions and by spontaneous return to normal levels of blood glucose even in the fasted state (Shull and Mayer, *in press*). By contrast, goldthioglucose and hypothalamic obese mice when injected with insulin in the absence of food are thrown into convulsions as easily as non-obese animals (Mayer

and Zighera, 1954; Mayer, French *et al.*, 1955). The mice with the hereditary obese-hyperglycaemic syndrome show hyperplasia of the islets of Langerhans and increased pancreatic insulin secretion (Mayer *et al.*, 1953; Wrenshall *et al.*, 1955). Total carcass protein is decreased in the genetic form, but is normal in the other two types of obesity (Bates, Nauss *et al.*, 1955).

Observed differences in fat metabolism also emphasise the marked differences between the chemical mechanisms of the three syndromes (Guggenheim and Mayer, 1952; Bates, Mayer and Nauss, 1955a, b; Bates, Zomzely and Mayer, 1955; Mayer, Hagman *et al.*, 1955). In the hereditary obese-hyperglycaemic syndrome, a profound shift toward lipogenesis is observed, both *in vivo* and *in vitro*, alike in the carcass and the liver, even under conditions which normally would preclude fat synthesis, such as underfeeding, chronic or suddenly imposed, and even, in the experiments on "instantaneous" (half-hour) incorporation of ¹⁴C-labelled acetate into liver and carcass fatty acids, a 24-hour fast. Goldthioglucose obesity presents an entirely different picture. With it mice show increased lipogenesis compared with their non-obese littermates only in the measure that they are allowed to overeat. Incidentally, the fact that a difference in ¹⁴C incorporation was established between animals of similar fat content eliminates the possibility that it was a secondary result of hyperphagia or of extreme adiposity. Cholesterol synthesis also is increased (Mayer, 1954a). Hypothalamic obese animals show "instantaneous" incorporation of ¹⁴C-labelled acetate like that in goldthioglucose obese mice (Bates, Zomzely and Mayer, 1955; Mayer, Hagman *et al.*, 1955), although long-term studies are complicated by the curious feeding pattern of these animals (Bates, Mayer and Nauss, 1955a). Underfeeding, while it cuts down the weight of hereditarily obese mice, still leaves them with an abnormally high fat content (Alonso and Maren, 1954; see footnote, p. 871). It brings the composition of goldthioglucose obese mice back to normal. Pair-fed hypothalamic obese and normal animals still differ in composition, the hypothalamic ones containing somewhat more fat. Van Putten (1952) has shown that at least the major part of the difference could be ascribed to different spontaneous feeding patterns and could be eliminated if the animals were fed so that they consumed their food under similar conditions of spacing and timing.

Skinner box¹ studies of the different types of obese mice show that the feeding patterns of hereditarily obese mice deviate from those of normal

¹ The contrast between the hypercholesterolaemia and hyperglycaemia of the genetically obese mice and the normal picture encountered in goldthioglucose and hypothalamic obesities does not exclude the fact that old animals with either syndrome are more prone to spontaneous rise of blood glucose and cholesterol levels than mice of normal weight. It shows, however, that at least as far as mice are concerned, the association of obesity with hyperglycaemia and hypercholesterolaemia is of two entirely different types.

¹ An apparatus for studying animal behaviour, in which the rat or other experimental animal presses a bar and is rewarded by a pellet of food (Skinner, 1953).

animals; goldthioglucoase and hypothalamic obese animals show different abnormalities (Anliker and Mayer, submitted for publication).

Finally, the pathological conditions accompanying the different forms of obesity are different (Mayer, 1954*b*; 1955*a*).

EXTENSION OF THE DISTINCTION BETWEEN REGULATORY AND METABOLIC OBESITY

This evidence indicates that in the hereditary obese-hyperglycaemic syndrome the essential lesion is a metabolic disturbance, consisting in primary hyperglycaemia followed by hypersecretion of insulin which in turn causes the obesity and hypercholesterolaemia. The syndrome has been in part reproduced in thin animals by appropriate hormonal treatment (Mayer and Slides, to be published). The nature of the primary hyperglycaemia has been discussed in a preliminary fashion elsewhere (Mayer, 1955*a*) and is under intensive investigation. The central mechanism regulating food intake is probably intact but functions on signals distorted by the metabolic lesion. The hereditary obese-hyperglycaemic syndrome can thus be considered typical of metabolic obesity. By contrast, in goldthioglucoase obesity, there is no detectable primary metabolic lesion, all observed metabolic abnormalities being clearly referable to the disturbed mechanism for regulating food intake. The mechanism, although it appears to be pegged at a higher level, is still susceptible to some influences: while the higher calorie intake on high-fat compared with high-carbohydrate diets could be explained in part by differences in calorie concentration, the fact that high-protein diets lead to lower intakes than high-carbohydrate diets clearly shows that the organism is still sensitive to the peculiar "satiety" effect of high-protein diets or, alternatively, cannot tolerate large amounts of protein as it can of other dietary constituents. The goldthioglucoase obesity syndrome can thus be considered typical of regulatory obesity. The status of hypothalamic obesity is more doubtful; it is probably another example of regulatory obesity. The negative correlation of non-fasting blood sugar levels with hyperphagia (Mayer, Bates and Van Itallie, 1952) and the extreme inertness of depot fats (Bates, Mayer and Nauss, 1955*b*) in hypothalamic obese rats are probably metabolic consequences of hyperphagia rather than phenomena of primary etiological significance. It is not absolutely excluded, however, that the mechanism of the hyperphagia may be in part mediated through metabolic disturbances.

Endocrine forms of obesity are obviously metabolic; the possibility that the hyperadrenocortical types may also have some regulatory aspects has

been mentioned. The hyperphagia due to social or familial pressure is purely regulatory. So, it would appear, are most types of psychogenic obesity, though it is not impossible that primarily psychological disturbances may have some metabolic results which in turn will cause hyperphagia.

METABOLIC AND REGULATORY FACTORS IN ANOREXIA

A similar type of analysis could be attempted for anorexia, though the experimental evidence is less complete. Both metabolic and regulatory forms exist. Anorexia can be produced in the laboratory by symmetrical lateral hypothalamic lesions (Anand and Brobeck, 1951) or by injecting glucose into hypophysectomised alloxan-treated animals (Mayer and Bates, 1952). Clinically, common examples of metabolic anorexia are those accompanying disease and old age. Ohlson *et al.* (1948) have shown that older women consistently eat from 300 to 500 Cal. less daily than representative samples of young women; they further showed that women who did not enjoy full health consistently ate less than the healthy. Vinther-Paulsen (1952) and Spies and Collins (1946) have emphasised the mutually accelerating relationship of anorexia and senile debility. Panhypopituitarism, and particularly Simmonds' disease, leads to anorexia, largely at least for metabolic reasons.

By contrast, in essential human thinness, the most general picture appears to be a disproportion between physiological requirements and appetite, without any known "metabolic" basis. *Anorexia nervosa*, which, although it presents certain characteristics that are probably secondary to calorie undernutrition and that make it resemble panhypopituitarism (emaciation, senile appearance, loss of hair, achlorhydria, hypotension, hypometabolism, hypoglycaemia, amenorrhoea), can be differentiated, at least when its onset is relatively rapid, by measurement of the ketosteroid excretion and insulin sensitivity, and by the presence of pubic and axillary hair. Since its initial description by Gull (1888), explanations have shifted from purely mechanical aspects, such as possible downward displacement of the stomach (gastropexia), to purely psychological explanations.

It is pertinent to call attention to the fact that for *anorexia nervosa* it is premature to conclude that non-cortical and metabolic factors can be ruled out in the etiology of all cases. A recent typical series described by Hertz (1952) emphasises certain puzzling aspects. The sex discrepancy, only two of the patients being male, corresponded with the findings of earlier studies. The incidence was closely related to age, the disease being most frequent in adolescent girls and young women

(age group 14 to 25). Earlier observers, such as Déjerine and Gauckler (1911) had been so struck by this relation to sex and age that they reserved the term "primary anorexia" for that seen in adolescent girls and young women, while they postulated that forms seen at other ages were "secondary" to other mental disturbances. The relation of *anorexia nervosa* to known psychological trauma could be established in less than one-half of the cases; these were usually the younger patients, for whom there was a better prognosis. In the older, the intractable anorexia not associated with psychological disturbance led to progressively worsening asthenia.

The fact that the response of *anorexia nervosa* to corticotropin is sometimes favourable, both as regards restoration of appetite and regression of abnormalities of behaviour (Wolfson, 1954), is difficult to interpret in terms of etiology because of the possibility that corticoids have both peripheral and central effects on food intake. To this reviewer, *anorexia nervosa* may well be, like obesity, a collection of distinct entities, of which many are of regulatory nature, either psychogenic or hypothalamic, but some may prove to be metabolic.

MODE OF ACTION OF DIFFERENT TREATMENTS

We may now consider the physiological and pharmacological basis for the drugs, preparations and methods of treatment used to deal with obesity and anorexia. Drugs such as amphetamine, gossypol (Eagle and Bialek, 1950), sedatives, and methylcellulose preparations are regulatory agents; so are the prescribed rituals which are part of the armamentarium of certain healers and those who practise individual and group psychotherapy. Agents like thyroid, the notorious dinitrophenols, pills made of maltose or other sugars, and reducing diets are metabolic in their action, as are, in the treatment of extreme leanness, insulin, high-fat diet, and intravenous and oral fat emulsions. The effect of diethylthiocarbamate on mice with the obese hyperglycaemic syndrome also appears to be metabolic (Mayer *et al.*, 1953). As a rule, regulatory agents overrule metabolic factors. For example, amphetamine will counteract the appetite-enhancing effect of insulin. Agents acting on the gastro-intestinal tract (*e.g.*, "bulk" pills of methylcellulose) seem to have relatively little effect on the total daily intake although they strongly influence the size of individual meals. It may not be unreasonable to think that response to treatment with psychotherapy, corticotropin or insulin may provide clues to the primary etiology in different types of anorexia.

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INTERACTION BETWEEN CONSTITUTIONAL AND ENVIRONMENTAL FACTORS, AS EXEMPLIFIED BY THE ROLE OF PHYSICAL ACTIVITY

The interrelation of the effects of constitution and diet on bodyweight has been discussed above. Recognition of this relation is shown in the endless quest for more successful reducing (or fattening) diets. The importance of constitutional factors and of environmental temperature has been alluded to. The problem of the relation of exercise to bodyweight is of major theoretical and practical importance; yet in the past one or two decades, at least on the western side of the Atlantic, the role of exercise in weight control has been minimised, if not ridiculed, and exercise has been denied any part in "obesity" programmes. This denial has not been based on recent experimental or clinical work or on the accumulated experience of centuries, which has always contrasted the lean, hard, active soldier or hunter with the fat merchant or clerk. Two plausible misconceptions have dominated the field:

- (1) Exercise requires relatively little calorie expenditure and therefore increased physical activity hardly changes the calorie balance.
- (2) An increase in physical activity is *always* automatically followed by an increase in appetite and food intake and may therefore actually impair weight reduction.

Let us examine these two propositions.

ENERGY EXPENDITURE IN EXERCISE

The first misconception, which minimises the calorie expenditure due to physical activity, should be avoided by anyone who has ever looked at a table of energy expenditure. Such tables clearly show that the cost of exercise can be high. For example, the table of recommended dietary allowances of the Food and Nutrition Board, U.S. National Research Council (1953) gives calorie values for men ranging from 2400 to 4500 Cal. daily according to the level of activity. The figure of 4500 Cal. daily does not represent an upper limit; labourers, soldiers in the field and athletes often require up to, or even more than, 6000 Cal. daily.

In contrast with these statements, one frequently hears or reads such statements as the following: the calorie equivalent of a pound of fat can be matched only by walking for thirty-six hours, splitting wood for seven hours, or playing volley ball for eleven hours. These unattainable extremes of physical activity are used to demonstrate that it is impossible to lose weight by exercise. The implicit postulate is that the cost of exercise

depends entirely on the exercise being done at one stretch. Actually, of course, the cost of splitting wood for seven hours will still be equivalent to one pound of fat even though the seven hours may not constitute one stretch. Thus, while splitting wood for seven consecutive hours would be difficult for anyone other than a Paul Bunyan, splitting wood for half an hour every day, by no means an impossible task for a healthy man, would add up to seven hours in a fortnight. If it represented a regular practice, it would, by the very reasoning of the detractors of exercise, represent the calorie equivalent of 26 pounds of body fat in a year. Half an hour of handball or squash daily would be equivalent to sixteen pounds in a year.

It seems more useful, however, to recall the measured costs of different types of physical exercise. Orr and Leitch (1937-38), who had assembled their own and other workers' data (Cathcart and Orr, 1919; Kestner, 1923; Medical Research Council, Committee upon Quantitative Problems in Human Nutrition, 1924; Kestner and Knipping, 1928; Farkas and Geldrich, 1930; Maisels *et al.*, 1935; Moss, 1935; Rose, 1935) give values for the cost of different types of activity established for a "mean" man with a body surface of 1.77 sq. m., which corresponds, for example, to a height of 172 cm. (5 ft. 7 in.) and a weight of 65 kg. (143 lb.). The values are given as excess requirement per hour of work over basal rate, with a ten per cent. addition for specific dynamic action, so that they could be used directly for the calculation of requirements by the factorial method.

From these data, one can readily calculate that, for the mean man, examples of energy expenditure over the cost of sitting are: walking, 100 to 550 Cal. per hour, depending on the speed; swimming, up to 685 Cal. per hour; climbing, up to 885 Cal. per hour; skating, up to 685 Cal. per hour; and cycling, up to 585 Cal. per hour. These hourly rates of energy expenditure above the sitting level do not include the admittedly brief peaks of activity reached in competition, when calorie expenditures may approach 22 Cal. per minute. An expenditure of from 500 to 600 Cal. per hour above the resting level represents a rate of physical activity which can be endured by the average adult not in training for a period of thirty minutes without undue discomfort.

In most types of exercise, no heavy object is moved other than the whole or parts of the body. Therefore, the energy cost of exercise is proportional to bodyweight (Food and Agriculture Organization of the United Nations, 1950; Keys, 1949-50). If excess bodyweight is so great that it impairs body movement, the relationship will no longer strictly apply, and the cost of exercise will actually increase faster than bodyweight (Newburgh, 1944).

If the energy cost of exercise is approximately proportional to bodyweight, it follows that the overweight person will require more energy, and hence burn more body reserves, for the same amount of exercise, than a slimmer person would. Twenty per cent. overweight will increase the cost of walking, tennis playing, golfing and so on by twenty per cent. This represents a much greater proportional increase than that introduced by the increase in basal metabolism due to excess weight, which is proportional to only a fractional power of the bodyweight (Food and Agriculture Organization of the United Nations, 1950).

Thus, any increase of the calorie intake above balance level in a physically active person will cause only a modest increase in weight because of the energy cost of moving the extra poundage. On the other hand, in a sedentary person, less energy will be expended in moving the extra weight and hence weight gain will be more rapid and more pronounced. A sedentary person will therefore be exposed to the danger of overweight to a much greater extent than a person who makes a practice of daily, or at least frequent, physical exercise.

EXERCISE AND EXPERIMENTAL OBESITY

Results of studies of experimental obesity support these concepts. In the hereditary obese-hyperglycaemic syndrome, as has already been mentioned, the bulk of the extra energy comes from inactivity rather than from hyperphagia. If non-fasted animals are placed in activity cages and spontaneous activity is measured, it is found that non-obese animals are over 50 times as active as obese animals (Mayer, 1953a, b). Inactivity is not the result of extreme obesity but in fact precedes it, as is shown by the comparison of activity rates of mature non-obese animals and of young obese animals of the same weight. It can thus be considered as one of the etiological factors in the syndrome determined by the obese-hyperglycaemic gene. Non-obese animals remaining steady in weight consume about 20 Cal. daily, of which 10 cover basal expenditure and 2 cover specific dynamic action, leaving 8 for the cost of activity. Obese littermates consume about 25 Cal., and may gain up to 1 g. (or 9 Cal.) daily. Their basal expenditure again accounts for 10 Cal. daily and specific dynamic action for 2.5 Cal. daily. When the 8 Cal. expended daily on activity by the non-obese mouse are devoted in the obese mouse to fat synthesis, the rapid development of extreme adiposity is no longer a thermodynamic impossibility.

The weight gain of genetically obese mice can be drastically reduced by treadmill exercise (Mayer,

1955a). The obese members of the strain which carry the "waltzing" gene and are in constant rotary movement in their cages show a weight gain only about 30 per cent. greater than the non-obese mice, against 200 or 300 per cent. shown by the sedentary obese mice.

Hypothalamic obesity in the mouse is also characterised by a considerable degree of inactivity (Mayer, French *et al.*, 1955). In contrast, goldthioglucoase obese mice are normally active but will spontaneously lose weight if made to exercise more in a squirrel type of rotating cage (Marshall and Mayer, 1954). Such findings emphasise both the different degree of spontaneous activity in the different forms of obesity and the importance of exercise as a weight-controlling factor.

EXERCISE, FOOD INTAKE AND BODYWEIGHT

A frequent misconception about the value of exercise in weight control is that an increase in physical activity *always* causes an increase in appetite and food intake which equals, or is greater in energy value than, the energy cost of the exercise.

That in a normal, reasonably exercised animal or person an increase in food intake follows an increase in activity is true; it explains why the weight of most adult animals and men is relatively constant. Proper adjustments of appetite prevent the body from indefinitely burning away its reserves if called upon to exert itself at higher levels than those to which it has been accustomed. Experimental results, however, show that such an adjustment occurs only within a certain range, which has been termed by Mayer "normal activity range" (Mayer, 1954b; Mayer *et al.*, 1954).

EXERCISE AND WEIGHT IN EXPERIMENTAL ANIMALS

Early work (Gasnier and Mayer, A, 1939) had shown that rabbits, when restricted in their activity by confinement in a small cage, will consume more food than they require and accumulate fat. The excess food consumed is characteristic of the strain; hence a hereditary factor is involved here. The same phenomenon is illustrated by the fact that rats can be made obese by total immobilisation (Ingle, 1949).

The dependence of food intake and bodyweight on physical activity has since been systematically studied in experimental animals (Mayer *et al.*, 1954). When mature rats accustomed to a sedentary (caged) existence were exercised on a treadmill for increasing daily periods, it was observed that with moderate exercise for a short time (20 minutes to 1 hour) there was no corresponding increase in food

intake, which actually decreased slightly but significantly. Bodyweight also decreased ("sedentary range"). With longer periods of exercise (1 to 5 or 6 hours), food intake increased linearly and weight was maintained ("range of proportioned response", or "normal activity range"). With very long periods of exercise, the animals lost weight, their food intake decreased and their appearance deteriorated ("exhaustion range"). Both the sedentary and the exhaustion range can thus be considered "non-responsive" ranges with respect to food intake, since in them an increase in activity is not accompanied by a corresponding increase in food intake. The sedentary range is obviously of particular interest for the problem of obesity. It demonstrates that under abnormal environmental conditions which force on the subject partial immobilisation or at least a sedentary life, the limit below which the regulation of food intake no longer responds to a decrease in activity is overtaken. Obesity is the unavoidable result. This, of course, has been known empirically to farmers for centuries and explains the practice of penning or cooping up cattle, pigs and geese for fattening.

EXERCISE AND WEIGHT IN ADULT MAN

Similar observations are available on man. Greene (1939) has studied more than 200 overweight adult patients in whom the beginning of obesity could be traced directly to a sudden decrease in activity. Mayer has examined the relation of bodyweight to food intake and work in an industrial population of West Bengal (India) with a particularly wide range of physical activity, from bazaar tailors and clerks to coolies carrying twice their bodyweight on their heads for 9 hours. Fig. 1 (p. 878) illustrates the findings (Mayer, 1955b; Mayer, Roy and Mitra, in press). Ascertainment of food intake was easy, since most of the persons studied did not live in a family but bought their food and cooked it for themselves. The lack of provision for storage of food forced them to shop frequently. The diet was extraordinarily uniform for each individual and showed little variety within groups or from group to group. Individual records made each day of the food eaten, verified by records of the food bought and checks on the amount of money spent per week on food, gave results generally identical with exhaustive dietary histories and apparently more representative of the intake over a long period than corresponding data obtained in a western society. Activity was ascertained from detailed schedules, "expert" appraisal of physical effort and some Douglas bag measurements. Clerks were subdivided into 4 classes according to the mileage

walked daily to and from work, class one, who actually lived within the factory grounds, being the most inactive group. Each of the occupations or subgroups was represented by at least 10 subjects; they were classified according to degrees of activity, extremes being represented on the one hand by merchants, supervisors and "non-walking"

BODYWEIGHT AND CALORIE INTAKE AS A FUNCTION OF PHYSICAL ACTIVITY

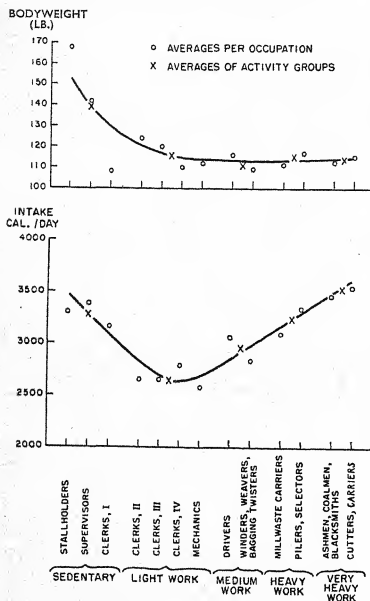


FIG. 1.—The relation of intake and weight to exercise in an industrial male population in West Bengal (Mayer, 1955b).

clerks, at the other end by selectors and pilers, carriers who carried up to 190 pounds of jute per man, coalmen, ashmen who carried equally heavy bags of coal and ashes and unloaded them in an awkward manner, and cutters who spent their whole day swinging heavy cutting knives with scarcely any pause. The individual bodyweight ranged from 67 to 198 lb. for about the same height (5 ft. 2 in. to 5 ft. 4 in.). Economic differences and cultural, religious and ethnic factors were studied and ruled out in the analysis of the

results. It is readily seen from Fig. 1 that the results obtained for food intake, and for bodyweight as a function of food intake, are strikingly similar to those obtained with rats. Again, there is a sedentary range which corresponds to no further decrease in food intake, but, instead, to an increase, and where increasing degrees of overweight follow decreasing exercise. The meaning of the actual increase in food intake under extremely sedentary conditions is, however, not clear. It may indicate a decrease in the availability of reserves, possibly from circulatory sluggishness due to inactivity.

EXERCISE AND WEIGHT IN CHILDREN

The problem of the relation of weight to activity in children has been investigated also. Bruch (1940) found that inactivity was characteristic of most of the 160 obese children whom she had studied. Only 18 per cent. of the boys and 22 per cent. of the girls were "normally" active. Seventy-six per cent. of the boys and 68 per cent. of the girls were physically inactive. Rony (1940) suggested that laziness or decreased tendency to muscular activity is a primary characteristic of obese subjects; in childhood it is demonstrated by avoidance of all unnecessary activity, outdoor play and athletics. Bronstein *et al.* (1942) found that most of the 35 obese children whom he and his associates studied spent much of their leisure time in sedentary activities. Graham (1947) reported similar observations. Danish workers, in particular Tolstrup (1953) and Juel-Nielsen (1953), attempted a semi-objective grading of groups of obese children and found that lack of activity was characteristic of them. Peckos (1953), studying a large group of Boston children, found that differences in body build, and more specifically in fat content and distribution, were not correlated with calorie intake. Fry (1953), studying obese children selected as presenting large fat pads, found that they did not have higher average calorie intakes than non-obese children of the same height and age. In her "rough psychological evaluation" a much higher proportion of obese than of non-obese children is labelled as inactive or only moderately active. The difference was particularly marked in boys. No data, however, are given to support her estimate.

In a recent study, Johnson *et al.* (in press) attempted to compare calorie intake and activity in carefully paired groups of obese and normal-weight schoolgirls. Exhaustive dietary histories and activity schedules covering the year preceding the study were obtained. The research method of Burke (1947) was used, in particular regard to the difficulties encountered in relation to children (Mayer, 1952) and to obese children (Beaudoin and Mayer, 1953; van der Meer, 1954).

Mayer, 1954). The schedule of physical activity was obtained by a system of successive examinations. First a list of usual activities was established and the subjects were asked how much time they devoted to each, on a daily or weekly basis, depending on the type of activity considered. The subjects were then asked to complete the list of activities and schedules, covering the year by seasons. Total hours per week were checked, and in another interview the activities were re-checked on the same general basis. If the total time per week had been grossly over- or underestimated, special efforts were made to find out the causes of the error. The activities were rated by the method of Rose (1935) and Orr and Leitch (1937-38). It was found that suburban high-school girls were generally not very active. Even the schedules of the non-obese group showed little time devoted to household duties, little participation in active sports and, at least during the school term, a minimum amount of time devoted to walking or to other physical activity. Even so, however, there was a marked difference between the obese and non-obese groups. The obese group was much more inactive than the non-obese. In general, the time spent by the obese group in sports or any sort of exercise, including ballroom dancing, was less than half that spent by the thin girls, the difference being absorbed by "sitting" activities. In contrast, calorie intakes were generally larger in the non-obese group than in the obese. When possible factors leading to positive energy balance are analysed, it appears therefore that in this particular obese group, even though probable sources of error inherent in the dietary interview method and in the type of activity analysis selected are recognised, inactivity was of greater importance than overeating in the development of obesity. The importance of exercise as a weight-controlling factor in this population of high-school girls was emphasised by the fact that when obese and non-obese girls attended summer camp, almost without exception they reported loss of weight under the system of enforced strenuous activity, in spite of a simultaneous increase in food consumption.

CONSTITUTIONAL FACTORS, EXERCISE AND WEIGHT

The following conclusions appear to be supported by the evidence presented above. First, it is trite but perhaps useful to say that exercise is the major variable in energy expenditure. Secondly, there is a sedentary range in which a decrease of activity is not followed by a decrease of food intake and the subject accumulates fat. Constitutional factors determine the extent of this range as well as the

magnitude of the effect of immobilisation. There is also a "non-responsive" range at high activity levels, its limit being again determined by constitution. Finally, though enforced exercise can move a person from the sedentary range to the range of normal activity, constitution will determine whether the subject, given a suitable environment, will spontaneously step up his activity so that he leaves the sedentary range. Thus it becomes apparent that the regulation of food intake, even in a normal subject, has a limited range of effectiveness as regards response to physical activity, and that environmental conditions can bring about regulatory disturbances leading to relative hyperphagia or to calorie deficit. The size of the effective range determines the capacity for adaptation. Beyond the limits of adaptation are regulatory obesity brought about by immobilisation and regulatory excessive leanness brought about by overwork. Again, the case, though of special practical importance, is but part of a general phenomenon.

CONCLUSIONS AND PRACTICAL SUGGESTIONS

COMPLEXITY OF THE PROBLEMS OF OBESITY AND EXCESSIVE LEANNESS

The aim of the reviewer has been to give the reader an idea of the extreme complexity of the problems set by obesity and excessive leanness. That there are inaccuracies and even serious errors in the picture drawn is highly probable; it can only be hoped that the inspiration of Montaigne's admonition has been heeded: "All of us, being human, are bound to err many times in our lives. The misfortune is not to be wrong; it is to be wrong pompously." In this field pompous generalisations and deceptively simple solutions have often been the rule: for example, it is quite obvious that if patients with anorexia can be made to add to their diet a quarter of a pound of butter, or the calorically equivalent quantity of fat emulsion, every day, they will put on weight. Similarly, legitimate belief in the validity of the first law of thermodynamics would dictate that any "low-calorie diet" should be effective in the treatment of obesity. Actually, the careful work of Kekwick and Pawan (1953) on weight loss in the obese, which included the study of water balance, nitrogen balance, creatinine and faecal fat, as well as some "compartment analysis" (distribution of body water), shows that while calorie restriction in the obese results in weight loss, the degree of weight loss does not appear to bear any simple relation to the degree of calorie deficiency, the rate

walked daily to and from work, class one, who actually lived within the factory grounds, being the most inactive group. Each of the occupations or subgroups was represented by at least 10 subjects; they were classified according to degrees of activity, extremes being represented on the one hand by merchants, supervisors and "non-walking"

BODYWEIGHT AND CALORIE INTAKE AS A FUNCTION OF PHYSICAL ACTIVITY

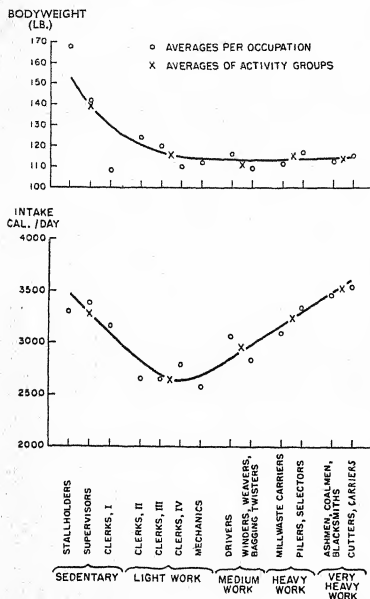


Fig. 1.—The relation of intake and weight to exercise in an industrial male population in West Bengal (Mayer, 1955b).

clerks, at the other end by selectors and pilers, carriers who carried up to 190 pounds of jute per man, coalmen, ashmen who carried equally heavy bags of coal and ashes and unloaded them in an awkward manner, and cutters who spent their whole day swinging heavy cutting knives with scarcely any pause. The individual bodyweight ranged from 67 to 198 lb. for about the same height (5 ft. 2 in. to 5 ft. 4 in.). Economic differences and cultural, religious and ethnic factors were studied and ruled out in the analysis of the

results. It is readily seen from Fig. 1 that the results obtained for food intake, and for bodyweight as a function of food intake, are strikingly similar to those obtained with rats. Again, there is a sedentary range which corresponds to no further decrease in food intake, but, instead, to an increase, and where increasing degrees of overweight follow decreasing exercise. The meaning of the actual increase in food intake under extremely sedentary conditions is, however, not clear. It may indicate a decrease in the availability of reserves, possibly from circulatory sluggishness due to inactivity.

EXERCISE AND WEIGHT IN CHILDREN

The problem of the relation of weight to activity in children has been investigated also. Bruch (1940) found that inactivity was characteristic of most of the 160 obese children whom she had studied. Only 18 per cent. of the boys and 22 per cent. of the girls were "normally" active. Seventy-six per cent. of the boys and 68 per cent. of the girls were physically inactive. Rony (1940) suggested that laziness or decreased tendency to muscular activity is a primary characteristic of obese subjects; in childhood it is demonstrated by avoidance of all unnecessary activity, outdoor play and athletics. Bronstein *et al.* (1942) found that most of the 35 obese children whom he and his associates studied spent much of their leisure time in sedentary activities. Graham (1947) reported similar observations. Danish workers, in particular Tolstrup (1953) and Juel-Nielsen (1953), attempted a semi-objective grading of groups of obese children and found that lack of activity was characteristic of them. Peckos (1953), studying a large group of Boston children, found that differences in body build, and more specifically in fat content and distribution, were not correlated with calorie intake. Fry (1953), studying obese children selected as presenting large fat pads, found that they did not have higher average calorie intakes than non-obese children of the same height and age. In her "rough psychological evaluation" a much higher proportion of obese than of non-obese children is labelled as inactive or only moderately active. The difference was particularly marked in boys. No data, however, are given to support her estimate.

In a recent study, Johnson *et al.* (in press) attempted to compare calorie intake and activity in carefully paired groups of obese and normal-weight schoolgirls. Exhaustive dietary histories, and activity schedules covering the year preceding the study were obtained. The research method of history method of Burke (1947) was used. In regard to the difficulties encountered in relation to children (Mayer, 1952) and to obese children (Beaudoin and Mayer, 1953; van den Berghe *et al.* 1954) the

Mayer, 1954). The schedule of physical activity was obtained by a system of successive examinations. First a list of usual activities was established and the subjects were asked how much time they devoted to each, on a daily or weekly basis, depending on the type of activity considered. The subjects were then asked to complete the list of activities and schedules, covering the year by seasons. Total hours per week were checked, and in another interview the activities were re-checked on the same general basis. If the total time per week had been grossly over- or underestimated, special efforts were made to find out the causes of the error. The activities were rated by the method of Rose (1935) and Orr and Leitch (1937-38). It was found that suburban high-school girls were generally not very active. Even the schedules of the non-obese group showed little time devoted to household duties, little participation in active sports and, at least during the school term, a minimum amount of time devoted to walking or to other physical activity. Even so, however, there was a marked difference between the obese and non-obese groups. The obese group was much more inactive than the non-obese. In general, the time spent by the obese group in sports or any sort of exercise, including ballroom dancing, was less than half that spent by the thin girls, the difference being absorbed by "sitting" activities. In contrast, calorie intakes were generally larger in the non-obese group than in the obese. When possible factors leading to positive energy balance are analysed, it appears therefore that in this particular obese group, even though probable sources of error inherent in the dietary interview method and in the type of activity analysis selected are recognised, inactivity was of greater importance than overeating in the development of obesity. The importance of exercise as a weight-controlling factor in this population of high-school girls was emphasised by the fact that when obese and non-obese girls attended summer camp, almost without exception they reported loss of weight under the system of enforced strenuous activity, in spite of a simultaneous increase in food consumption.

CONSTITUTIONAL FACTORS, EXERCISE AND WEIGHT

The following conclusions appear to be supported by the evidence presented above. First, it is trite but perhaps useful to say that exercise is the major variable in energy expenditure. Secondly, there is a sedentary range in which a decrease of activity is not followed by a decrease of food intake and the subject accumulates fat. Constitutional factors determine the extent of this range as well as the

magnitude of the effect of immobilisation. There is also a "non-responsive" range at high activity levels, its limit being again determined by constitution. Finally, though enforced exercise can move a person from the sedentary range to the range of normal activity, constitution will determine whether the subject, given a suitable environment, will spontaneously step up his activity so that he leaves the sedentary range. Thus it becomes apparent that the regulation of food intake, even in a normal subject, has a limited range of effectiveness as regards response to physical activity, and that environmental conditions can bring about regulatory disturbances leading to relative hyperphagia or to calorie deficit. The size of the effective range determines the capacity for adaptation. Beyond the limits of adaptation are regulatory obesity brought about by immobilisation and regulatory excessive leanness brought about by overwork. Again, the case, though of special practical importance, is but part of a general phenomenon.

CONCLUSIONS AND PRACTICAL SUGGESTIONS

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and extent of weight loss varying greatly with the type of diet. Thus, in their patients, high-fat reducing diets led to greater weight loss than isocaloric high-carbohydrate reducing diets. Only a study of metabolism and energy expenditure, including "basal" and physical activity, could interpret these findings. Similarly, the difficulties encountered in practice when dealing with either obesity or thinness are better understood when the complexity of the factors regulating food intake is realised. Intermediary metabolism, and humoral, hormonal and autonomic regulations can be involved in metabolic disturbances, while environmental conditions, activity, social and cultural "milieus", and neurological and psychological factors may lead to regulatory disturbances. The existence of such a multiplicity of determinants logically leads one to avoid over-simplifications and universal cures.

The same multiplicity leads one to expect that different reactions to the same treatment may be expected in patients with obesity or excessive leanness. Of particular interest in this connection is the finding by Ohlson (1955) that obese patients losing weight for a sufficient period can be classified into two groups: those who can be maintained in nitrogen balance and those who are in negative nitrogen balance, even on high-protein reducing diets where calories are not too drastically curtailed. The first group present a fair prognosis as far as staying at the lower weight reached after treatment is concerned. The second group, in negative nitrogen balance, present an extremely poor prognosis and invariably return to the pre-reduction weight as soon as rigid control is removed. This physiological difference may correspond to the psychological classification attempted by Young (1955), who found that some of her patients could be put on reducing diets without manifesting any special emotional difficulties but another group deteriorated psychologically when their calorie intake was cut down. Finally, there is general agreement (Beaudoin *et al.*, 1953; Bruch, 1955; Stuart, 1955) that patients persistently obese since childhood constitute a distinct problem, more difficult than that of patients whose weight has fluctuated widely, including periods of normal weight, or patients who have become obese in adult life. These different types of classification, physiological, psychological, chronological, as well as those based on general anthropometric descriptions (*e.g.*, android, gynaeoid (Leroy, 1951)) and on descriptions of the number and distribution of adipose cells (Tanner, 1954) have yet to be combined in a comprehensive taxonomic system. In the long run, only identification of the cause of the primary condition and understanding of its mechanism will permit systematic and successful treatment.

PRACTICAL SUGGESTIONS CONCERNING OBESITY

The reviewer, in the course of several years during which he has given consideration to weight control programmes, has arrived at some practical suggestions which may be of use to readers engaged in treatment.

General Attitude of the Therapist. Obesity is not a moral issue. It is a medical problem, complex and little understood. Censorious comments, sermons, and the shifting of the entire responsibility on to the patient are neither proper nor effective.

Diagnosis of Obesity. Blind application of height-weight tables is unscientific. The principles underlying the construction of these tables have been ably criticised by Keys (1955). In practice, extreme deviations from the average are obvious. Smaller deviations cannot be interpreted without examination of the patient for muscle development. The old-fashioned pinching method is a cheap and simple substitute for underwater weighing, measurement of thiocyanate or deuterium space, and the like.

Inducements to the Patient. "Scare" propaganda is one of the curses of the modern world. Though the association of obesity with increased mortality and morbidity risks is established, distinction between association and causation is not always clear. There is enough evidence to justify reduction programmes to promote health as well as on aesthetic grounds, but there are dangers in threats as well as in excessive promises of reward. This has been particularly emphasised by Bruch (personal communication) as regards children.

Informing and Misinforming the Patient. It is necessary to inform the patient about the first law of thermodynamics, and about the calorie value of foods. The importance of the latter cannot be overemphasised. Sound knowledge of the calorie value of foods will not only guide the patient during treatment, it will also protect him against the dishonest claims of manufacturers of "miracle foods" (such as "low caloric bread"). It is wrong and dangerous to belittle the influence of genes or exercise.

Use of Hereditary Data. It has been repeatedly shown (see above) that obesity runs in families, with genetic as well as environmental factors involved. Studies in the United States have shown that less than 10 per cent. of the children of parents of normal weight are obese, but that the proportion rises to 50 per cent. if one parent is obese and to 80 per cent. if both parents are obese. Studies of identical and fraternal twins have shown that food habits are not the main factor. Instead of denying the facts of heredity it would be more intelligent and effective to use them to detect other overweight persons and, more im-

portant, to try to prevent the development of obesity in susceptible children. Obesity is most malignant when the onset is early.

Exercise. Natural selection, operating for hundreds of thousands of years, made men active, resourceful creatures, well prepared to be hunters, fishermen or farmers. The mechanism regulating food intake was not adapted to the highly mechanised conditions of modern life, any more than animals were evolved to live in a cage. In many cases, adaptation to modern conditions without development of obesity implies that the person will have either to step up his activity or endure mild or acute hunger all his life. The first alternative is difficult, especially in the United States and Canada, where the cities offer little inducement to walking and are often poorly provided with facilities for adult exercise. Even among the young, highly competitive sports for the few are often emphasised at the expense of individual sports which all could learn and continue to enjoy after school and college years are over. If the first alternative, stepping up activity, is difficult, it is well to remember that the second alternative, life-time hunger, is so much more difficult that to rely on it for weight control in cases of sedentary overweight can only continue to produce the fiascos of the past. Strenuous exercise on an irregular basis, in untrained persons already obese, is obviously not what is advocated here. But a re-organisation of one's life to include regular exercise adapted to one's physical capacity is a sound preventive measure and a justified return to the wisdom of the ages. Moderate exercise during weight reduction, when practicable, also helps in promoting nitrogen balance and muscle tone.

Diets. The essential principle to follow in devising the diets is that a good reducing diet is one on which the patient does not feel too hungry. The diversity of probable etiologies makes it likely that different patients will feel more comfortable on different types of diet. In practice, the choice of foods by obese individuals and their feeding patterns are as diverse as in normal subjects (Beaudoin and Mayer, 1953). It has been repeatedly found (Beaudoin and Mayer, 1953; Dole *et al.*, 1954; Stunkard, Grace and Wolff, 1955) that most obese patients tend to do their overeating late in the day and at night, which indicates that evening eating should be controlled with particular care. Diet prescription should be an individual operation, adapted to the patient's rate of energy expenditure and desired rate of weight loss. It should furnish an opportunity for education in the caloric value of foods. It should also permit nutrition education in general. Finally, it should be experimental; trial and error will permit the finding of the most effective diet, as well as the most suitable schedule of exercise. "Fad" diets

may have a short-term value but they have no lasting educational or practical worth. If, as some have claimed, it is possible to "shrink the stomach" or "re-train the appetite", special diets might perhaps be used for that purpose before a change is made to a more normal diet. The evidence offered in favour of the process is, however, very scanty. In some cases, better success is obtained with smaller and more frequent meals. The practice of eating slowly seems desirable on physiological grounds, since satiety mechanisms are likely to need time to take effect; it is desirable on psychological grounds also.

Obesity in Childhood and Pregnancy. It seems undesirable as a rule to attempt to reduce weight in children or pregnant women. A better solution consists in keeping the child's weight at its existing value and letting the child "grow up" to the weight, and in letting *post partum* weight loss achieve at least part of the desired result in the woman. It is important to remember, when dealing with obesity in childhood, that inactivity may be the major cause and that it may be easier and more effective to step up activity than to reduce food intake. Care must be exercised, particularly with children obese since their youth, not to do more harm than good; with present methods, the prognosis for such subjects is generally poor and the psychological trauma of persistent and tactless attempts at reduction may be considerable.

Limitations of Potential Success. It ought to be more generally recognised that present-day methods are ineffective with many individuals. With some patients, psychiatrists feel that attempts at weight reduction may be undesirable in the absence of a complete physiological and psychological investigation which may be out of the question. It has already been mentioned how Ohlson (1955) showed that a certain type of obese patient is invariably thrown into negative nitrogen balance on reducing diets, even of the high-protein variety, and that the weight of this type of obese patient returns rapidly to its original level when the period of treatment is over. In general, few problems are more important in this field than the typing of obese patients as regards their anthropometric, metabolic and psychological characteristics. Modes of response to different treatments are doubtless highly correlated with the precise nature of the abnormalities.

Note added in proof. Since this review was written, a number of reports have confirmed, extended and interpreted previous findings. Stunkard, Van Itallie and Reis (1955) have reported that glucagon abolishes hunger contractions and subjective hunger. It simultaneously raises blood glucose and increases capillary-venous differences. Subsequent fall in blood glucose levels with decreasing capillary-venous differences is associated with a

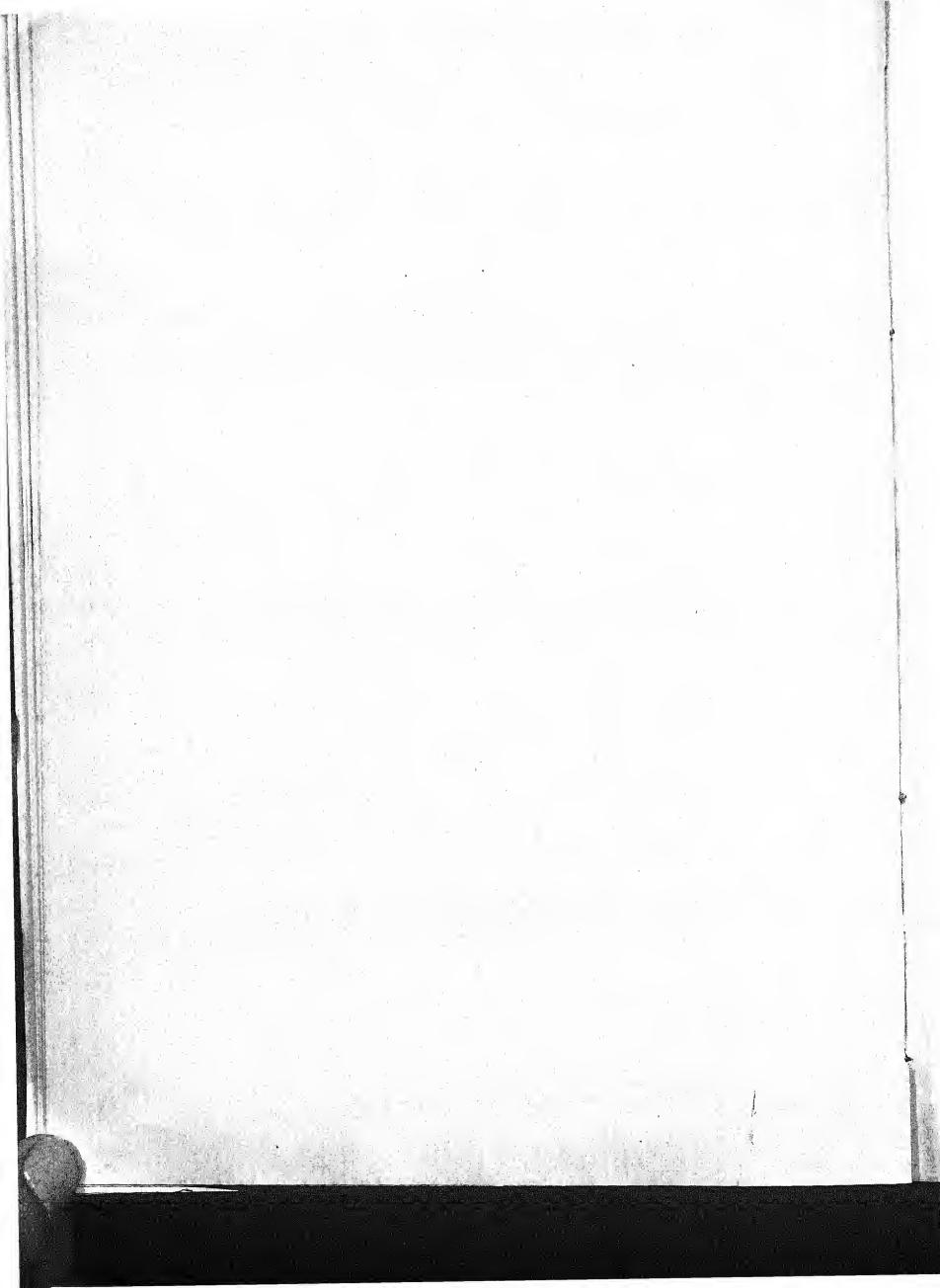
return of hunger contractions and intensification of the experience of hunger. A technique has been developed by Larsson and co-workers (1955) for recording encephalograms from the "feeding" areas. Souleirac's finding of an association between hyperphagia and increased intestinal absorption of glucose in hypothalamic obese rats (Part 1, p. 604) has been extended to hypothalamic obese mice, goldthiogluconase obese mice and genetically obese-hyperglycaemic mice (Mayer and Yanonni, 1955, in press). The increased absorption has been shown to be probably secondary to the excessive consumption of high-carbohydrate diets, with no primary etiological significance. The metabolic nature of the obesity in mice resulting from the graft of tumours secreting adrenocorticotrophic hormone has been established (Mayer, Zomzely and Furth, 1955, in press). This syndrome also entails

increase of body cholesterol. It has been shown that goldthiogluconase, but not goldthiomalate or other goldthio-compounds which are equally toxic, causes severe lesions in the ventromedial ("feeding") area of the hypothalamus (Marshall *et al.*, 1955, in press). The lesions are permanent in animals which become obese. The area damaged is that previously postulated by Mayer to contain glucoreceptors and shown by Forssberg and Larsson to concentrate phosphate and glucose in the fasted state (p. 605). The suggested etiology of the obese-hyperglycaemic syndrome has been supported by the finding of a sixfold increase in pancreatic glucagon after growth hormone administration (Clarke *et al.*, to be published); these animals show also an increased glycogen turnover and increased liver phosphorylase activity (Shull and Mayer, 1955, in press).

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I. TECHNIQUE

CHEMICAL

APPARATUS

4521

GROGAN, C. H. and ROBOZ, E. Simple apparatus for concentrating biologic fluids of low protein content. *J. Lab. Clin. Med.*, 1955, **45**, 495-498. [Nat. Cancer Inst., Dept. Health, Bethesda, Md.]

A dialysis apparatus is described.—H. G. Bray.

4522

BROWN, J. H. U. and BAIN, J. A. A simple Warburg calibrator. *J. Lab. Clin. Med.*, 1955, **45**, 822-824. [Dept. Physiol., Emory Univ., Ga.]

The device which is described makes possible the calibration of vessel and manometer in a single operation.—H. G. Bray.

4523

COOK, C. D., CHERRY, R. B. and KARLBERG, P. An adaptation of the capillary pH electrode for practical use. *Pediatrics*, 1955, **15**, 200-201. [Boston Lying-in Hosp., Mass.]

A simple suction system is attached to the capillary electrode to allow easy filling and rinsing in routine analysis. The electrode was used for plasma and blood of infants and small animals.

H. G. Bray.

4524

FRANGLIN, G. T., MARTIN, N. H. and TREHERNE, J. D. An apparatus for paper electrophoresis. *J. Clin. Pathol.*, 1955, **8**, 144-149. [Dept. Chem. Pathol., St. George's Hosp. Med. Sch., London.]

The relatively complex apparatus designed meets the 3 requirements considered essential. Stable electrical conditions were produced by the use of reversible Ag—AgCl—KCl electrodes. The horizontal filter-paper strip was kept in stable condition by the even distribution of buffer, controlled tension and the reduction to a minimum of changes in temperature and water vapour pressure. The material to be analysed was applied to the filter paper with the minimum disturbance by a micrometer syringe through a tiny hole in the lid of the air-tight box containing the apparatus. Electrophoresis can proceed in the presence of gases other than air. The cost of the apparatus was considered to be offset by the highly reproducible results obtained.—A. Hepburn.

4525

MEAD, T. H. Apparatus and technique for two-dimensional paper ionophoresis. *Biochem. J.*, 1955, **59**, 534-543. [S. African Coun. Sci. Indust. Res., Cape Town.]

4526

CRESTFIELD, A. M. and ALLEN, F. W. Improved apparatus for zone electrophoresis. *Anal. Chem.*, 1955, **27**, 422-423. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

ANALYTICAL METHODS

General

4527

PINTA, M. Applications de la spectrographie de flamme et d'arc dans l'analyse agronomique. [Applications of flame and arc spectrography in agricultural analyses.] *Ann. agronom.*, 1955, **6**, 189-202. [Lab. Spectrograph., Inst. Enseignement Recherches Trop., Bondy.]

4528

MATCHETT, J. R. and LOESECKE, H. W. v. Review of industrial applications of analysis, control, and instrumentation. *Food. Anal. Chem.*, 1955, **27**, 623-632. [Washington Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Washington, D.C.]

A review of recent work on estimation of moisture, proteins and amino-acids, metallic ions, fats and oils, enzymes, carbohydrates, vitamins, acids, colour and taste.

4529

ARCHIBALD, R. M. Review of industrial applications of analysis, control, and instrumentation. *Clinical chemistry. Anal. Chem.*, 1955, **27**, 677-679. [Hosp. Rockefeller Inst. Med. Res., New York 21.]

A review of some recent contributions to quantitative clinical chemistry.

4530

CERIOTTI, G. A simple paper chromatographic technique for the study of free metabolites of tissues and body fluids. *Nature*, 1955, **175**, 897-898. [Centro Tumori, Busto Arsizio, Varese, Italy.]

The filter paper is held between 2 glass plates, one of which has a small central hole. The tissue is dried at 100° C., powdered and evenly

distributed in the hole and held in place by a filter-paper disk. The plates are then inverted over the developing solvent so that the chromatogram can be irrigated by a wick.—H. G. Bray.

4531

GANGULI, N. C. A relation between R_F values of unidimensional and circular paper chromatography. *Anal. chim. Acta*, 1955, **12**, 335-341. [Dept. Appl. Chem., Univ. Coll. Sci. Technol., Calcutta.] French and German summaries.

The squares of the circular R_F values of the amino-acids and sugars studied were observed to be equal to the linear R_F values. This relation can be accounted for theoretically.—H. G. Bray.

4532

BICKEL, H. Die klinische Bedeutung der Papierchromatographie für die Entdeckung von Aminosäuren und Zuckerstoffwechselstörungen. [The clinical use of paper chromatography to detect disorders of amino-acid and sugar metabolism.] *Helv. paediat. Acta*, 1955, **10**, 258. [Kinderklin., Univ. Marburg.]

See also Absts. 6003, 6005.

Carbohydrate Constituents

4533

GLEGG, R. E. and EIDINGER, D. A method for fractionating the carbohydrate components of bone. *Arch. Biochem. Biophys.*, 1955, **55**, 19-24. [Dept. Anat., McGill Univ., Montreal.]

A neutralised NaOH extract of cattle bone shavings was fractionated by precipitation with 63 and 84 per cent. ethanol. From paper chromatograms of the hydrolysates one fraction was found to contain glucuronic acid and galactosamine and was therefore tentatively identified as chondroitin sulphate. The other fraction contained fucose, galactose, mannose and glucosamine.

A. Hepburn.

4534

TÄUFEL, K. and MÜLLER, K. Die Reversion der Saccharide und ihre Bedeutung für die Analytik der Kohlenhydrate. 1. Zum Chemismus der Reversion. [The reversion of sugars and its importance in analysis of carbohydrates. 1. The chemistry of reversion.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, **100**, 351-359. [Inst. Ernährungsforsch., Potsdam-Rehbrücke.]

The reversion on heating of solutions of *d*-glucose, *d*-galactose, *d*-mannose, *d*-fructose, *l*-sorbose, *l*-arabinose and *d*-xylose was studied analytically and chromatographically, with different concentrations of sugar and HCl.—D. Duncan.

4535

BRÜCKNER, J. Estimation of monosaccharides by the orcinol-sulphuric acid reaction. *Biochem. J.*, 1955, **60**, 200-205. [Chem. Sect., Dept. Pathol., Univ. Otago Med. Sch., Dunedin.]

The measurement of the absorption spectra of a 31.2 N H_2SO_4 -orcinol-monosaccharide solution after a 50-sec. immersion in boiling water enabled individual monosaccharides to be characterised and estimated either singly or in binary mixtures.

A. Hepburn.

4536

VENNER, H. Eine Schnellmethode zur papierchromatographischen Bestimmung reduzierender Zucker. [A rapid method for estimating reducing sugars by paper chromatography.] *Naturwissenschaften*, 1955, **42**, 179-180. [Inst. Mikrobiol., Jena.]

Circular paper chromatography is used, with a mixture of butanol, acetone, ammonia and water (40 : 50 : 3 : 15) as solvent and aniline phthalate as spray reagent.—H. G. Bray.

4537

FISCHER, F. G. and DÖRFEL, H. Die quantitative Bestimmung reduzierender Zucker auf Papierchromatogrammen. [Quantitative estimation of reducing sugars by paper chromatography.] *Hoppe-Seyler's Ztschr.*, 1954, **297**, 164-178. [Chem. Inst., Univ. Würzburg.]

4538

FISHER, H., HANSEN, R. G. and NORTON, H. W. Quantitative determination of glucose and galactose. *Anal. Chem.*, 1955, **27**, 857-859. [Univ. Illinois, Urbana.]

Glucose and galactose were simultaneously estimated in mixtures by a modification of Brückner's method (*Hoppe-Seyler's Ztschr.*, 1941, **268**, 163) in which orcinol and concentrated H_2SO_4 reacted with the sugars and colour developed. The reaction took place in the spectrophotometer tube and from the absorbance at 470 and 560 m μ . standard equations were derived from which the amounts of the sugars in unknown mixtures were calculated. Results were usually within 0.03 mg. for glucose and 0.01 mg. for galactose in amounts up to 0.150 mg. of each sugar.

A. Hepburn.

4539

LEVY, R. Perfectionnement à la méthode de Folin de mesure de la glycémie. [Improvement of Folin's method of estimating blood sugar.] *Méd. trop.*, 1954, **14**, 734-740. [Corps de Santé Colonial.]

The final colour developed when the original method was used was found to vary in repeated estimations of the same sugar solution and did not follow the Beer Lambert law exactly. The diffi-

N.A. and R., October 1955

culty was overcome by making 2 changes in the technique. The tubes were cooled after removal from the water-bath and before the phosphomolybdic-tungstic reagent was added. After addition of the reagent and when gas had ceased to come off, the tubes were heated again for 5 min. in a boiling-water bath before the solution was diluted for the colorimetric or photometric estimation of the sugar.—L. Wills.

4540

VOLLAIRE-SALVA, J. L'analyse du glucose industriel. [Analysis of industrial glucose.] *Mitt. Geb. Lebensmittel. Hyg.*, 1955, **46**, 58-66. *Proc.* [Paris.]

4541

NAGHSKI, J., WILLITS, C. O. and PORTER, W. L. Maple sirup. 8. A simple and rapid test for the analysis of maple sirup for invert sugar. *Food Res.*, 1955, **20**, 138-143. [E. Reg. Res. Lab., Philadelphia 18, Pa.]

For previous work see Abst. 3378, Vol. 25.

An approximation to within 1 per cent. of the invert sugar content of maple syrup was obtained from the colour reaction of a series of dilutions after the addition of "Clinitest" tablets.—A. Hepburn.

4542

CHEFURKA, W. Some observations on the determination of fructose by the Seliwanoff reaction. *Analyst*, 1955, **80**, 485-486. [Sci. Serv. Lab., Canada Dept. Agric., Univ. Sub Post Office, London, Ont.]

A calibration curve obeying Beer's law can be obtained if sufficient time is allowed for maximum colour development to occur.—H. G. Bray.

4543

WHITE, L. M. and SEOR, G. E. Microscopic identification of microgram quantities of D-fructose. Direct synthesis of crystalline 2,4-dinitrophenylhydrazones by solvent diffusion technique. *Anal. Chem.*, 1955, **27**, 1016-1018. [W. Utilisation Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 10, Calif.]

As little as 0.5 μ g. of pure fructose or 10 μ g. of that separated by chromatography can be identified by the formation of its 2:4-dinitrophenylhydrazone dioxane solvate. Some other sugars give less sensitive and rapid reactions; many give no apparent reaction under the conditions described.—H. G. Bray.

4544

GIBBONS, M. N. The determination of methylpentoses. *Analyst*, 1955, **80**, 268-276. [Lister Inst., London, S.W.1.]

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4545

BÖHM, P. and RICHARZ, G. Zur quantitativen Bestimmung von Inosit in Phosphatiden. [Quantitative estimation of inositol in phosphatides.] *Hoppe-Seyler's Ztschr.*, 1954, **298**, 110-120. [Med. Klin., Univ. Bonn.]

The lipid is hydrolysed in a sealed tube with 6N HCl at 110°C. for 6 hr. and the inositol is separated by paper chromatography with a mixture of isopropanol, acetic acid and water (3:1:1) as solvent and elution with water. The inositol in the eluates is estimated by a periodate oxidation method.—H. G. Bray.

4546

DOUGALL, H. W. Correction of 'crude-fibre' estimation for the effect of altitude. *Nature*, 1955, **175**, 952. [Sch. Agric., King's Coll., Univ. Durham.]

The crude fibre in material analysed at 5700 ft. was inversely related to the logarithm of the digestion time. A formula is given by which the digestion time, which has to be increased at higher altitudes beyond the conventional 30 min. at sea level, is calculated from the boiling-point of the reagents. Alternatively, another formula enables a correction to be applied to the crude fibre obtained after digestion for 30 min.—A. Hepburn.

4547

GAILLARD, B. D. E. Chromatografisch onderzoek naar de samenstelling van de polysacchariden uit de celwand in verband met de analyse van ruwvoerders. [Chromatographic study of the composition of the polysaccharides of the cell wall, with reference to the analysis of coarse fodders.] *Meded. Landbouwhogeschool, Wageningen*, 1954, **54**, 115-179.

See Abst. 1584, Vol. 25.

Nitrogenous Constituents

4548

GRUNBAUM, B. W., KIRK, P. L., GREEN, L. G. and KOCH, C. W. Kjeldahl method with sealed tube digestion. Factors influencing ammonia decomposition. *Anal. Chem.*, 1955, **27**, 384-388. [Dept. Biochem., Univ. California, Berkeley 4.]

Loss of ammonia in the sealed tube procedure was shown to be due to its oxidation to nitrogen.

H. G. Bray.

4549

SHER, I. H. Two-step mixed indicator for Kjeldahl nitrogen titration. *Anal. Chem.*, 1955, **27**, 831-832. [Dept. Chem., Mount Sinai Hosp., New York 29.]

A mixed indicator of bromocresol green, new coccine and p-nitrophenol gave a sharp end-point

in the acid titration of ammonia trapped in boric acid solution.—A. Hepburn.

4550

ADAMS, C. I. and SPAULDING, G. H. **Determination of organic nitrogen by Kjeldahl method without distillation.** *Anal. Chem.*, 1955, **27**, 1003-1004. [Dept. Chem., Morgan State Coll., Baltimore, Md.]

The catalyst used for digestion is selenium. It is removed by precipitation with sulphurous acid; the excess of this is boiled off and the ammonia is estimated by formol titration.—H. G. Bray.

4551

BEET, A. E. **Potassium permanganate in the Kjeldahl method for the determination of nitrogen in organic substances.** *Nature*, 1955, **175**, 513-514. [Dept. Fuel Technol., Univ. Sheffield.]

4552

MAYER, S. W., KELLY, F. H. and MORTON, M. E. **Ammonia determination and sample preparation for mass spectrometer by a micro diffusion method.** *Anal. Chem.*, 1955, **27**, 837-838. [Radioisotope Unit, Veterans Admin. Hosp., Long Beach, Calif.]

A sealed 30-ml. bottle with the N-containing material and concentrated K_2CO_3 was rotated at $65^\circ C$. The NH_3 liberated was absorbed in H_2SO_4 suspended above the alkaline sample in glass "helices" on a glass rod passing through the stopper. The H_2SO_4 was transferred to a solution of Nessler's reagent and the NH_3 was estimated by spectrophotometer. The method is suitable for large numbers of routine microanalyses. From 0.5 μg . to 10 mg. N can be measured. It is also very satisfactory for the estimation of isotope ratio with a mass spectrometer after converting the NH_3 to N with hypobromite.

A. Hepburn.

4553

LEFEBVRE, J. M. **Les constituants azotés solubles chez les végétaux (méthodes d'étude).** [Soluble nitrogenous constituents in plants (methods of study).] *Ann. agronom.*, 1954, **5**, 995-1007. [Lab. Plantes Fourragères, Rouen.]

The preparation of samples of plant material for the extraction of the soluble nitrogenous constituents and their analysis are described. Standard methods of analysis were used with modifications where desirable. The analysis for protein N, total soluble N, polypeptide N, N from the trichloroacetic acid precipitation, free ammonia, nitrate, total and unstable amide N and total amino-N and the separation of the amino-acids of the soluble N fraction are described. Results of

varying accuracy were obtained. Colorimetric estimation of amino-acids was accurate to within 4 per cent. Total soluble N and protein N were accurate to 1 or 2 per cent., but ammonia and nitrate were less accurate, and amide N, polypeptide N and total amino-N were the least accurate.

T. D. Bell.

4554

TANNERT, S. **Über eine Mikromethode zur quantitativen Eiweissbestimmung auf der Basis der Trübung bei Eliminierung des Faktors der Eiweissdispersion. [A turbidimetric micro-method of estimating proteins in which the protein dispersion factor is eliminated.]** *Ztschr. ges. exp. Med.*, 1954-55, **125**, 305-313. [Med. Poliklin., Univ. Leipzig.]

The effect of amount of protein, pH, type of acid, amount and type of salt, temperature and time on the stability of protein suspensions was studied. A simple and rapid quantitative method is described in which the protein is precipitated in the presence of NaCl, HNO_3 and the surface-active substance "Medizinal-Präcutan" (an aqueous solution of the sodium salts of oleyl methyl tauride and hydroxystearyl sulphate).—H. G. Bray.

4555

BOARDMAN, N. K. and PARTRIDGE, S. M. **Separation of neutral proteins on ion-exchange resins.** *Biochem. J.*, 1955, **59**, 543-552. [Low Temp. Res. Stat., Univ. Cambridge.]

The resin used is Amberlite IRC-50 and protein is eluted by buffers. An account is given of the adsorption of cytochrome c and of the separation of sheep foetal haemoglobin from maternal and bovine carboxyhaemoglobin and of bovine carboxyhaemoglobin from bovine methaemoglobin.

H. G. Bray.

4556

BOMAN, H. G. **Chromatography of serum and some other proteins on an anion-exchange resin.** *Nature*, 1955, **175**, 898-899. [Inst. Biochem., Univ. Uppsala.]

The resin used was Dowex 2 in the chloride form, the protein fractions being eluted with a tris(hydroxymethyl)aminomethane buffer (pH 7.2) of increasing concentration. Results of experiments with serum proteins are described.

H. G. Bray.

4557

GIRI, K. V. **A simple paper chromatographic method for the study of serum protein patterns, in health and disease.** *Experientia*, 1955, **11**, 165-166. [Dept. Biochem., Indian Inst. Sci., Bangalore.]

The albumin and globulin fractions of human serum separated by circular paper chromatography were characteristically different from normal in subjects with cirrhosis of the liver.—A. Hepburn.

N.A. and R., October 1955

4558

ZENTNER, H. A modified method of filter paper electrophoresis. *Nature*, 1955, 175, 953. [Bread Res. Inst. Australia, 111 Pacific Highway, North Sydney.]

Strips of filter paper 60 cm. long were wrapped spirally round a glass tube through which cold water was running. Protein fractions were well separated in 24 hr. with an applied potential of 9 volts per cm. Full results will be published elsewhere.—A. Hepburn.

4559

KIMBEL, K. H. and BÜNTE, H. Die Bestimmung des Gesamtproteingehaltes aus dem Papier-elektropherogramm. [Estimation of total protein content by paper electrophoresis.] *Klin. Wochenschr.*, 1955, 33, 187-188. [Med. Klin., Univ. Erlangen.]

4560

DUMAZERT, C., CHIGLIONE and BOZZI-TICHADOU, M. Electrophorèse des protéines sur colonne. [Column electrophoresis of proteins.] *Bull. Soc. Chim. biol.*, 1955, 37, 123-126. [Lab. Chim., Fac. Méd. Pharm., Marseilles.]

4561

JENCKS, W. P., JETTON, M. R. and DURRUM, E. L. Paper electrophoresis as a quantitative method. Serum proteins. *Biochem. J.*, 1955, 60, 205-215. [Dept. Pharmacol., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington, D.C.]

The quantity of bromophenol blue bound by denatured serum proteins after electrophoresis on filter paper depended on the time of heat denaturation, the time of staining and the amount of rinsing. Under the conditions described only the densely stained albumin fraction deviated from Beer's law when directly scanned. Albumin tailing amounted to only 3 to 5 per cent. of the total albumin and a correction could be applied for it. There was a linear relation between dye uptake and protein concentration which did not depend on the area of application of protein.

A. Hepburn.

4562

WOLVIUS, D. and VERSCHURE, J. C. M. (with HOFFSMIT, F. C. M.) The reliability of the determination of urinary proteins by electrophoresis on filter paper. *J. Clin. Pathol.*, 1955, 8, 140-143. [Med. Dept., Univ. Hosp., Utrecht.]

Urine was concentrated by dialysis against a 15 per cent. solution of carboxymethylcellulose until it contained at least 1.5 per cent. protein. The proteins were separated by paper electrophoresis, in an apparatus described, with a rather

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high voltage over 4 hr.; they were then stained with azocarmine B, eluted and estimated spectrophotometrically. The method was shown to give reliable results with serum and was presumed to be satisfactory for clinical use with urinary proteins.

C. Warner.

4563

LARSON, B. L. and JENNESS, R. Identification of α -lactalbumin in the electrophoretic pattern of milk serum proteins. *J. Dairy Sci.*, 1955, 38, 313-315. [Lab. Biochem., Dept. Dairy Sci., Univ. Illinois.]

By electrophoresis of concentrated solutions of milk serum proteins containing added α -lactalbumin, the latter was established independently by the authors to be component III observed by Smith (Abst. 859, Vol. 17). Gordon and Semmett (Title 2638, Vol. 23), from a comparison of electrophoretic mobilities, had previously suggested it to be component IV.—A. Hepburn.

4564

CUNNINGHAM, D. K., GEDDES, W. F. and ANDERSON, J. A. Precipitation by various salts of the proteins extracted by formic acid from wheat, barley, rye, and oat flours. *Cereal Chem.*, 1955, 32, 192-199. [Grain Res. Lab., Board of Grain Commissioners, Winnipeg, Manitoba.]

4565

JOUBERT, F. J. Sunflower seed proteins. *Biochim. biophys. Acta*, 1955, 16, 520-523. [Nat. Chem. Res. Lab., S. African Counc. Sci. Indust. Res., Pretoria.] French and German summaries.

Repeated extraction with a 1:1 mixture of ethanol and water at room temperature and then with cold water completely removed chlorogenic acid from sunflower seed meal. The 2 major protein components separated by $(\text{NH}_4)_2\text{SO}_4$ fractionation had molecular weights of 343,000 and 19,000.—A. Hepburn.

4566

GURNANI, S. U., KUMTA, U. S. and SAHASRABUDHE, M. B. Influence of formic acid on the hydrolysis of tissue proteins. A new and rapid method of hydrolysis of proteins. *Biochim. biophys. Acta*, 1955, 16, 553-557. [Biol. Div., Dept. Atomic Energy, Indian Cancer Res. Centre, Bombay.] French and German summaries.]

Hydrolysis for 2 hr. with 85 per cent. formic acid and 2N HCl suffices. Tryptophan is partly destroyed.—H. G. Gray.

4567

LYMAN, C. M. and DOCTOR, B. P. **Stabilization of cystine during acid hydrolysis of foodstuffs.** *Federation Proc.*, 1955, **14**, 441-442. *Proc. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., College Station.]*

4568

WIELAND, T., DOSE, K. and PFLEIDERER, G. **Eine enzymatische Bestimmung des Glutathions. [Enzymic estimation of glutathione.]** *Biochem. Ztschr.*, 1955, **326**, 442-445. [*Inst. Org. Chem., Univ. Frankfurt a. M.*]

In presence of glyoxalase I in phosphate buffer at pH 6.3 glutathione and methylglyoxal combine to form S-lactoylglutathione, which is measured spectrophotometrically by its ultraviolet absorption at 240 μ . The method and its application to human blood and mouse muscle and liver are described. As little as 15 μ g. glutathione can be estimated. The reaction is unaffected by previous treatment with trichloroacetic or perchloric acid, or by borate or Na ions, but cysteine is unsuitable as a reducing agent.—W. M. Deans.

4569

BAUDET, P. and CHERBULIEZ, E. **Microdosage des acides α -aminés et de peptides simples par l'intermédiaire de leurs sels complexes de cuivre. [Micro-estimation of α -amino-acids and simple peptides as their copper complexes.]** *Helv. chim. Acta*, 1955, **38**, 841-847. [*Lab. Org. Pharm. Chem., Univ. Geneva.*] English summary.

Dowex-50 containing cupric and phosphate ions was used as a specific cupric ion donor. Cu in soluble form was estimated iodimetrically. The minimum amounts of α -amino-N which can be measured are 0.2 μ g. per ml. for oligopeptides and 0.01 μ g. per ml. for amino-acids.—H. G. Gray.

4570

BODE, F. **Eine Vereinfachung und Verbesserung der Methode zur quantitativen Bestimmung von Aminosäuren und Peptiden mittels des Ninhydrin-Kupferkomplexes. [Simplification and improvement of the method of quantitative estimation of amino-acids and peptides by means of the ninhydrin-copper complex.]** *Biochem. Ztschr.*, 1955, **326**, 433-435. [*Lab. Klin. Chem., Frankfurt a. M.*]

The method previously described (Abst. 1216, Vol. 23) is improved by dipping the paper in a solution of ninhydrin in acetone, as suggested by Smith (Abst. 2644, Vol. 23), instead of spraying it. As little as 0.5 μ g. amino-acid N can be estimated. The method can be used also to estimate the total free amino-N in biological fluids.—W. M. Deans.

4571

HARDY, T. L., HOLLAND, D. O. and NAYLER, J. H. C. **One-phase solvent mixtures for the separation of amino acids.** *Anal. Chem.*, 1955, **27**, 971-974. [*Med. Chem. Div., Beecham Research Laboratories, Ltd., Botolph Claydon, Surrey.*]

Of 18 amino-acids 16 can be identified on a single one-dimensional chromatogram or all 18 on 4 separate one-dimensional chromatograms. Treatment of developed chromatograms with cyclohexamine or dicyclohexamine before spraying with ninhydrin gives variations in the colours produced and helps identification. The compositions of 17 useful solvent mixtures are given.

H. G. Gray.

4572

ORESKIES, I. and SAIFER, A. **Qualitative determination of amino acids in protein hydrolyzates by circular paper chromatography.** *Anal. Chem.*, 1955, **27**, 854-856. [*Dept. Phys. Chem., Div. Labs., Jewish Chronic Dis. Hosp., Brooklyn 3, N.Y.*]

Two circular paper chromatograms were developed separately with phenol and a mixture of butanol and acetic acid as the solvents. Half of each chromatogram was stained with isatin and the other half with ninhydrin. From the separate bands and different colours produced a hydrolysate of human serum was thus qualitatively analysed for the constituent amino-acids.—A. Hepburn.

4573

RAO, N. A. N. and WADHWANI, T. K. **Quantitative estimation of amino-acids by circular paper chromatography.** *J. Indian Inst. Sci.* [A], 1955, **37**, 130-140. [*Sec. Pharmacol., Indian Inst. Sci., Bangalore 3.*]

The solvents used were *n*-butanol saturated with water, and butanol : water : acetic acid (40 : 5 : 5 and 40 : 5 : 15).—H. G. Gray.

4574

GRASSMANN, W., HANNIG, K. and PLÖCKL, M. **Eine Methode zur quantitativen Bestimmung der Aminosäurezusammensetzung von Eiweißhydrolysaten durch Kombination von Elektrophorese und Chromatographie. [A method for the quantitative estimation of the amino-acid constituents of protein hydrolysates by combined electrophoresis and chromatography.]** *Hoppe-Seyler's Ztschr.*, 1955, **299**, 258-276. [*Max-Planck-Inst. Eiweiß Lederforsch., Regensburg.*] English summary.

The protein hydrolysate is first separated by continuous electrophoresis at pH 3.9 into 4 fractions, basic amino-acids, neutral amino-acids, glutamic acid and aspartic acid, sometimes with cysteine acid as a fifth. The neutral fraction is then

separated by electrophoresis at pH 2.3 to allow quantitative separation of glycine and alanine from the rest. Further separation of basic and neutral amino-acids is achieved by one-dimensional paper chromatography. After development of the spots with ninhydrin quantitative estimation is made by photometry in monochromatic light of wavelength 550 m μ ., the paper first being rendered transparent with Transparenzöl.

The mean error with standard mixtures was about 3 per cent. The method was used for hydrolysates of casein, collagen, procollagen and insulin.

D. Duncan.

4575

RIDER, A. A. and McCOLLUM, E. V. The extraction of amino acid-containing substances from urine. *J. Lab. Clin. Med.*, 1955, **45**, 215-218. [Johns Hopkins Univ., Baltimore, Md.]

Amino-acids from urine, free or combined, were separated into simpler fractions by precipitation brought about by neutralisation with ammonia of extracts of urine solids in a solution of camphor-sulphonic acid and acetone. Hippuric acid was the only material containing amino-acids which was not precipitated. Undissolved material could be extracted after acid hydrolysis. Trichloro-acetic and benzenesulphonic acids were not found suitable.—A. Hepburn.

4576

HACKMAN, R. H. and LAZARUS, M. Paper chromatography of mixtures of amino acids containing glutamic or aspartic acid. *Biochim. biophys. Acta*, 1955, **17**, 147-148. [Div. Entomol., C.S.I.R.O., Canberra.]

The anomalous results obtained by Beck and Ebrey (Abst. 1612, Vol. 25), in which paper chromatography of mixtures of glycine and glutamic acid gave rise to 3 spots, were examined. It was concluded that there is no reaction between the acids and it is suggested that the results are due to the high amino-acid concentrations used. Under these conditions there may be interaction between glutamic acid and phenol of the developing solvent and, in addition, different ionic species of this amino-acid may give rise to multiple spots.

H. G. Bray.

4577

PFLIEDERER, G., GRUBER, W. and WIELAND, T. Eine enzymatische Bestimmung der L-Asparaginsäure. [Enzymic estimation of L-aspartic acid.] *Biochem. Ztschr.*, 1955, **326**, 446-450. [Inst. Org. Chem., Univ. Frankfurt a. M.]

A method for estimating L-aspartic acid, from 10 to 120 μ g. in 0.1 ml., claimed to be rapid, accurate and highly specific, depends on enzymic transamination to oxaloacetic acid. This is reduced with maleic acid dehydrase and dihydrodiphosphopyridine nucleotide, which is estimated spectro-

photometrically at 366 m μ . Results for insulin, horse haemoglobin and bovine serum albumin are in good agreement with those in the literature.

W. M. Deans.

4578

ZAMIR, A. and LICHTENSTEIN, N. A colorimetric method for the estimation of glutamic acid in protein hydrolysates. *Anal. chim. Acta*, 1955, **12**, 577-579. [Dept. Biol. Colloidal Chem., Hebrew Univ., Jerusalem.] French and German summaries.

The hydrolysate is autoclaved at 125° C. and pH 3 to 4 for 4 hr. to convert glutamic acid to pyrrolidone carboxylic acid. This is estimated by means of a colour reaction with hydroxylamine and ferric chloride.—H. G. Bray.

4579

WEISS, S., ANDERSON, E. I., HSU, P. T. and STEKOL, J. A. An adaptation of the Floyd-Lavine procedure for the isolation of methionine to tracer work. *J. Biol. Chem.*, 1955, **214**, 239-244. [Lankenau Hosp. Res. Inst., Philadelphia, Pa.]

The procedure of Floyd and Lavine (*J. Biol. Chem.*, 1954, **207**, 119) for isolating methionine from protein digests as the methyl sulphonium bromide was modified to ensure separation from cystine, cysteine, cystathionine and homocystine, though not homocysteine. The product was shown to be chromatographically pure. No exchange was found between the methyl groups of methionine and the methanol used in the procedure.

C. Warner.

4580

DE VERDIER, C. H. On phosphorus-containing amino acids and peptides from acid hydrolysates of casein. *Acta Soc. Med. upsalien.*, 1955, **60**, 48-55. [Inst. Med. Chem., Univ. Upsala.]

Best yields of phosphoserine were obtained from casein by 20 hours' hydrolysis at 100° C. with 2 N HCl, but best yields of phosphopeptides by 4 days' hydrolysis at 37° C. with 11 N HCl; ion-exchange resins were used for the isolations. X-ray diffraction studies by the powder and the single crystal techniques were made on phosphoserine, phosphothreonine and pyroglutamic acid.

C. Warner.

4581

GIANNINI, F. and ZINGONI, U. Sul dosaggio dell'acido urico e dell'allantoina nei tessuti. [Estimation of uric acid and of allantoin in the tissues.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1396-1398. [Lab. Fisiol., Univ. Florence.]

See also Abst. 5091.

Lipoid Constituents

4582

BRUS, J. B. F. and VAN DEN BERG, J. C. T. Een methode voor het afmeten van pappen en vlaas ten behoeve van de butyrometrische vetbepaling. [Method for measuring viscous milk products for use in the butyrometric estimation of fat content.] *Nederlands Melk Zuivelijdschr.*, 1955, 9, 42-55. [Melkcontrôlestat., Zuid-Hollandsche Zuivelbond, Gorinchem.] English summary.

Viscous samples were measured by syringe into a butyrometer, the proteins were decomposed with H_2SO_4 and the fat content was estimated. Several corrections according to the type of milk used, the sp. gr. of the sample and the degree of decomposition by H_2SO_4 were applied. (From summary.) A. Hepburn.

4583

RADEMA, L. De bepaling van het vetgehalte volgens Jones. [The estimation of fat (in products with a low fat content) by the method of Jones.] *Nederlands Melk Zuivelijdschr.*, 1955, 9, 72-87. [Nederlands Inst. Zuivelonderzoek (N.I.Z.O.), Ede.] English summary.

An improvement on the method of Heinemann and Rohr (Abst. 4620, Vol. 20). Results for skimmed milk and buttermilk were satisfactory. The method was rather lengthy and not very accurate. (From summary.)—A. Hepburn.

4584

MURTHY, G. K. Reichert-Meissl value: its importance and limitations in the detection of foreign fats in butterfat. *J. Dairy Sci.*, 1955, 38, 317-318. [Dept. Food Technol., Univ. Illinois.]

The purity of butterfat cannot be judged solely from the Reichert Meissl value.—A. Hepburn.

4585

KARTHA, A. R. S., SETHI, A. S. and GULATI, K. C. Rapid estimation of yield and iodine value of oils in small samples of oilseeds. *Indian J. Agric. Sci.*, 1955, 25, 79-84. [Indian Agric. Res. Inst., New Delhi.]

Extraction of 11 different oilseeds with CCl_4 gave results similar to those with benzene and aliquots of the extract could be used for simultaneous estimation of oil yield and iodine value (by Hanus's method) on 0.3 to 0.5 g. oilseed in about 2 hr. The gravimetric bromine absorption method of estimating iodine value was found unsatisfactory.—W. M. Deans.

4586

TROENG, S. Oil determination of oilseed. Gravimetric routine method. *J. Amer. Oil Chem.*

Soc., 1955, 32, 124-126. [Cereal Lab., Swedish Seed Assoc., Svalöv.]

4587

CASON, J. and GILLIES, G. A. Adsorption and chromatography of fatty acids on charcoal. *J. Org. Chem.*, 1955, 20, 419-427. [Chem. Lab., Univ. California.]

The adsorbent used was Darco G-60 charcoal, mixed with 2 parts by weight of Celite 521 to control the rate of flow. The presence of charcoal acid was no disadvantage. The solvent was 95 per cent. ethanol. The apparatus for elution chromatography is described and illustrated. Static adsorption isotherms were estimated by this method for a series of saturated, unsaturated and branched-chain acids.—D. Duncan.

4588

ASHLEY, B. D. and WESTPHAL, U. Separation of small quantities of saturated higher fatty acids by reversed-phase paper chromatography. *Arch. Biochem. Biophys.*, 1955, 56, 1-10. [Dept. Biochem., Army Med. Res. Lab., Fort Knox, Ky.]

Filter paper coated with paraffin oil or latex was the supporting medium. Spots were identified by spraying with bromothymol blue or more sensitively as lead sulphide or rhodizonate by treating with lead acetate and then H_2S or potassium rhodizonate.—A. Hepburn.

4589

ASHLEY, B. D. and WESTPHAL, U. Separation of saturated higher fatty acids by reversed-phase paper chromatography. *Federation Proc.*, 1955, 14, 175. *Proc.* [Dept. Biochem., Army Med. Res. Lab., Fort Knox, Ky.]

4590

BOLLEY, D. S. Chemical determination of unsaturation of fats and derivatives. *J. Amer. Oil Chem. Soc.*, 1955, 32, 235-240. [Baker Castor Oil Co., Bayonne, N.J.]

A review.

4591

GLAVIND, J. and HARTMANN, S. Studies on methods for the determination of lipoperoxides. *Acta chem. scand.*, 1955, 9, 497-508. [Dept. Biochem. Nutrit., Polytechnic Inst., Copenhagen.]

Modifications of an earlier indophenol method (Hartmann and Glavind, *Acta chem. scand.*, 1949, 3, 954) are described and compared with iodimetric and thiocyanate procedures. The latter of these was found to be more suitable. The effect of phospholipins on the estimation of peroxide groups in fats was studied.—H. G. Bray.

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4592

ORZOWSKI, M. and S'EMON, J. Miareczkowa metoda oznaczania cholesterolu. [A titration method for estimating cholesterol.] *Acta biochim. polon.*, 1955, **1**, 231-238. [Inst. Anat. Patol., Acad. Med., Wrocław.] English and Russian summaries.

The method is based on the amount of Br added to C_2 and C_6 at the site of the double bond. Greater accuracy than with other methods is claimed. (From summary.)—E. M. Hume.

4593

AMELUNG, D. and BÖHM, P. Papierchromatographische Trennung von Phosphatiden. [Separation of phosphatides by paper chromatography.] *Hoppe-Seyler's Ztschr.*, 1954, **298**, 199-209. [Med. Klin., Univ. Bonn.]

A procedure is described for the separation of lecithin and ethanolamine- and serine-cephalins. The preparation of these phosphatides from human brain is described and an account of the specificity of several detecting reagents is given.

H. G. Bray.

See also Abst. 5091.

Other Organic Constituents

4594

SCOTT, R. W. Chromatography of organic acids with nonesterifying solvents. *Anal. Chem.*, 1955, **27**, 367-369. [Dept. Plant Pathol., Univ. Wisconsin, Madison.]

Mixtures of 4-methyl-2-pentanone and methylene chloride are recommended for the elution of free organic acids from silica columns.—H. G. Bray.

4595

NORDMANN, R., GAUCHERY, O., DU RUISSEAU, J. P., THOMAS, Y. and NORDMANN, J. Chromatographie sur papier des acides organiques non-volatils des liquides biologiques. 2. Le chromatogramme qualitatif de l'urine humaine normale. [Paper chromatography of non-volatile organic acids in biological fluids. 2. The qualitative chromatogram of normal human urine.] *Bull. Soc. Chim. biol.*, 1955, **36**, 1641-1654. [Lab. Biochim., Salpêtrière, Paris.]

4596

BIRK, Y. and BONDI, A. Separation and determination of acetic and lactic acids by paper partition chromatography and its application to silages. *Analyst*, 1955, **80**, 454-457. [Animal Nutrit. Lab., Agric. Res. Stat., Rehovot, Israel.]

Ammonium salts of the acids are transferred to 2 papers. One of these is chromatographed immediately, with *n*-butanol saturated with an equal

volume of 1.5 *N* redistilled ammonia as solvent. Acetic and lactic acids run together and their sum is estimated by measuring the spot area after spraying with a mixture of methyl red, bromothymol blue, formol and ethanol (pH 5.2). The other paper is left at room temperature for several hours to allow volatilisation of the salts of volatile acids. Chromatography then enables lactic acid to be estimated alone.—H. G. Bray.

4597

PFELEDERER, G. and DOSE, K. Eine enzymatische Bestimmung der L(+)-Milchsäure mit Milchsäuredehydrase. [Enzymic estimation of L(+)-lactic acid with lactic acid dehydrase.] *Biochem. Ztschr.*, 1955, **326**, 436-441. [Inst. Org. Chem., Univ. Frankfurt a. M.]

In presence of lactic acid dehydrase from rabbit muscle in carbonate-bicarbonate buffer at pH 9.7, lactic acid reacts with diphosphopyridine nucleotide to form pyruvic acid and dihydrodiphosphopyridine nucleotide; the latter is estimated by the Beckman spectrophotometer and the lactic acid values are read from a standard curve. The method and its application to human blood and mouse muscle and liver are fully described. Amounts from 3 to 35 μ g. L(+)-lactic acid can be estimated; with concentrations from 1 to 10 μ g. per ml. in blood the mean error is from 3.5 to 4 per cent.—W. M. Deans.

4598

REIFER, I. Nowa metoda mikrooznaczania kwasu cytrynowego. [A new method for the micro-estimation of citric acid.] *Acta biochim. polon.*, 1955, **1**, 293-305. [Inst. Biochem. SGGW, Warsaw.] English and Russian summaries.

The method is based on the pentabromoacetone reaction in presence of chloroform, which permits separation from permanganate and H_2O_2 , the presence of which in excess causes interference. The rose-red colour appearing when pentabromoacetone reacts with resorcinol is used for the colorimetric estimation of citric acid. (From summary.)

E. M. Hume.

4599

BERGERMAN, J. and ELLIOT, J. S. Method for direct colorimetric determination of oxalic acid. *Anal. Chem.*, 1955, **27**, 1014-1015. [Solano Lab., Berkeley, Calif.]

4600

REIFER, I. and MOZEJKO, R. M. Nowa mikro-metoda ilościowego oznaczania alkaloidów w tubinach pastewnych. [New micro-method for estimating alkaloids in lupins.] *Acta biochim. polon.*, 1955, **1**, 197-223. [Lab. Biochem. IUNG.] English and Russian summaries.

The method described is an iodimetric one. Alkaloids can be estimated by it in concentrations of from 0.001 to 0.005 per cent. within the limits of from 25 to 250 μg . (From summary.)

E. M. Hume.

4601

HOLT, R. Studies on dried peas. 1. The determination of phytate phosphorus. *J. Sci. Food Agric.*, 1955, 6, 136-142. [Fruit Veg. Canning and Quick Freezing Res. Assoc., Chipping Camden, Glos.]

Phytate was estimated from its ability to reduce the intensity of the colour produced by the interaction of ferric iron and thiocyanate. Quantities between 75 and 150 μg . in extracts from dried peas were estimated with an accuracy of ± 5 per cent. Interference was negligible with 0.1 mg. orthophosphate P and less than 5 per cent. error with 0.4 mg. Chloride, sulphate, tartrate, citrate and malate did not interfere, but oxalate did interfere when in the same concentration as phytate.

A. Hepburn.

Inorganic Constituents

4602

MUNTZ, J. H. and MELSTED, S. W. Spectrographic analysis of briquetted unashed plant material. *Anal. Chem.*, 1955, 27, 751-753. [Dept. Agronom., Univ. Illinois, Urbana.]

P, Mg, Ca, K, Mn, B, Cu and Zn were rapidly estimated by spectrographic analysis in finely ground unashed plant material when in the compressed form of briquettes also containing Li_2CO_3 and graphite. A high-voltage spark was used. Plant samples that had been chemically analysed were used as standards. The accuracy was within ± 20 per cent.—A. Hepburn.

4603

STEPHENSON, W. H. and HARTLEY, A. W. The determination of sodium bicarbonate in self-raising flours containing chalk B.P. *Analyst*, 1955, 80, 461-470. [Spillers, Ltd., Millennium Mills, London, E.16.]

Sodium bicarbonate is decomposed selectively by sodium acid pyrophosphate. The CO_2 evolved is measured in the Chittick apparatus, the use of which is discussed.—H. G. Bray.

4604

HUNTER, G. Micro-determination of bromide in body fluids. *Biochem. J.*, 1955, 60, 261-264. [Stoke Mandeville Hosp., Aylesbury, Bucks.]

The estimation of Br^- by the method of Hunter and Goldspink (*Analyst*, 1954, 79, 467), whereby Br^- is quantitatively converted into BrO_3^- by OCl^- , Br^- is liberated and treated with rosaniline and the resulting tetrabromorosaniline is measured colorimetrically, is here applied to blood and other

body fluids. The standard deviation is less than 5 per cent. and as little as 1 μg . Br^- is sufficient for analysis.—A. Hepburn.

4605

NATELSON, S. and PENNIAL, R. Colorimetric estimation of ultramicro quantities of calcium in human serum as the complex with alizarin. *Anal. Chem.*, 1955, 27, 434-437. [Dept. Biochem., Rockford Mem. Hosp., Rockford, Ill.]

The calcium-alizarin complex prepared directly or from precipitated calcium oxalate is extracted with *n*-octanol and estimated colorimetrically or spectrophotometrically. Interference by Mg, Sr and Ba is discussed.—H. G. Bray.

4606

BAKER, R. W. R. The determination of calcium in serum by flame photometry. *Biochem. J.*, 1955, 59, 566-571. [Dept. Chem. Pathol., Guy's Hosp. Med. Sch., London, S.E.1.]

4607

STEWART, G. S., BOWEN, H. F. and CULLETON, E. M. The direct microdetermination of calcium in the urine by nephelometry. *J. Lab. Clin. Med.*, 1955, 45, 653-657. [Rush Dept. Biochem., Presbyterian Hosp., Chicago, Ill.]

Calcium is estimated in 0.1 ml. urine as a suspension, stabilised by sodium lauryl sulphate, of its oleate in ammoniacal solution.—H. G. Bray.

4608

CHOW, T. J. and THOMPSON, T. G. Flame photometric determination of calcium in sea water and marine organisms. *Anal. Chem.*, 1955, 27, 910-913. [Dept. Oceanogr., Univ. Washington, Seattle.]

4609

GROGAN, C. H., CAHNMAN, H. J. and LETHCO, E. Microdetermination of chromium in small samples of various biological media. *Anal. Chem.*, 1955, 27, 983-986. [Nat. Cancer Inst., Nat. Insts. Health, Bethesda 14, Md.]

4610

KROL, B. M. and DEN HERDER, P. C. A routine method for the determination of copper in milk and in dried milk. *Nederlands Melk Zuivelijdschr.*, 1955, 9, 56-62. [Govt. Dairy Stat., Leyden.] Dutch summary.

Milk or reconstituted milk was extracted with alcoholic HCl, the milk protein being precipitated at the same time. Citric acid was added to the clear filtrate to prevent turbidity with phosphate, the solution was made alkaline with ammonia and diluted with ethanol and Cu was estimated in a

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photo-electric colorimeter after reaction with sodium diethyldithiocarbamate. From duplicate estimations the standard deviations of individual samples were calculated to be 19 $\mu\text{g. Cu}$ per kg. milk and per 100 g. dried milk, respectively. The mean of the results of this method for 72 samples of milk was 8 $\mu\text{g. Cu}$ per kg. milk higher than the mean obtained by an incineration method.

A. Hepburn.

4611

UMLAND, F. and WEYER, F. G. Eine neue Methode zur gleichzeitigen Mikrobestimmung von Eisen und Kupfer in Körperflüssigkeiten. [A new method for the simultaneous micro-estimation of iron and copper in body fluids.] *Klin. Wochenschr.*, 1955, **33**, 237-238. [Inst. Anorg. Chem., Tech. Hochschule, Hanover.]

A method is described for using the formation of a complex between 8-hydroxyquinoline and Fe or Cu in their micro-estimation. At a sharply defined pH in chloroform solution the Fe and Cu complexes, respectively, had maximum light absorption at 580 and 410 m μ , and the concentration could be calculated from readings in a Unicam photometer. Details of the necessary calculations are given.—A. M. Copping.

4612

GOLDSTONE, N. I. Microchemical detection of fluorides. Sodium fluosilicate crystal test. *Anal. Chem.*, 1955, **27**, 464-466. [Dept. Health, New York.]

A modification of the test described by Gettler and Ellerbrook (*Amer. J. Med. Sci.*, 1939, **197**, 625).—H. G. Bray.

4613

SHVETZ, A. S. Uskorenniy metod opredeleniya iodida v iodiroyannoi povarennoi soli. [A rapid method for the estimation of iodide in iodised cooking (or table) salt.] *Gigiena Sanit.*, 1954, No. 7, 41-43. [Chernovitz. Med. Inst.]

Details are given of an improvement on the method of Kogan, depending on oxidation of iodide to iodate with bromine water in an alkaline medium in the cold.—D. W. Taylor.

4614

DUBRAVČIĆ, M. Determination of iodine in natural waters (sodium chloride as a reagent in the catalytic reduction of ceric ions). *Analyst*, 1955, **80**, 295-300. [Lifeguard Milk Products, Ltd., Melbourne, Victoria.]

A 14-ml. sample is used, the error being less than 0.3 $\mu\text{g.}$ per litre. The presence of NaCl prevents the existence of catalytically-inactive iodate and reduces interference from certain ions, e.g., Hg^{2+} , Ag.—H. G. Bray.

4615

GROSSMANN, A. and GROSSMANN, G. F. Protein-bound iodine by alkaline incineration and a method for producing a stable cerate color. *J. Clin. Endocrinol.*, 1955, **15**, 354-361. [Grace Labs., Philadelphia, Pa.]

4616

BOTHWELL, T. H. and MALLETT, B. The determination of iron in plasma or serum. *Biochem. J.*, 1955, **59**, 599-602. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

A study was made with ^{59}Fe of the liberation of Fe from protein by treatment with HCl and its loss by entrainment on protein precipitated with trichloroacetic acid. A 2:2'-dipyridyl procedure is described which is based on previous methods but is simpler and more rapid.—H. G. Bray.

4617

SCHIEBL, F. and SAFFER, D. Zur Eisenbestimmung im Serum mit o-Phenanthrolin. [Estimation of iron in serum with o-phenanthroline.] *Hoppe-Seyler's Ztschr.*, 1954, **298**, 272-277. [Med. Chem. Inst., Univ. Innsbruck.]

The method is applicable to from 0.2 to 0.5 $\mu\text{g. Fe}$; 2 ml. serum is used and the Fe in a trichloroacetic acid filtrate is estimated after neutralisation with ammonia and mild acidification with H_2SO_4 . Colour development is achieved in the presence of o-phenanthroline and hydroquinone.

H. G. Bray.

4618

KALDOR, I. Studies on intermediary iron metabolism. 5. The measurement of non-haemoglobin tissue iron. *Austral. J. Exp. Biol. Med. Sci.*, 1954, **32**, 795-799. [N.S.W. Red Cross Blood Transfusion Serv., Sydney.]

Fe is extracted from a tissue homogenate with 4 per cent. HCl. The extract is deproteinised with trichloroacetic acid and Fe is estimated with o-phenanthroline.—H. G. Bray.

4619

JOHNSON, E. I. and POLHILL, R. D. A. The use of sodium hexametaphosphate in the determination of traces of lead in food. *Analyst*, 1955, **80**, 364-367. [Dept. Govt. Chem., Govt. Lab., Clement's Inn Passage, Strand, London, W.C.2.]

4620

GOFFINET, A. Quelques considérations sur dosage du magnésium par la méthode au jaune thiazol. [The estimation of magnesium by the thiazole yellow method.] *Bull. Inst. agronom. Gembloux*, 1955, **23**, 166-175. [Stat. Recherches Zootech., Gembloux.]

The interference of Fe, Mn, Ca, P and Cu in the colorimetric estimation of Mg in plant ash is here taken into account.—A. Hepburn.

4621

PASSARO, G. and PASSALACQUA, W. Modificazione del metodo di Kramer e Tisdal per la determinazione della potassiemia. [Modification of Kramer and Tisdall's method for estimating blood potassium.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1329-1330. [Ist. Clin. Pediat., Univ. Rome.]

4622

KING, E. J., STACY, B. D., HOLT, P. F., YATES, D. M. and PICKLES, D. The colorimetric determination of silicon in the micro-analysis of biological material and mineral dusts. *Analyst*, 1955, 80, 441-453. [Post-grad. Med. Sch., London, W.12.]

4623

MURACA, R. F. and BONSACK, J. P. Photometric determination of sodium in blood serum with violuric acid. *Chemist-Analyst*, 1955, 44, 38-42. [Lehigh Univ., Bethlehem, Pa.]

Ashed serum was suspended in water and SO_4^{2-} , PO_4^{3-} , CO_3^{2-} and Cl^- were removed by precipitation with Ba and Ag acetates. The resulting acetates were dissolved in a solution of violuric acid in anhydrous dimethylformamide saturated with K violurate and the optical density of the resulting Na violurate was measured by spectrophotometer. By reference to standard curves obtained from solutions containing NaCl and a synthetic serum-mineral mixture the Na content of serum was estimated. Results compared favourably with those of the flame photometer method and accuracy was consistently within 4 m. equiv. per litre.—A. Hepburn.

4624

BOTT, P. A. Determination of sodium in serum and glomerular fluid by flame photometer. *Federation Proc.*, 1955, 14, 185. *Proc.* [Dept. Physiol. Chem., Woman's Med. Coll. Pennsylvania, Philadelphia.]

4625

SCHARRER, K. and JUNG, J. Zur Bestimmung des Gesamt-, Protein- und Sulfat-Schwefels in pflanzlichen Futtermitteln. [Estimation of total, protein and sulphate sulphur in plant feedingstuffs.] *Ztschr. Tierernährung Futtermittelk.*, 1955, 10, 25-31. [Agric. Chem. Inst., Justus Liebig Hochschule, Univ. Giessen.]

For total S the plant material was mixed with MgO and ashed with concentrated and then with

fuming HNO_3 on a sandbath. The neutral S was oxidised to sulphate for gravimetric estimation.

For extraction of sulphate S the plant material was heated with 5 per cent. HCl and the solution was clarified with activated charcoal or phosphotungstic acid, which gave results in good agreement.

For protein S precipitation with phosphotungstic acid was used; the protein precipitate was ashed and the S was estimated gravimetrically as sulphate.

The methods were used on lucerne hay, meadow grass and young sunflowers. With increase in total S, both sulphate and neutral S rose, especially the former.—D. Duncan.

4626

ADDINK, N. W. H. An improved method for the spectrochemical determination of zinc in blood. *Rec. Trav. chim. Pays-Bas*, 1955, 74, 197-205. [Philips Res. Lab., Eindhoven.]

4627

PRZYBYLSKI, E. and SZYSZKO, E. Próba polarograficznego oznaczania cynku w niektórych artykułach żywności. [Attempts at the polarographic estimation of zinc in different food articles.] *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 383-388. Russian and English summaries.

See also Absts. 4673, 5985.

Enzyme Activity

4628

AVAKYAN, A. O. Gigienicheskaya otzhenka teplovoi obrabotki myasnykh izdelii putem postanovki reaktsii na fosfatazu. 1. Metod opredeleniya aktivnosti fosfatazy v myasnykh izdeliyakh. [Hygienic rating of heat treatment of meat products by means of a reaction for phosphatase. 1. Method of determining phosphatase activity in meat products.] *Vop. Pitan.*, 1955, 14, No. 2, 41-43. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

4629

SCHWERT, G. W. and TAKENAKA, Y. A spectrophotometric determination of trypsin and chymotrypsin. *Biochim. biophys. Acta*, 1955, 16, 570-575. [Dept. Biochem., Sch. Med., Duke Univ., Durham, N.C.] French and German summaries.

Synthetic substrates were used, e.g., N-acetyl-L-tyrosine, N-benzoyl-L-arginine and their ethyl esters.—H. G. Bray.

Miscellaneous

4630

WINTHER, O. Om anvendelsen af holdbarhedsprøven ved undersøgelsen af varmebehandlet mælk og fløde. [The test of keeping quality in

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the examination of heat-treated milk and cream.] *Nord. Vet.-Med.*, 1955, 7, 464-480. [Sundhedskomm. Lab., Copenhagen.] English and German summaries.

4631

STAS, M. E. De beoordeling van de hoeveelheid verontreinigingen van dierlijke oorsprong in ongebuild meel. [Estimation of contamination of animal origin in unbolted flour.] *Voeding*, 1955, 16, 524-529. [Rijks Inst. Volksgezondheid, Utrecht.] English summary.

Dutch specifications for limits of contamination of flour, cocoa, chocolate powder and other dry foods with animal matter are discussed with reference to regulations in other countries. The problem of unbolted flour is considered in particular, and details are given of a method of separating "filth" from bran and other parts of the coarse meal.—A. M. Copping.

4632

A note on the estimation of the proportion of coffee and chicory in mixtures. *Chem. and Indust.*, 1955, No. 20, 549. [Labs., J. Lyons and Co., Ltd.]

4633

EDWARDS, S. J. and HASKINS, M. D. The determination of antibiotic content in supplemented feeding-stuff. *J. Sci. Food Agric.*, 1955, 6, 218-223. [Agric. Res. Council, Field Stat., Compton, near Newbury, Berks.]

Aureomycin and penicillin were estimated in meals by 2 methods.

In the serial-dilution method the concentration of an aqueous extract of the meal was estimated by the capacity of falling dilutions to inhibit the growth of

a sensitive strain of *Streptococcus agalactiae* compared with extracts of standard control meals. Non-specific substances in the meal did not interfere with the accuracy.

In the paper-disc method a little of a volatile solvent extract of meal was absorbed on to a filter-paper disc, dried and placed on an agar medium inoculated with *Bacillus cereus*. The concentration of the unknowns was calculated from the average diameters of the inhibiting zones by reference to a control graph. The method was satisfactory but more difficult.—A. Hepburn.

4634

TIEWS, J. Beitrag zur Pigmentanalyse in wirtschafteigenen Futtermitteln. [Estimation of pigments in homegrown feedingstuffs.] *Arch. Tierernährung*, 1955, 4, 357-363. [Inst. Physiol. Ernährung Tiere, Univ. Munich.]

Carotenes are extracted in a mixture of petrol (b.p. 60° to 95° C.) 80 and acetone 20 per cent.; acetone is removed from the extract by washing with water. The residual solution of pigments is fractionated on alumina columns, and eluates are estimated spectrophotometrically.—H. G. Bray.

4635

PONS, W. A. (Jr.) and HOFFHAUT, C. L. Determination of free gossypol in chemically treated cottonseed meals containing dianilnogossypol. *J. Amer. Oil Chem. Soc.*, 1955, 32, 295-300. [S. Reg. Res. Lab., New Orleans, La.]

A chemical method for the estimation of free gossypol in meals which may contain dianilnogossypol is described, in which aniline is used in place of *p*-anisidine. A qualitative test for the presence of dianilnogossypol is also given, since the modified method is recommended only for meals which have been chemically treated.

D. H. Shrimpton.

MICROBIOLOGICAL

4636

ADRIAN, J. Nouvelle technique pour le dosage microbiologique simultané des acides aminés indispensables et conditions de leur extraction en présence de glucides. [New technique for the simultaneous microbiological estimation of the essential amino-acids and conditions for their extraction in the presence of carbohydrates.] *Bull. Soc. Chim. biol.*, 1955, 37,

107-121. [Lab. Biochim. Nutrit., C.N.R.S., Bellevue, Seine-et-Oise.]

4637

MEERTZ, E. T. and COLE, E. W. A bacterial method for determining protein digestibility. *Federation Proc.*, 1955, 14, 444. *Proc. [Dept. Biochem., Purdue Univ., Lafayette, Ind.]*

CLINICAL AND EXPERIMENTAL

4638

ZIFF, R. E., WEBBER, J. M. and GROVE, G. R. A gravimetric technique for the determination of plasma volumes with radiiodinated human serum albumin. A comparison of routine plasma volume determination methods using radiiodinated human serum albumin and Evans blue dye. *J. Lab. Clin. Med.*, 1955, 45, 648-652; 800-805. [Dept. Res., Miami Valley Hosp., Dayton, Ohio.]

Human serum albumin labelled with radio-active iodine ($20 \mu\text{C}$) is injected into one arm. A sample is withdrawn from the other and weighed, the sp. gr. is estimated in part by the copper sulphate method and the radio-activity is measured by a scintillation counter. The remainder of the sample is centrifuged and the plasma treated as was the whole blood.

The gravimetric radio-active iodine method was found to be more precise and to have fewer technical and clinical limitations than the Evans Blue method.—H. G. Bray.

4639

SCHWARTZKOPFF, W. and BARTELHEIMER, H. Fraktionierte Gewebssaftuntersuchung. 8. Zum Übertritt des Farbstoffes Evans Blau (T 1824) von der Blutbahn in den extravasalen Raum. [Studies of fractionated tissue juice. 8. On the passage of the dye Evans Blue (T 1824) from the bloodstream into the extravascular space.] *Ztschr. ges. exp. Med.*, 1954-55, 125, 409-418. [I. Med. Klin., Städt. Krankenhaus Moabit, Berlin.]

The presence of Evans Blue in tissue fluid could be demonstrated about 20 min. after injection and equilibrium was reached in about 8 hr. The concentration of dye in tissue fluid was always lower than that in serum and it is suggested that it depends on the concentration and transfer of albumin. It is calculated that the extravascular space is equivalent to from 9 to 11 per cent. of the bodyweight.—H. G. Bray.

4640

STOLL, G. and BREITENSTEIN, C. L'instabilité des densités optiques du sérum sanguin coloré. Cause d'erreur dans la détermination du volume plasmatique par la méthode du bleu de Geigy. [Instability of the optical density of dyed blood serum. A cause of error in the estimation of plasma volume by the Evans Blue method.] *Presse méd.*, 1955, 63, 497. [Clin. Chirurg. A, Centre Recherches Chirurg., Strasbourg.]

It is suggested that the effect of time on the optical density of dyed blood serum is due to oxidation-reduction changes in the dye and to flocculation produced by changes in pH. It is recommended that readings be taken as soon as possible.—H. G. Bray.

4641

BOWERS, D., SHEPHERD, J. T. and WOOD, E. H. A constant-rate indicator-infusion technic for the measurement of central vascular volume in man. *Canad. J. Biochem. Physiol.*, 1955, 33, 340-348. [Sect. Physiol., Mayo Clin., Rochester, Minn.]

Evans Blue was injected into the right ventricle or pulmonary artery and arterial dilution patterns were recorded by means of a cuvette oximeter connected to an indwelling needle in the radial artery. From these patterns the amount and concentration of dye in the intravascular space between the sites of injection and sampling were estimated and the "central vascular volume" was calculated from a formula, the derivation of which is discussed. The values obtained are compared with others in the literature.—H. G. Bray.

4642

FALLER, I. L., PETTY, D., LAST, J. H., PASCALE, L. R. and BOND, E. E. A comparison of the deuterium oxide and antipyrine dilution methods for measuring total body water in normal and hypodryc human subjects.

FALLER, I. L., BOND, E. E., PETTY, D. and PASCALE, L. R. The use of urinary deuterium oxide concentrations in a simple method for measuring total body water. *J. Lab. Clin. Med.*, 1955, 45, 748-758; 759-764. [Dept. Biochem., Northwestern Univ. Med. Sch., Chicago, Ill.]

D₂O spaces were consistently found to be significantly larger than antipyrine spaces. For the estimation of total body water D₂O can be injected or given by mouth and is more suitable for oedematous subjects, since it equilibrates rapidly where antipyrine may fail to do so within 24 hr.

An accurate method for the estimation of D₂O in urine is described. Identical values for the body water of 13 normal male subjects were obtained by the serum and urine methods. A negligible amount of D₂O is lost in urine during equilibrium.—H. G. Bray.

4643

FRIS-HANSEN, B. The measurement of total body water and extracellular fluid in children. Changes in body water compartments during

growth. *Helv. paediat. Acta*, 1955, 10, 7-11; 12-16. [Dronning Louises Child. Hosp., Copenhagen.]

4644

REILLY, W. A., SCOTT, K. G., WINTERS, R. W. and HELWIG, H. L. Anionic resin measurement of protein-bound I^{131} in euthyroid children. *Amer. J. Dis. Child.*, 1955, 89, 572-574. [Dept. Paediat., Sch. Med., Univ. California.]

The rate of thyroid hormone production was estimated in 14 euthyroid children by giving them ^{131}I by mouth, separating inorganic and organic I in the plasma by adsorption of the former on anionic resin and measuring the activity of both fractions (see *Abst. 1651*, Vol. 25). The children appeared to release protein-bound I earlier and in greater amounts than 27 adults (loc. cit.).

A. Hepburn.

4645

INGBAR, S. H. Simultaneous measurement of the iodide-concentrating and protein-binding capacities of the normal and hyperfunctioning human thyroid gland. *J. Clin. Endocrinol.*, 1955, 15, 238-264. [Dept. Biophys., Army Med. Serv. Grad. Sch., Walter Reed Army Med. Centre, Washington 12, D.C.]

A tracer dose of 50 μC . of carrier-free inorganic ^{131}I was injected intravenously into each patient. Measurements of radio-activity were made over the neck and thigh for the next 2½ hr. and 4 blood samples were drawn from 40 to 60 min. after administration of the ^{131}I and radio-activity was measured in 0.5 ml. serum. From the data obtained a method of estimating the simultaneous concentration of inorganic iodide in the thyroid and the binding of the iodide to protein is described.

A study was made with 28 normal subjects and 20 patients with Graves' disease. In the second group there was an increased rate of iodide binding to protein and also an increase in the iodide-concentrating capacity of the gland. The importance of each of these functions in the production of thyroid disease is stressed.—B. W. Simpson.

4646

MORELAND, F. B. and GURGILOLO, A. E. The use of the urinary pigment: creatinine ratio as a measure of basal metabolic rate and thyroid activity. *J. Lab. Clin. Med.*, 1955, 45, 352-356. [Dept. Biochem., Baylor Univ. Coll. Med., Houston, Tex.]

The basal metabolic rate derived from the calculation of the ratio of urinary pigment to creatinine (P/C) was compared with the B.M.R. calculated from oxygen consumption, with clinical status and with radio-iodine uptake. On 22 adult males

46 estimations of P/C ratios were made on the same morning as the measurement of B.M.R. by oxygen consumption. The coefficient of correlation obtained was only 0.36. The 2 tests agreed in 61 per cent. of the observations. The P/C B.M.R. corresponded with clinical status in 62 per cent. of all the observations and in 71 per cent. of those made on euthyroid and hyperthyroid patients. The B.M.R. calculated by oxygen consumption corresponded with clinical status in 81 per cent. of the observations. The P/C B.M.R. corresponded with iodine uptake in 8 of 15 patients.

It is suggested that the estimation of P/C B.M.R., though not so reliable as estimation by oxygen consumption, may be of value when it is impossible to obtain an accurate measurement of oxygen consumption in the basal state. The method of estimating urinary pigment is given in detail.

B. W. Simpson.

4647

SCHOFFA, G. Die methodischen Fehlerquellen der Grundumsatzbestimmung. [Sources of error in methods for estimating basal metabolism.] *Ztschr. ges. inn. Med.*, 1955, 10, 45-46. [Deutsch. Akad. Wissensch., Inst. Med. Biol.]

The relative effect on the end result is discussed of errors in the measurements that have to be made in estimating basal metabolism. It is concluded that only errors in estimating the volume of expired air and the concentration of O_2 are important, and that they do not result from shortcomings in the apparatus. To achieve accuracy the measurements should be repeated again and again until consistent results are obtained.

E. M. Hume.

4648

SHEPHERD, R. J. A critical examination of the Douglas bag technique. *J. Physiol.*, 1955, 127, 515-524. [Cardiac Dept., Guy's Hosp., London, S.E.1.]

Standard Douglas bags were tested for sources of error which might arise by diffusion of gases and in other ways. The selective loss of CO_2 is discussed; it is concluded that the solubility coefficient of rubber with respect to the respiratory gases is the chief difficulty and the prevention of this error must lie in search for a new proofing agent. The best results from present-day bags are obtained when they are filled almost to capacity.

D. Duncan.

4649

LORFFLER, R. K., RAPPOPORT, D. A. and COLLINS, V. P. Radioiron citrate as tracer to determine disappearance rate of plasma iron in normal subjects. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 441-444. [Dept. Radiol., Baylor Univ., Texas Med. Centre, Houston.]

In 6 patients, none with disease affecting the haemopoietic system, 2 disappearance rates of Fe

were measured on the same day, during the forenoon after an injection of radio-active ferric citrate and during the afternoon after an injection of a sample of the patient's own plasma which had been incubated with radio-active ferric citrate. The rates of disappearance from the 2 forms were similar. The use of radio-active Fe as citrate is suggested for simplifying the administration of a tracer in clinical studies of Fe turnover.

D. Harvey.

4650

SCHMERL, E. F. The in-bed scale: a new scale for universal hospital use. *J. Amer. Med. Assoc.*, 1954, 156, 1401-1402. [Dept. Med., Highland Alameda County Hosp., Oakland, Calif.]

This ingenious device permits a completely passive, recumbent patient to be lifted clear of the bed and weighed separately with a minimum of disturbance and effort.—A. M. Thomson.

4651

KORNFIELD, A. T. Method for continuous weight loss determination in human subjects. *Federation Proc.*, 1955, 14, 87. *Proc. (Dept. Physiol., Sch. Med., St. Louis Univ., Mo.)*

4652

KLAKEG, C. H., PRUITT, R. D. and BURCHELL, H. B. A study of electrocardiograms recorded during exercise tests on subjects in the fasting state and after the ingestion of a heavy meal. *Amer. Heart J.*, 1955, 49, 614-625. [Mayo Clin., Rochester, Minn.] Interlingua summary.

The subjects were 64 men and 12 women aged from 19 to 62 years, but mostly between 40 and 59, most of whom had complained of pain in the chest. Partly on the results of the test, 26 of the men and 7 of the women were diagnosed as having coronary disease. The electrocardiograms were recorded before and after exercise consisting of 40 ascents and descents of two 9-in. steps, or less if the subject complained. The test was made at least 2 hr. after food and repeated on the same day within an hour after what the subject considered a large meal.

The average heart rates in the fasting test were 78.6 at rest, 101.2 immediately after exercise and 82.6 after a 5-min. rest. After a meal the corresponding rates were 86.4, 112.6 and 91.3. QT intervals were within the normal range, but the average height of T waves in lead V_5 was less after the meal than fasting in all subjects, and in fasting tests less after exercise than before in the subjects thought to have heart disease. The level of the RS—T segments relative to the P—R segments in lead V_5 was lower after a meal in all subjects, and there was no diagnostic advantage in performing the test after a meal.—D. Duncan.

4653

SCARU, A. and SCHIANO, S. Tentativo di applicazione della reazione di Nagler alla diagnostica sierologica della malattia aterosclerotica umana. [Application of Nagler's reaction to the serological diagnosis of atherosclerosis in man.] *Acta gerontol.*, 1954, 4, 179-187. [Ist. Patol. Spec. Med., Univ. Naples.] English and French summaries.

Nagler's reaction as used by Horlick (Abst. 617, Vol. 25) was modified in that the lecithinase activity of *Cl. welchii* toxin was replaced by that of a phenol solution.

A constant and significant difference in final turbidity values was found between 10 normal and 20 atherosclerotic subjects, related to the increase of the β : α lipoprotein ratio in the latter. In other subjects with essential hypertension, hyperlipaemia and other disorders the results were less constant. The method is considered promising for clinical diagnosis of atherosclerosis.—D. Duncan.

4654

QUICK, A. J. Die Ein-Stufen-Methode der Prothrombinzeit-Bestimmung. [The one-stage method of estimating prothrombin time.] *Deutsch. med. Wochenschr.*, 1955, 80, 620-621. [Dept. Biochem., Sch. Med., Marquette Univ., Milwaukee, Wis.]

In the presence of excess Ca and a source of thromboplastin the formation of thrombin is proportional to the concentration of prothrombin, a labile substance (Abst. 2959, Vol. 13) and a stable substance in the plasma. For a one-stage method of estimating prothrombin time it is essential to use as source of thromboplastin rabbit brain treated with acetone, since this is free of both the labile and the stable substance. Normal human plasma has then a constant prothrombin time of 12 sec. Both accessory substances must be present, but in excess they do not reduce the time, which is therefore determined primarily by the prothrombin itself.

Adult plasma contains a prothrombin precursor, prothrombinogen, which is absent from the blood of newborn infants. The two-stage prothrombin method did not distinguish free prothrombin from the precursor, but the one-stage method does not estimate prothrombinogen. The prothrombin time of newborn infants is therefore the same as that of adults.

The prothrombin time is normal in haemophilia, thrombocytopenia and von Willebrand's disease, and the method can be used for distinguishing these disorders from disorders in which prothrombin is low. Increased prothrombin time of congenital origin is usually due to deficiency of only one substance, but acquired hypoprothrombinaemia usually involves more than one, and diagnosis is more complex.—D. Duncan.

4655

KOGAN, A. M. and DYUBYUK, N. E. *Kratkie metodicheskie ukazaniya po ispol'zovaniyu statisticheskogo metoda pri izuchenii pitaniya. [Brief hints as to method in the use of statistics in nutrition studies.] Vop. Pitan., 1955, 14, No. 2, 35-41. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]*

4656

STRUSS, F. *Neuartiges Prinzip der Luftführung für langdauernde Respirationsversuche. [New principle of ventilation for prolonged respiration experiments.] Arch. Tierernährung, 1954, 4, 76-78. [Inst. Tierernährung, Univ. Halle.]*

A metabolism cage for small animals is described, which is designed for long closed-circuit experiments. Two chambers are provided which can be sealed off and opened alternately for feeding and collection. For large animals a cage is described with an air-lock through which food can be passed in.—D. Duncan.

4657

CASANERA, T. J., KIMELDORF, D. J. and JONES, D. C. *An apparatus for measurement of activity in small animals. J. Lab. Clin. Med., 1955, 45, 825-832. [U.S. Naval Radiol. Defence Lab., San Francisco 24, Calif.]*

A cage suspended from springs is used with an integrator, constructed from clock parts, which permits a cumulative numerical index of activity to be determined. An automatic watering system is described.—H. G. Bray.

4658

SMITH, A. M. and REID, J. T. *Use of chromic oxide as an indicator of fecal output for the purpose of determining the intake of pasture herbage by grazing cows. J. Dairy Sci., 1955, 38, 515-524. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]*

Five trials with 17 individual cows were made to investigate the use of chromic oxide for the estimation of total faeces voided by cows during

pasture herbage trials. From 10 to 28 g. Cr_2O_3 was given once or twice daily, in capsules or mixed with a small amount of concentrate feed. The daily pattern of Cr_2O_3 excretion was studied, and it was found that least Cr_2O_3 was recovered at 2 p.m., and most at midnight. Samples taken at 6 a.m. and 4 p.m. for 7 consecutive days could be used for accurate estimation of the total faeces voided, as found by the use of collection bags. The method of giving the Cr_2O_3 did not affect the accuracy.—T. D. Bell.

4659

JAAP, R. G. *Sampling body weight of growing chickens. Poultry Sci., 1955, 34, 396-397. [Ohio State Univ., Columbus 10.]*

Samples of 75 chicks, taken from groups containing from 200 to 1500 birds at 8 weeks of age, were weighed and the means were found to differ from the true means for the corresponding whole groups (1.0 to 3.4 lb.) by not more than 0.08 lb. in a series of 12 tests and showed no tendency for a systematic bias. The samples were obtained by grouping 60 to 100 chicks against a wall with a catching frame and allowing all but 25 to escape at the sides; these were weighed and 2 further samples were taken at different points in the pen.—K. J. Carpenter.

4660

M McNALLY, E. H. *Calculation of the moisture and protein content of market chickens from the fat content. Poultry Sci., 1955, 34, 152-155. [U.S. Dept. Agric., Agric. Res. Serv., Animal and Poultry Husb. Res. Branch, Beltsville, Md.]*

Regression equations for the relation of fat content to moisture, protein and ash contents in fattened and unfattened hens and cockerels are presented. It was found that growth, fattening and sex did not affect the relationships. The calculations from fat content of protein, moisture and ash of breast muscle and ash of total edible meat and leg muscle were only fairly accurate, but the accuracy of the other calculations was high.

T. D. Bell.

See also Absts. 4729, 5545.

COOKING, STERILISATION AND PRESERVATION OF FOOD

4661

SOUCI, S. W. *Ziele und Grenzen der chemischen Konservierung der Lebensmittel. [Aims and limitations of the chemical preservation of food.] Angew. Chem., 1955, 67, 16-25. [Deutsch. Forschungsanst. Lebensmittelchem., Munich.]*

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Chemical preservatives are discussed under several headings, including substances used to prevent bacterial spoilage, chemical changes, physical changes, destruction by pests and changes such as sprouting in stored potatoes. Problems of safety in the use of some preservatives are briefly outlined.—A. M. Copping.

4662

SOUCI, W. S. El problema de la conservación química de los víveres. [Chemical preservation of foods.] *Arch. venezol. Nutricion*, 1954, 5, 285-304. [Inst. Food Chem., Munich.] English and German summaries.

Preservatives used in the food industry are described with reference to the 24 now tolerated in Federal Germany. The basis for making positive lists is discussed; the first principles should be reduction of the number of preservatives to a minimum and their use only when indispensable.—D. Duncan.

4663

KUPRIANOFF, J. Lebensmittelkonservierung durch ionisierende Beta- und Gamma-Strahlen. [Preservation of food by ionising beta and gamma rays.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, 100, 275-303. [Bundesforschungsanst. Lebensmittelfrischhaltung, Karlsruhe.]

A review.

4664

GOLDBLITH, S. A. Preservation of foods by ionizing radiations. *J. Amer. Dietetic Assoc.*, 1955, 31, 243-249. [Dept. Food Technol., Massachusetts Inst. Technol., Cambridge.]

This is a short discourse on the application, limitations and future possibilities of preservation of foods by ionising radiations. Examples quoted are the increase in shelf life of frankfurters, fresh meats and similar foods produced by a decrease in bacterial or mould growth, the destruction of insects in grain and grain products and the inhibition of sprouting in potatoes during storage.

A. Hepburn.

4665

LUCKEY, T. D., WAGNER, M., REYNIEERS, J. A. and FOSTER, F. L. (Jr.) Nutritional adequacy of a semi-synthetic diet sterilized by steam or by cathode rays. *Food Res.*, 1955, 20, 180-185. [Lobund Inst. Res. Life Sci., Univ. Notre Dame, Ind.]

Three generations of Swiss mice were reared in small numbers (16 first generation dams) on a semi-synthetic diet of casein (Labco) 25, maize starch 54, cellophane 2, maize oil 6.8, minerals 6, yeast and liver extracts 5 per cent., with liberal amounts of vitamins (details supplied), given to appetite, or the same sterilised by steam or by cathode rays under specified conditions, along with non-sterile tap water.

General appearance, growth, reproduction and lactation were similar in the 3 groups of mice and it is considered that sterilisation by cathode rays does not have any toxic effect. Analyses showed that neither process destroyed much of the vita-

mins, except vitamin B₁, of which less than a third remained, but it is emphasised that in any case the amounts were ample. Cathode rays destroyed rather less than steam did.

W. M. Deans.

4666

MELCHER, D. Probleme radioaktiver Verseuchung von Lebensmitteln. [Contamination of foods with radio-active material.] *Mitt. Geb. Lebensmittel. Hyg.*, 1955, 46, 68-75. *Proc.* [Berne.]

4667

MINISTRY OF FOOD, FOOD STANDARDS COMMITTEE. Recommendations relating to the use of colouring matters in foods. *J. Roy. Inst. Pub. Health Hyg.*, 1955, 18, 36-37.

4668

DE MEUBON, G. L'état actuel de la question des colorants pour denrées alimentaires. [Present position of the problem of colouring agents in foods.] *Mitt. Geb. Lebensmittel. Hyg.*, 1955, 46, 97-119. *Proc.* [Basle.]

4669

VENKATAPPAIAH, D. and BASU, K. P. Non-protein nitrogenous constituents of milk. 3. Effect of different heat treatments. *Indian J. Dairy Sci.*, 1955, 8, 1-8. [Indian Dairy Res. Inst., Bangalore.]

The methods of estimation were as in part 1 (Abst. 183, Vol. 23). Pasteurisation of cow or buffalo milk by the holder or the high-temperature, short-time method in the laboratory, or by the second method in the dairy, did not affect total N, total N.P.N. or N.P.N. constituents. When milk was brought just to the boil (at altitude 3000 ft.) and cooled, with shaking to prevent a skin forming, urea N and uric acid N decreased and ammonia N increased, but not significantly. When the milk was boiled for 30 min. and then cooled, these changes reached significance. In the last 2 processes a small amount of creatine was transformed into creatinine.—W. M. Deans.

4670

TAMSA, A. F. A study of the volatile fraction isolated from oxidized milk fat. 1. Isolation, preliminary characterization, and chromatographic separation of the volatile fraction. 2. Further characterization of compounds responsible for the oxidized flavor. *J. Dairy Sci.*, 1955, 38, 284-291; 478-498. [Dairy Indust. Sect., Iowa Agric. Exp. Stat., Ames.]

1. Milk fat was oxidised by exposure to the atmosphere at different temperatures and deodorised by steam distillation. Only the distillate possessed an oxidised flavour, which could be removed by extraction with Skellysolve B and was

N.A. and R., October 1955

apparently due to carbonyl compounds, as peroxides and epoxides were absent. The carbonyl compounds were not all recovered in the distillate and the amount obtained was much less after oxidation for 1 month at 40° or 25° C. than after oxidation for 24 hr. at 100° C.

The fraction extracted with Skellysolve B had characteristic ultraviolet absorption maxima at about 215 and 260 $m\mu$, indicating conjugated monoene and diene carbonyl compounds, respectively. Changes in absorption were distinct before other signs of oxidation appeared. The diene compounds were less stable than the monoenes when this fraction was stored. On the basis of the ultraviolet absorption of the eluate the fraction was separated by chromatography. The oxidised flavour was present in the first fractions, in those with an absorbance at 215 $m\mu$ and in the eluate just preceding them.

Compounds with no appreciable absorption in the ultraviolet region apparently also contributed to the oxidised flavour.

2. The volatile fraction from milk fat oxidised at 100° C. and soluble in Skellysolve contained 3 carbonyl compounds, unconjugated unsaturated, apparently responsible for the oxidised flavour, conjugated monoene and a little conjugated diene. These compounds were probably ketonic, the first 2 possibly tautomeric, and the last one was unstable. A promising method for their separation depended on chromatography on Celite, the reaction of the eluate fractions with semi-carbazide and the recrystallisation of the semi-carbazones.

A. Hepburn.

4671

TOLLENAAR, F. D. Vetbederf in melkpoeder. [Rancidity of fat in dried milk.] *Voeding*, 1955, 16, 195-204. [Centraal Inst. Voedingsonderzoek T.N.O., Utrecht.] English summary.

The production of dried milk is of great importance in the Netherlands. Of the total of 4.9 million tons of milk produced in 1954 about 11 per cent. was dried. Whole milk and whole milk with added fat, up to 42 per cent., and skimmed milk are dried. The effects of pre-heating and of roller and spray drying are discussed. Spray-dried whole milk has a higher percentage of "tallowy" and roller-dried of "stale" samples.

The chemical changes leading to rancidity and flavour defects, the defects of processing that accelerate these changes and what can be done to avoid them are discussed.—I. Leitch.

4672

PATTON, S. Browning and associated changes in milk and its products: a review. *J. Dairy Sci.*, 1955, 38, 457-478. [Dept. Dairy Sci., Pennsylvania Agric. Exp. Stat., University Park.]

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4673

VAN KREVELD, A. and VAN MINNEN, G. Calcium and magnesium ion activity in raw milk and processed milk. *Nederlands Melk Zuivelijdschr.*, 1955, 9, 1-29. ["Friesland" Co-operative Condensery, Leeuwarden.] Dutch summary.

The Ca and Mg ion activity of fresh and treated milks was measured by shaking samples of them with a quantity of the cation-exchange resin Duolite C 20 which had been conditioned by treatment with chlorides of Na, K, Ca and Mg. The load which was least affected by the process provided a measure of the cation activities in the milk. If K ions in raw milk were assumed to be free than Na ions were found also to be free, but of Ca and Mg only part, about one-fourteenth and one-sixth, respectively, was present as free ions. Data are given also for changes produced by pasteurisation, when both Ca and Mg ion activities were significantly reduced, and by condensation and sterilisation, when in the one case that of Ca and in the other that of Mg was diminished most.

D. Harvey.

4674

DENT, C. E. How to make decalcified milk. *Helv. paediat. Acta*, 1955, 10, 165-166. [University Coll. Hosp., London.]

4675

KOTSCHKEVAR, L. H. Nutritive values and flavor in frozen meat. A review. *J. Amer. Dietetic Assoc.*, 1955, 31, 250-252. [Residences and Foods Serv., Montana State Univ., Missoula.]

4676

GRISWOLD, R. M. The effect of different methods of cooking beef round of Commercial and Prime grades. 1. Palatability and shear values. 2. Collagen, fat and nitrogen content. *Food Res.*, 1955, 20, 160-170; 171-179. [Univ. Chicago, Ill.]

1. Meat from paired rounds from Hereford steer carcasses, 4 of U.S. Commercial and 2 of Prime grade, was cooked by a standard braising method to 185° F. (85° C.) or by 14 other methods, namely, braising to 176° or 199°, or to 185° with previous scoring or pounding or treatment with 2 papain preparations or vinegar, or to 185° with vinegar or without water, or pressure cooking to 185° at a pressure of 5, 10 or 15 lb. per sq. in., or roasting to 185° in an oven at 250° or 300°. It was judged by a panel for aroma, flavour of fat and of lean, tenderness, juiciness and acceptability, and shear values were measured. The results are tabulated and analysed statistically.

Most variants of the standard braising method did not improve quality, except that tenderness was increased by pounding or by treatment with

papain, but not by scoring or soaking in vinegar, and the last impaired the flavour. Braising gave rather better results than pressure cooking. Roasting at 250° F. took a long time and the outside appearance of the meat was unsatisfactory, but flavour and tenderness were excellent. Beef from Prime grade carcasses generally, but not always, surpassed that from Commercial grade carcasses in flavour and tenderness. On the whole, the different cooking methods affected both grades in the same way.

2. In the meat cooked as described above pH was measured and moisture, fat by acid hydrolysis, total N by the Kjeldahl method, free amino-N by formal titration, and collagen by the method of Lowry *et al.* (Title 817, Vol. 11), and the fat content of the drippings, were estimated. The results are tabulated and analysed statistically.

The results suggested that the total amount of free amino-N does not increase during cooking and that the more soluble nitrogenous constituents go into the drippings. The average loss of collagen for all cooking methods was 61 per cent. Loss of collagen tended to increase with the internal temperature of the meat and was high in meat roasted at 250° F. or soaked in vinegar and low in meat braised without water; pounding, scoring or treatment with papain had little effect. Cooked beef from Commercial grade carcasses contained more collagen than that from Prime grade carcasses.

W. M. Deans.

4677

TADLE, J., LEWIS, M. N., WINTER, A. R. and JAAP, R. G. Cooked, edible meat in parts of chicken. 1. Broilers. *J. Amer. Dietetic Assoc.*, 1955, 31, 597-600. [Dept. Dietetics, Ohio State Univ., Columbus.]

This study was based on 10 male and 10 female 10-week-old broilers of each of 3 crosses, of average liveweight 3.4 lb. After losses in dressing and evisceration had been found, the carcasses were cut into parts (illustrated), wrapped in aluminium foil and cooked at 15 lb. pressure for 20 min.

The results include the following: dressing loss, males 10.9, females 12 per cent.; evisceration loss as percentage of liveweight 26, 24.4; overall cooking loss 23.0, 25.8 per cent. Wings lost 16.1, legs and thighs 23.9, breast 24.0, back 24.0 per cent.; giblets lost more. Cooked edible meat amounted to 37.5 per cent. of liveweight; differences between sexes and crosses were not significant. For the parts the percentage yields of cooked edible meat were: heart 67.2, liver 66.8, breast 63.4, gizzard 58.6, legs and thighs 53.3, wings 50.0, back 41.7.—W. M. Deans.

4678

SZCZYGIŁŁE, A. and SICZKÓWNA, J. Badania nad wzbogacaniem pieczywa z różnych gatunków

małki. [Experiments on bread enrichment.] *Roczn. Państwowego Zakł. Hig.*, 1955, 6, 55-74. Russian and English summaries.

The object was to find a recipe for an enriched bread, consumption of which in amounts of 500 to 750 g. daily would cover nutritional requirements for short periods, except for vitamins A, D and C. The basal ingredients of the dough were 100 g. wheat or rye flour of different extractions, margarine 10, sugar 5 and skimmed milk powder 6 g. and the additions tested were yeast 2 to 10 per cent., beans 10 per cent. or blood 20 to 60 per cent. by weight, and calcium carbonate. The biological value of the different breads was tested on rats.

The yeast-fermented breads had a high biological value but with more than 4 per cent. yeast had a bitter taste. Addition of beans to this bread did not improve the biological value. Bread made with added blood had poor organoleptic qualities. Leaven-fermented bread of 82 per cent. extraction rye flour had a better taste than yeast-fermented bread, but did not keep well. (From summary.)—J. S. Thomson.

4679

JANSEN, A. P., VAN DER LINDEN, A. C. and WÖSTMANN, B. S. J. Die Wirkung der Ammoniumpersulfat-Behandlung von Mehl auf den Methioningehalt des Brotes. [The effect of ammonium persulphate treatment of flour on the methionine content of bread.]

SCHORMÜLLER, J. Die Wirkung der Ammoniumpersulfat-Behandlung von Mehl auf den Methioningehalt des Brotes. Erwiderung auf die gleichlautende Arbeit von A. P. Jansen, A. C. van der Linden und B. S. J. Wöstmann. [The effect of ammonium persulphate treatment of flour on the methionine content of bread. Reply to the paper with this title by A. P. Jansen, A. C. van der Linden and B. S. J. Wöstmann.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, 100, 345-350; 350-351. [Nederlands Inst. Volksvoeding, Amsterdam; Inst. Lebensmittelchem., Techn. Univ. Berlin, Charlottenberg.]

Schormüller *et al.* (Abst. 2750, Vol. 23) reported a 20 per cent. loss of methionine from the gluten isolated from flours treated with ammonium persulphate. Jansen *et al.*, in experiments in which flour was treated and bread baked by ordinary practical methods, were unable to confirm this either chemically by the method of Baernstein (Title 2893, Vol. 6) used by Schormüller *et al.* or microbiologically with *Leuconostoc mesenteroides* P-60.

Schormüller retorts that the experiments were not comparable, and points out that he tested several flours of different extractions and took the crust into consideration, whereas they confined

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themselves to the crumb of bread from a single flour. He reiterates a previous remark that the final decision must come from a biological experiment.—W. M. Deans.

4680

NARAYANA RAO, M. and SWAMINATHAN, M. **The nutritive value of calcured rice.** *Bull. Central Food Technol. Res. Inst., Mysore*, 1954, **4**, 34. [Div. Biochem. Nutrit.]

Rice "calcured" by soaking in CaCl_2 solution and parboiling had a chemical composition similar, except for a much higher Ca content, to rice parboiled in tap water. The nutritive value was significantly improved.—A. Hepburn.

4681

SUBRAHMANYAN, V., RAMA RAO, G., MURTHY, H. B. N. and SWAMINATHAN, M. **Effect of storage on the chemical composition and nutritive value of groundnut flour, tapioca flour and their blends.** *Bull. Central Food Technol. Res. Inst., Mysore*, 1954, **4**, 31-33.

Tapioca flour, groundnut flour and a mixture of them in a 4:1 ratio were stored in gunny bags at room temperature and at 37° C. for 5 months. The free fatty acid and peroxide values of the groundnut flour and of the mixture increased during storage. Changes in tapioca flour were negligible. Increases were most in the mixture, which, however, did not become rancid like the groundnut flour. Between 12 to 25 per cent. of vitamin B_1 was lost from all samples. Temperature had no appreciable effect on any of these changes. The nutritive value of the flour mixture and the biological value of the groundnut protein [others were not tried] did not decrease on storage.—A. Hepburn.

4682

WALKER, G. W. **Removal of excess fluorine from drinking water for stock.** *East African Agric. J.*, 1955, **20**, 220. [Vet. Res. Lab., Mpwapwa, Tanganyika.]

Many of the natural waters in Tanganyika, both borehole and stream, contain over 18 p.p.m. F, an amount dangerous to livestock. By the application of calcium chloride to a bore-hole water containing 28 p.p.m. F this concentration was reduced to 13 p.p.m. The optimum amount of CaCl_2 was 0.54 g. per litre. The pH of the water was reduced from 8.8 to 7.4.—J. S. Thomson.

4683

ARNOLD, L. K. and JUHL, W. G. **The reduction of free gossypol in cottonseed flakes during solvent extraction.** *J. Amer. Oil Chem. Soc.*, 1955, **32**, 151-152. [Iowa Eng. Exp. Stat., Iowa State Coll., Ames.]

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The free gossypol content of cottonseed flakes of initial moisture content 6.55 per cent. was reduced in a pilot plant by extraction with trichloroethylene at 122° F. The soluble protein content was higher than in meals in which the free gossypol content was reduced by heat treatment, but no feeding trial has been made.

D. H. Shrimpton.

4684

BRUHN, H. D. **Pelleting grain and hay mixtures.** *Agric. Eng.*, 1955, **36**, 330-331. [Dept. Agric. Eng., Univ. Wisconsin.]

An experimental hydraulic press was used to make pellets of alfalfa, bromegrass and clover, alone or mixed, chopped or long. No binding agent was needed. A suitable pressure was 4000 lb. per sq. in., giving pellets 1.25 to 2.5 in. in diameter and 1.5 to 2.0 in. long. They were readily eaten by cattle.—T. D. Bell.

4685

NASH, M. J. and WATSON, S. J. **Recent advances in conservation of forage crops.** *J. Roy. Agric. Soc. Engl.*, 1954, **115**, 20-26. [Univ. Edinburgh.]

4686

MICHAEL, G. and BLUME, B. **Über das Verhalten einiger lebenswichtiger Aminosäuren beim biologischen Abbau in verschiedenen Pflanzen.** [The behaviour of some essential amino-acids in the biological decomposition of different plants.] *Arch. Tierernährung*, 1955, **5**, 41-51. [Inst. Agric. Chem., Friedrich-Schiller Univ., Jena.]

As a guide to losses in haymaking, laboratory studies were made on lucerne, red clover, summer barley and tobacco leaves, harvested before flowering and either dried at once at 65° C. or stored damp for 4 days in the dark. In the soluble fraction after coagulation of protein by heat, lysine and arginine were estimated by ascending chromatography on carboxyl paper with a sodium phosphate buffer at pH 8; arginine was also estimated colorimetrically, after electrophoretic separation, by the method of Sakaguchi, and tryptophan colorimetrically by xanthoprotein reaction.

Barley and lucerne stored damp lost 47 and 40 per cent. of their protein on a dry matter basis, clover only 16 per cent. Arginine and tryptophan in the soluble fraction increased about 3 times, lysine much less and the suggestion is made that it breaks up during storage. Combination of the results with those of Block and Bolling on the amino-acid composition of the plant proteins indicated losses from lucerne of 31 per cent. of its lysine, 13 per cent. of its arginine and 6 per cent. of its tryptophan. For barley the corresponding figures were 23, 25, 8 and for clover 12, 8, 6.

W. M. Deans.

4687

ROSSINI, M. La chiusura "ermetica" dei silii per la conservazione dei foraggi. [*"Hermetic" sealing of silos for fodder conservation.*] *Riv. Zootec.*, 1955, 28, 113.

Perfect sealing of silos is not possible in practice. Changes in atmospheric temperature and pressure cause expansion and concentration of the gases inside the silo, which are expelled and subsequently replaced by air. Lactic acid fermentation should be encouraged to prevent spoiling. Pit silos are better than those exposed to the sun, since changes in external temperature do not affect them so much.—T. D. Bell.

4688

BARNETT, A. J. G. and BAXTER, J. *Laboratory studies on the initiation of the silage fermentation by means of whey.* *J. Brit. Grassland Soc.*, 1955, 10, 45-57. [Div. Agric. Biochem., Dept. Biol. Chem., Univ. Aberdeen.]

A small unreplicated trial did not show any effect of acid- or rennet-whey on pH or lactic acid production in fermenting grass slurries in glass aspirator jars, though volatile fatty acid production was apparently increased.—J. L. Corbett.

4689

ULVESLI, O., FYRILEIV, E. and BREIREM, K. En sammenligning av ensileringsmetoder for gras. [A comparison of ensiling methods.] *Norsk Landbruk*, 1954, No. 12, 262-264; No. 18, 390-391. English summary.

The quality of silage is important because of its effect on the quality of milk. Trials from 1946 to 1952 showed that the A.I.V. method was the most reliable for making grass silage of good quality. Under Norwegian conditions grass silage made without any addition was not a success, even when the grass was wilted, chopped or crushed. Chopping or crushing made it possible to use less A.I.V. acid. Sulphur dioxide led to practical difficulties and is not recommended. Small scale trials with Kofa salt were successful; it was not tried on a large scale. As a carbohydrate addition only steamed potatoes were tried, and no advantage resulted.—T. D. Bell.

4690

MURDOCH, J. C., BALCH, D. A., HOLDSWORTH, M. C. and WOOD, M. The effect of chopping, lacerating and wilting of herbage on the chemical composition of silage. *J. Brit. Grassland Soc.*, 1955, 10, 181-188. [Nat. Inst. Res. Dairying, Univ. Reading.]

In the trials reported the effects of chopping, lacerating, wilting and adding molasses to herbage for ensiling were investigated. Chopping and lacerating generally gave better silage, but even

when these methods were used silages high in butyric acid and volatile bases occasionally resulted. Excellent silage was made by adding molasses to chopped grass. The temperature was too high in silage made with wilted grass, but this could be controlled by chopping the wilted material, which was then more easily compacted.—T. D. Bell.

4691

AXELSSON, J. and KIVIMÄE, A. Effect of wilting and addition of kofasalt and molasses on ensiled clover. *Kgl. Lantbrukshögsk. Ann.*, 1954, 21, 41-48. [Inst. Animal Nutrit.]

Kofa salt (20 parts Ca formate and 3 parts Na nitrite) was added at 0.23 per cent. of the crop weight, molasses at 3 per cent. Effluent wastage, highest from molassed silage, was greatly reduced by wilting, which increased the average dry matter of the silage from 18 to 31.5 per cent. Both additives reduced dry matter losses and to a similar extent. Their effects on the chemical composition of the silage were slight.—J. L. Corbett.

4692

BRANDSMA, S. Verliezen bij het inkuilen van bietenkoppen en -blad. [Losses in ensiling beet tops and leaves.] *Landbouwoorlichting*, 1954, 11, 533-541. [Rijkslandbouwprefstat., Hoorn.]

Earlier results (*Landbouwoorlichting*, 1953, 10, 358-366) are compared with those of experiments in 1953-54 with chopped tops and leaves in an undrained and a drained silo and a pit, and with whole tops and leaves in a heap on the ground. The unchopped silage contained less acetic and lactic acids and more butyric acid and ammonia. Composition in terms of sand, sand-free dry matter, crude protein, crude fibre, other carbohydrates, ash, digestible true protein, starch equivalent and K, Na, Ca, Mg, P, Cl, SO₂ and Cu is given for each silo. Mean losses of proximate principles from silos were of the order of 30 per cent., and of crude fibre (cut, undrained) 6 and (cut, drained) 15 per cent.; from the pit, proximate principles about 40 and crude fibre 22 per cent.—I. Leitch.

4693

MURDOCH, J. C., BALCH, D. A., FOOT, A. S. and ROWLAND, S. J. The ensiling of lucerne with addition of formic and glycolic acids, molasses and barley meal, and with wilting. *J. Brit. Grassland Soc.*, 1955, 10, 139-150. [Nat. Inst. Res. Dairying, Univ. Reading.]

Silage was made from first, second and third cuts of a lucerne-timothy sward. For the first 2 cuts tower silos holding about 15 tons and for the third cut small-scale experimental silos were used. Silage made with additions of glycolic acid, or formic acid for the second cut, molasses, or barley

meal and from the crop without additions but wilted for 24 to 48 hr. were compared. To facilitate distribution of the barley meal the crop was chopped when this addition was used.

The acids and the barley meal gave the best silages, but a subsidiary trial with chopped silage with or without barley meal showed that the quality of the silage was due to the chopping rather than to the barley meal. The wilted silage was well preserved, but compaction was poor and the silage was overheated, with reduced digestibility and the development of moulds. Molasses silage was the least satisfactory, with more butyric acid than the others.—T. D. Bell.

4694

WENTIGER, J. H. and FUNK, K. Untersuchungen über die Silierung von Luzerne unter Beigabe verschiedener Sicherungszusätze. [Ensilage of

alfalfa with different preservatives.] *Arch. Tierernährung*, 1955, 5, 33-40. [Inst. Tierzucht, Martin Luther Univ., Halle, Wittenberg.]

Lucerne harvested in bud was chopped and ensiled with Kofa salt, formic acid or calcium thiocyanate in airtight silos of capacity 2 c.m. After 3 months the Kofa salt silage had 1.40 per cent. lactic acid and a pH value of 4.86 and was considered good; the formic acid silage was of medium quality and the calcium thiocyanate silage bad. Trials with wethers given 2½ kg. silage daily with 400 g. hay showed that the Kofa salt silage had the best starch value but the formic acid silage was equally good in digestible crude protein; the calcium thiocyanate silage was decidedly inferior, and this additive is not recommended.

W. M. Deans.

See also Absts. 4707, 4853, 4875, 5914.

2. CHEMICAL COMPOSITION OF FOODSTUFFS

(Except Vitamins, for which see Section 3)

ENERGY VALUE, PROXIMATE PRINCIPLES AND INORGANIC CONSTITUENTS

GENERAL

4695

SCHELTJINGA, H. Lood in grond, plant en dier. [Lead in soil, plant and animal.] *Landbouwk. Tijdschr.*, 1955, 67, 153-164. [Landbouwk. Bur. Sporenelement., Arnhem.] English summary.

FOODSTUFFS OF ANIMAL ORIGIN

Milk and Milk Products

4696

ANDERSSON, M. and WALKER, A. R. P. Methionine concentration in South African Bantu breast milk. *Brit. J. Nutrition*, 1955, 9, 197-199. [Human Biochem. Unit, S. African Inst. Med. Res., Johannesburg.]

The mean values with standard deviations and ranges for the methionine content of human milk were, for 29 samples from Bantu mothers lactating for from 1 to 27 months, 29.7 ± 5.1 , 19.6 to 39.0, and for 25 samples from South African European mothers lactating for from 2 weeks to 10 months, 26.2 ± 3.2 , 19.3 to 33.4 mg. per 100 ml. The finding for Bantu was significantly higher than for European mothers and provided no evidence in support of the view that a deficiency of methionine may be a cause of kwashiorkor in infants.

D. Harvey.

4697

PARADISO, M. and LA CAUZA, C. La gonadotropina corionica quale nuovo mezzo per il trattamento dell'eccesso di grasso nel latte umano. [Chorionic gonadotropin as a new

means for treating excess of fat in human milk.] *Riv. Clin. pediat.*, 1954, 54, 122-129. [Clin. Pediat., Univ. Florence.] English and French summaries.

Fat, protein and lactose were estimated in the milk of 20 women before and after 4 intramuscular injections of 500 "units" of chorionic gonadotropin on alternate days. The women were selected as having milk high in fat, the infants of 15 of them having been admitted to the Clinic for eczema or dyspepsia. In 10 of the women the fat value, which ranged from 5.4 to 6.6 per cent. before treatment, fell with treatment to from 3.2 to 3.6. It did not rise again in the next 2 months, 4.4 per cent. in 2 patients being the highest value reached. The other 10 women also showed a fall in the fat value; it did not remain low but could be more or less effectually controlled by further injections. The concentration of protein and lactose was not affected by the injections. The women suffered no adverse effect.—E. M. Hume.

4698

WINZENRIED, H. U. Die Wirkung von Umwelt- und Erbfaktoren auf die Zusammensetzung der Milch mit besonderer Berücksichtigung des MilCHFettes und seiner Bestandteile. [Effect of environment and heredity on the composition of milk with special reference to milk fat and its components.] *Ztschr. Tierzucht. Züchtungsbiol.*, 1955, 64, 105-152. [Inst. Tierzucht., Eidg. Tech. Hochschule, Zürich.]

There is a comprehensive review of the literature, with 118 references. Original work was done in Sweden with 14 pairs of monozygous twin cows studied at different stages of lactation; the study on individual pairs lasted for from 3 to 10½ months and included from 7 to 21 analyses, 205 in all. Variations in the composition of the milk and milk fat were the basis of a statistical study according to methods described by Bonnier and Tédin ("Biologisk Variationsanalys", Stockholm, 1940).

The correlation coefficients between partners of the pairs suggested a strong inherited influence. The values were for protein content + 0.78, sugar + 0.60 and fat + 0.68, and for fat components measured by Reichert Meissl number, Polenske number, iodine number and others they lay between + 0.62 and + 0.89. Between 60 and 80 per cent. of the variation in these characteristics was genetically determined.

The stage of lactation had a greater effect on protein than on other constituents of milk, and was responsible for 31.5 per cent. of its variation. The sugar content varied less with stage of lactation. Of variations in fat content only 10 per cent. were due to stage of lactation.

There was a positive correlation between fat and protein content, $r = + 0.64$.—D. Duncan.

4699

HUNGER, K. and HENRICH, K. G. Ein Beitrag zur Kenntnis der Verteilung des Fettes in der Milch unter besonderer Berücksichtigung der individuellen Unterschiede und Untersuchungen über die Natur der Fettkügelchen an Hand von Dauerpräparaten. [Distribution of fat in milk with special reference to individual differences and studies of the nature of fat globules by means of permanent preparations.] *Ztschr. Tierzucht. Züchtungsbiol.*, 1955, **64**, 333-354. [Inst. Tierzucht., Justus Liebig Hochsch., Giessen.]

The permanent preparations of milk to show fat globules were made by mixing 2 ml. milk and 3 ml. aqueous solution of 2 per cent. sodium citrate and 0.1 per cent. NaOH; after shaking, 2 ml. of this mixture was mixed with 3 ml. of 10 per cent. gelatine and 1 per cent. phenol at 30° C., and a drop was mounted for microscopical examination.

There was a strong positive correlation between the fat content of milk and the size of the globules, $r = + 0.7721$. There was no effect of diet. In mastitis and in cows given large quantities of beet the size increased, but in cows with poor appetites it fell. In 2 cows exercised for an hour the globules were larger at the next 2 milkings and then returned to normal size. An increase in the interval between milkings from 6½ to 12 hr. resulted in an increase of globule size from 15-95 to 21-34 μ . The size depended on the quantity

of milk and the pressure in the udder. The range of fat globules was less in morning than in afternoon and evening milk. In 5 cows the mean size of globules, in μ , was in the morning 15-25, at midday 17-37, and in the evening 16-92. The variation in size was especially wide in the first 10 or 12 weeks after calving, when the largest globules might exceed 40 μ .—D. Duncan.

4700

OOSTHUIZEN, J. C. Daily fluctuations in the fat content of herd milk. *Farming in S. Africa*, 1955, **30**, 49-52. [Coll. Agric., Glen.]

Milk from 36 farms supplying cheese factories was sampled daily for 5 consecutive days to ascertain the extent of variation in fat content. The percentage deviation ranged from 2.7 to 27.6 and reasons for this are discussed in relation to payment on the basis of fat content alone.

J. S. Thomson.

4701

THOMAS, W. R., HARPER, W. J. and GOULD, I. A. Lipase activity in fresh milk as related to portions of milk drawn and fat globule size. *J. Dairy Sci.*, 1955, **38**, 315-316. [Ohio State Univ.]

The total milk from each of 16 cows in different stages of lactation was drawn in 3 portions. The first portion was on the average higher in lipase activity and free fatty acid than the others which did not differ greatly. The size of fat globules increased slightly from the first to the third portion. [In Table 1, columns 6 and 7 are headed fat content instead of initial free fatty acid content, and this is referred to in the text, p. 316, line 3, as initial free fatty content.]—A. Hepburn.

4702

KING, J. O. L. Variations in the quantity and composition of milk yielded by diseased cows while their body temperatures were elevated. *Vet. Rec.*, 1955, **67**, 432-435. [Fac. Vet. Sci., Univ. Liverpool.]

Milk samples from 28 cows under veterinary observation were used in this study. The effects of body temperature on milk composition were considered through the following temperature ranges: 104° F. and over, between 102.5° and 103.9° F., and 102.4° F. and under. The results showed that a rise of temperature was accompanied by a fall of milk yield and solids-not-fat percentage and a rise of butterfat percentage.—J. N. Aitken.

4703

LOPES, C. F. and FILHO, F. S. S. Tipos de leite em São Paulo. [Types of milk in São Paulo.] *Bol. Indúst. animal, São Paulo*, 1954, **14**, 153-163. English summary.

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Three grades of pasteurised milk are sold in São Paulo. Grade A is only about 2 per cent. of the total and Grade B 2-6 per cent. Both are whole milks and are produced and pasteurised under good conditions near the city. Grade C milk is produced all over the State, collected at receiving stations, refrigerated and then sent to São Paulo City before it is pasteurised. It is standardised to 3 per cent. fat. Conditions of production are often bad and losses by souring are high.—D. Duncan.

4704

ROGICK, F. A. and LEME DA ROCHA, G. Contribuição ao estudo dos leites ácidos esporadicamente observados no Estado de São Paulo. [Acid milk found sporadically in the State of São Paulo.] *Bol. Indúst. animal, São Paulo*, 1954, 14, 111-121. English summary.

Milk which had been rejected for its high acidity, pH from 5 to 7, was bacteriologically sound. It was high in total solids, solids-not-fat and ash. The cows were at pasture, and the supplementary feeds could not be incriminated in group feeding tests. After 3 weeks the high acidity disappeared spontaneously.—D. Duncan.

4705

BADR, A. A. Factors influencing the titratable acidity of cow and buffalo milk. *Indian J. Vet. Sci.*, 1955, 25, 47-60. [Fac. Agric., Ibrahim Pasha Univ., Cairo.]

4706

GORDON, W. G. and ZIEGLER, J. Amino acid composition of α -lactalbumin. *Federation Proc.*, 1955, 14, 220. *Proc. [E. Reg. Res. Lab., U.S. Dept. Agric., Philadelphia, Pa.]*

4707

BLOCK, R. J. and WEISS, K. W. Studies on bovine whey proteins. 4. The amino acid analyses of crystalline β -lactoglobulin and α -lactalbumin by quantitative paper chromatography. *Arch. Biochem. Biophys.*, 1955, 55, 315-320. [Biochem. Res. Labs., Special Products Div., The Borden Co., Yonkers, N.Y.]

The amino acid compositions of crystalline β -lactoglobulin from skimmed milk spray-dried at low temperature and crystalline β -lactoglobulin and α -lactalbumin from milk pasteurised by the short-time high-temperature process were quantitatively analysed by the measurement of colour density on paper chromatograms of the hydrolysates. The results agreed well with those of more elaborate methods.—A. Hepburn.

4708

SUMTZOV, B. M. and MURAV'EVA, N. I. Izuchenie esteraznoj aktivnosti moloka i syvorotki krovii

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korov v zavisimosti ot zhirmolochnosti i stadii laktatzii. [Research into the esterase activity of milk and blood serum of cows and its relation to the fat content of milk and stages of lactation.] *Zh. Obschei Biol.*, 1954, 15, 388-396. [Lab. Biokhim. Vses. Nauch.-Issled. Inst.]

Biochemical investigation of milk and of serum from blood taken from the jugular vein of healthy lactating cows of the same breed suggested that, despite a fairly large degree of individual variation, certain correlations might be assumed. Animals tended to have either low or high values for milk fat, serum lipolytic activity, and content of sulphhydryl compounds in milk. There was also a parallel between blood glutathione and phosphatase activity of milk. Different stages of lactation were marked by alterations in metabolism manifested by changes in alkaline phosphatase in milk and inorganic P and lipase of serum, all of which give values low immediately after calving but rising throughout lactation. Further, animals with milk of high fat content had more reduced vitamin C and sulphhydryl compounds than had those with milk low in fat. Alkaline phosphatase activity and inorganic P content of milk were somewhat higher in animals with milk low in fat than in those with milk high in fat.—D. W. Taylor.

4709

JACQUET, J. and VILLETTE, O. Études sur les phosphatases du lait de vache. [Phosphatases of cow's milk.] *Bull. Acad. vét. France*, 1954, 27, 429-433. [Lab. Microbiol., Centre Études Laitières, Fac. Sci., Caen.]

By a modification of Bodansky's technique the presence of 3 phosphatases was demonstrated in milk, with optimum pH values of 9.4, 5.5 and 4.0. They could be obtained also from the mammary tissue of cows and the blood of calves and cows. Considerable differences in the relative proportions of the phosphatases were found in the blood of calves at different ages and of adult cows.

A. M. Copping.

4710

RUTZ, W. D., MARTIN, W. H. and WHITNAH, C. H. Reichert-Meissl numbers of butterfat from commercial products produced in Kansas. *J. Dairy Sci.*, 1955, 38, 387-390. [Dept. Dairy Husb., Kansas Agric. Exp. Stat., Manhattan.]

4711

DACRE, J. C. A chemical investigation of the volatile flavour principle of Cheddar cheese. *J. Dairy Res.*, 1955, 22, 219-223. [Dairy Res. Inst. (N.Z.), Palmerston North.]

4712

MAEBITT, L. A. Quantitative estimation of the amino-acids in Cheddar cheese and their importance in flavour. *J. Dairy Res.*, 1955, 22, 224-231. [Nat. Inst. Res. Dairying, Univ. Reading.]

The amino-acids in the aqueous phase of Cheddar cheese during ripening differed from those in casein in that basic amino-acids were greater in amount and proline less and ornithine was present. In serum from ripe cheese 7 to 9 per cent. of the total ninhydrin-positive material was unidentifiable.

A. Hepburn.

4713

SADEK, G. M. and HAMED, M. G. Some chemical properties of market samples of Damietta cheese. *Indian J. Dairy Sci.*, 1955, 8, 9-13. [Dairy Dept., Fac. Agric., Shebin El Kome, Egypt.]

See also Absts. 4669, 4670, 4673, 4800, 4813, 4835, 4913, 5816.

Eggs

4714

HAZEZ, E. S. E., BADRELDIN, A. L. and KAMAR, G. A. R. Egg components in the Fayomi fowl during the first laying year. *Poultry Sci.*, 1955, 34, 400-410. [Fac. Agric., Cairo.]

The weight of whole egg, albumin, yolk and shell of 6663 eggs laid by 50 Fayomi pullets in their first laying year was measured. The results were grouped for consecutive periods of 5 eggs. The average weight of the first egg was 27.8 g., and weight rose at a declining rate to 45.8 g. at the 150th egg. The absolute weight of the components also rose. In the first egg the distribution was albumin 58, yolk 29 and shell 13 per cent. The proportions gradually changed to 51.5, 35 and 12.5 per cent. There were high positive correlations between egg weight and weight of each component, and between the weights of the components. The percentage of yolk in the Fayomi eggs was higher than is reported for other breeds.—T. D. Bell.

Meat (All Kinds)

4715

BURNETT, M. C., GEHRKE, C. W. and BRADY, D. E. Volatile components of vacuum-packed dehydrated pork. *J. Agric. Food Chem.*, 1955, 3, 524-531. [Dept. Agric. Chem., Missouri Agric. Exp. Stat., Columbia.]

4716

PRITCHARD, H. and CAWTHORNE, M. The composition of whale-meat meals of various grades. *J. Sci. Food Agric.*, 1955, 6, 148-153. [13 Hamilton Sq., Birkenhead, Cheshire.]

Unofficial commercial grading of whalemeat meals in the United Kingdom is: A, meatmeals,

protein content 80 to 85 per cent.; B, meat-and-bone meals, protein content from 40 to 65 per cent., with more oil and ash than grade A meals; C, mainly bonemeals, but with about 20 per cent. protein and some oil. Analyses of 7 samples in these 3 grades, some from land stations in the southern hemisphere and some from a British floating factory, show that composition is variable but that the crude protein of genuine whalemeat meals is highly digestible by pepsin *in vitro* and contains over 80 or even over 90 per cent. true protein.

Riboflavin, nicotinic acid, pantothenic acid, pyridoxine, inositol and vitamin B₁₂ (cobalamin) were also estimated by methods already described (Abst. 369, Vol. 24); nicotinic acid, vitamin B₁₂ and inositol were more variable than was previously thought. It is stated that the processes now in use reduce riboflavin, pantothenic acid and cystine, but not nicotinic acid, methionine or tryptophan.

Estimations of true protein with Cu, rate of digestion with pepsin, and free fatty acids and peroxide value of oil are suggested as useful criteria of quality and promptness of processing.

W. M. Deans.

See also Absts. 4660, 4676.

Fish

4717

NIKKILÄ, O. E. and LINKO, R. R. Paper-electrophoretic analysis of protein extracted at low ionic strength from fish skeletal muscle. *Biochem. J.*, 1955, 60, 242-247. [Dept. Biochem., Univ. Turku, Finland.]

The paper-electrophoretic diagrams of muscle extracts from 10 different fishes were similar in their main features but differed in detail. The diagrams from pike muscle extract analysed electrophoretically in free solution and on paper were similar. The electrophoretic properties and the proportions of different fractions of pike muscle extract obtained by ethanol precipitation were examined.—A. Hepburn.

4718

TEIXEIRA E SILVA, H. M. Composição química e valor nutritivo dos principais pescados marítimos encontrados no mercado de São Paulo. [Chemical composition and nutritive value of the principal sea fish found in the market of São Paulo.] *Bol. Indúst. animal, São Paulo*, 1954, 14, 141-152. English summary.

Chemical composition and energy value of 14 kinds of sea fish sold in the market of São Paulo at different seasons were studied. Moisture, protein, fat and mineral content and energy value are tabulated for each species.—D. Duncan.

N.A. and R., October 1955

4719

WIERZCHOWSKI, J. and KASIŃSKI, W. Metodyka badań i ocena wartości kalorycznej najpospolitszych krajowych konserw rybnych. [A method for testing and evaluating the energy value of the most common Polish canned fish products.] *Rocz. Państwowego Zakł. Hig.*, 1955, 6, 75-84. Russian and English summaries.

Analysis of 6 canned fish products showed that eels in oil had the highest energy value, 425 Cal. per 100 g., followed by sprats in oil 350 Cal., Baltic cod in oil 244 Cal., pickled herring 174 Cal., mackerel in tomato sauce 139 Cal. and perch in tomato sauce 65 Cal. (From summary.)

J. S. Thomson.

4720

JONES, N. R. The free amino acids of fish. 1. Methylhistidine and β -alanine liberation by skeletal muscle anserinase of codling (*Gadus callarias*). *Biochem. J.*, 1955, 60, 81-87. [Torry Res. Stat., Aberdeen.]

4721

LOVE, R. M. The expressible fluid of fish fillets. 1. Nucleic acid as an index of cell damage in fillets frozen on both sides.

BANKS, A. 2. Method of determination.

LOVE, R. M. 3. Nucleic acid from unfrozen cod under various conditions. *J. Sci. Food. Agric.*, 1955, 6, 30-37; 282-286; 287-292. [Torry Res. Stat., Aberdeen.]

See also Absts. 5480, 5767.

Other Types

4722

BACHSTEZ, M. and BUSTAMANTE, M. S. Beiträge zur Kenntnis mexikanischer Drogen, Pflanzen und Nahrungsmittel. 16. Verteilung der Aminosäuren im essbaren Anteil der Krabbe (*Peneus setiferus* L.) [Mexican drugs, plants and foods. 16. Distribution of amino-acids in the edible part of the prawn *Peneus setiferus*, L.] *Ztschr. Lebensmittel-Untersuch. Forsch.*, 1955, 100, 266-269. [Lab. Carlo Erba, Mexico.]

In 285 g. of prawns identified as *Peneus* [*Penaeus*?] *setiferus*, there was 65 per cent. of edible matter and 16.9 per cent. of chitin. The composition of the flesh was water 81.4, ash 1.1, ether extract 0.16 and protein 16.89 per cent., and in mg. per 100 g., Ca 70, P 198, vitamin B₁ 0.05, riboflavin 0.07 and nicotinamide 1.64.

A hydrolysate free from fat, ash and water contained, in percentage of total N, ammonia 7.67, arginine 21.02, cystine 0.56, histidine 5.64, lysine 11.39, proline and hydroxyproline 5.54 and other amino-acids 44.30.—D. Duncan.

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4723

MILLER, C. D., PEN, F. and GATTY, H. Nutritive value of the palolo. *Federation Proc.*, 1955, 14, 445. *Proc.* [Dept. Foods Nutrit., Univ. Hawaii Agric. Exp. Stat., Honolulu.]

FOODSTUFFS OF VEGETABLE ORIGIN

General

4724

NAVIA, J. M., LÓPEZ, H., CIMADEVILLA, M., FERNÁNDEZ, E., VALIENTE, A., CLEMENT, I. D. and HARRIS, R. S. Nutrient composition of Cuban foods. 1. Foods of vegetable origin. *Food Res.*, 1955, 20, 97-113. [Lab. Fund. Invert. Méd. Nutric., Habana, Cuba.]

The results of analysis of 115 representative samples of some 50 cereals, vegetables and fruits of Cuba for moisture, ether extract, crude fibre, N, ash, Ca, P, Fe, carotene, vitamin B₁, riboflavin, nicotinic acid, ascorbic acid, tryptophan, methionine and lysine are tabulated, with botanical and Spanish names. The methods used were generally those of Munsell *et al.* (Absts. 1900, Vol. 19; 1543, Vol. 20), so that comparison can be made with values for Central America. Descriptions of the plants and some native names are included. The sweetsop (*Annona squamosa*, L.) had 0.13 mg. vitamin B₁ and 0.16 mg. riboflavin per 100 g. fresh material, more than most fruits, and 3.61 mg. Fe. Arracacha (*Arracacia xanthorrhiza*, Bancr.), a starchy root vegetable, had a high nicotinic acid content, 5.3 mg.; another good source was one of the egg plants (*Porteria campechiana*, Bachni), which also had 58.1 mg. ascorbic acid per 100 g.—W. M. Deans.

4725

FLOCH, H. and GÉLARD, A. Valeur alimentaire de produits guyanais. [Food value of products of French Guiana.] *Arch. Inst. Pasteur Guyane franç. Publ.* No. 335, August 1954, pp. 7.

Data are tabulated for energy, protein, fat, fibre, ash, Fe, Ca and P contents of 9 vegetable products either used as foods or potentially valuable as such in French Guiana. Notes are given on their use.

D. Harvey.

4726

PIEKARSKA, J. Zastosowanie bomby kalorymetrycznej do oznaczania wartości energetycznej warzyw. [The use of bomb calorimetry for estimating the energy value of vegetables.] *Rocz. Państwowego Zakł. Hig.*, 1955, 6, 39-46. [Zakł. Hig. Żywnienia A.M., Warsaw.] Russian and English summaries.

The energy value of locally grown vegetables was estimated by bomb calorimeter and the results were compared with net physiological values quoted in foreign tables and obtained from chemical

analysis. From the relationship between these a coefficient was ascertained and applied with fair accuracy to the estimation of the net energy value of different species of vegetables. (From summary.)—J. S. Thomson.

4727

CERELIO SANTALÓ, R. El ion K + y los glucidos y protidos intracelulares. [The K + ion and intracellular carbohydrates and proteins.] *Rev. clín. española*, 1955, 57, 87-90. English, German and French summaries.

Cereals, legumes and vegetables, but not fruit, exhibited a positive linear correlation between energy value and K content, and also between N and K content.

General relations between energy and protein metabolism and cell K in both plants and animals are discussed.—D. Duncan.

See also Absts. 4988, 5022, 5988.

Cereals

4728

HUTCHINSON, J. B. and MARTIN, H. F. The chemical composition of oats. 1. The oil and free fatty acid content of oats and groats. 2. The nitrogen content of oats and groats. *J. Agric. Sci.*, 1955, 45, 411-418; 419-427. [Res. Assoc. Brit. Flour-Millers, St. Albans.]

1. Values are tabulated and analysed statistically for the oil content (extracted with light petroleum, b.p. 40° to 60° C.) of the kernel and whole grain of 10 varieties of spring oats from 22 centres (trial stations of the National Institute of Agricultural Botany and farms in England and Scotland, some represented in more than one season) and 4 varieties of winter oats from 46 centres, and for the free fatty acids of the kernel oil of the same varieties from a smaller number of centres. A special study was made of the oil content of the kernel of Victory oats (174 samples). Another table gives the average oil content of groats from 44 varieties of spring oats and 10 varieties of winter oats.

It was concluded that the oil content may range from 3.5 to 8.0 per cent. on a dry basis, and depends mainly on variety and kernel content (the latter itself a varietal characteristic), though there were indications of slight environmental effects. About 90 per cent. of the oil comes from the kernel, the oil content of which may range from 4 to 11 per cent., with a considerable range within variety. The range was from 5.2 to 7.0 and from 5.9 to 7.3 per cent. for samples of Victory oats from England and Scotland, respectively. The difference was much smaller than is generally supposed by millers and farmers. Acid hydrolysis of the kernel released also about 2.5 per cent. of more complex fatty material. Oat husks contained

under 1 per cent. of oil and about 1 per cent. of complex material. The oil content of groats ranged from 5.0 to 10.1 per cent. according to variety.

The fatty acid content of kernel oil ranges from 3 to 10 per cent. in sound grain and depends much more on environment, including harvest and storage conditions, than on variety.

2. Nitrogen was estimated by the Kjeldahl method in the above samples and others. Values for N content of the kernel, which contains about 95 per cent. of the total N of the grain, are tabulated for 10 varieties of spring oats from 22 centres and 4 varieties of winter oats from 50 centres; some data for newer varieties are included and, finally, N content of the whole grain is given for 20 varieties.

The N content of oat kernels may range from 1.4 to 3.9 per cent. Differences between varieties exist but are much less than those due to environment, and it is suggested that the main factor is the amount of available N in the soil in late spring and early summer. Little difference was found between spring oats and winter oats. For Victory oats grown in England (127 samples) and Scotland (92 samples) the ranges and means were 1.72 to 3.44, 2.43 \pm 0.34 and 1.69 to 2.72, 2.07 \pm 0.22 per cent., respectively. Oat husks contained only about 0.3 per cent. N. When varietal differences were eliminated, a high negative correlation was found between N content and oil content of oat kernels. A smaller negative correlation between N content and kernel weight is ascribed to the tendency in certain drier localities for the oats to ripen before they are fully developed.

W. M. Deans.

4729

SIMS, H. J. The protein content of wheat varieties grown in standard plots and spaced rows. *J. Austral. Inst. Agric. Sci.*, 1955, 21, 38-39. [Dept. Agric., Melbourne, Victoria.]

Although the protein content of a number of wheat varieties was greater when they were grown in rows 14 in. apart than in trial plots of 1/40 acre, the correlation between the results was sufficiently high ($r = +0.89$) to justify the common practice of selecting for protein content from hybrids grown in rows.—W. M. Deans.

4730

BRESSON, C. R. and BARMORE, M. A. Viscosity vs. protein and ash content of western wheat varieties. *Cereal Chem.*, 1955, 32, 144-152. [W. Wheat Quality Lab., Dept. Agric. Chem., Washington Agric. Exp. Stat., State Coll. Washington, Pullman.]

See also Abst. 5534.

Roots

- 4731
BETTELHEIM, F. A. and STERLING, C. **Factors associated with potato texture. 1. Specific gravity and starch content. 2. Pectic substances.**
STERLING, C. and BETTELHEIM, F. A. **3. Physical attributes and general conclusions.** *Food Res.*, 1955, 20, 71-80; 118-129; 130-137. [Dept. Food Technol., Univ. California, Davis.]
A study of 10 varieties.

Leafy Vegetables

- 4732
SYNGE, R. L. M. and WOOD, J. C. **A new free amino acid in cabbage.** *Biochem. J.*, 1955, 60, xv-xvi. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Legumes

- 4733
KOLOUSEK, J. and COULSON, C. B. **Plant proteins. 2. Amino-acid content of the seed protein of *Trigonella foenum graecum* L. and of the seed protein and thallus protein of *Galega officinalis* L.** *J. Sci. Food Agric.*, 1955, 6, 203-206. [Agrobiochem. Lab., Fac. Agric., Technická 1903, Prague 19.]

The methods of protein extraction and routine analysis were as before (Abst. 2907, Vol. 24); amino-acids were estimated by a rapid method of 2-dimensional chromatography described elsewhere (*J. Sci. Food Agric.*, in the press).

The proteins of galega or goat's rue (*Galega officinalis*, L.), a leguminous plant which contains a poisonous substance and is of uncertain feeding value, do not seem to have been studied before. Galega thallus contained 14.8 per cent. crude protein on a dry basis and galega seed 40.7 per cent., but much of the N could not be isolated as protein; 56 and 70 per cent., respectively, of the total organic N was in the alkali-soluble fraction. In fenugreek (*Trigonella foenum graecum*, L.) seed, on the other hand, protein N formed 47 per cent. of the total N.

The approximate amino-acid composition of the protein of fenugreek seed, galega seed and galega thallus, respectively, was as follows: aspartic acid 9, 4, 5, glutamic acid 9, 10, 5, serine 6, 11, 6, glycine 9.5, 8.7, 6.9, threonine 5, 7, 10, alanine 5.9, 3.6, 7.3, tyrosine 3, 5, 2, histidine 1.1, 5.7, 2.4, lysine 8.0, 5.6, 7.9, arginine 8.0, 5.4, 5.5, phenylalanine 1, 8, 3, leucine 11, 11, 16, proline 1, 4, 4, valine plus methionine 6, 12, 19. The seed proteins show no preponderance of one or two amino-acids.—W. M. Deans.

- 4734
FAROOQ, M. O. and SALEEM SIDDIQUI, M. **Chemical investigation of the seed-oil of *Leucaena glauca*,**

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Benth. *J. Amer. Oil. Chem. Soc.*, 1954, 31, 8-9. [Muslim Univ., Aligarh.]

Palmitic, stearic, behenic, lignoceric, oleic and linoleic acids formed 12.74, 5.01, 3.64, 0.67, 23.63 and 54.3 per cent., respectively, of the total fatty acids excluding unsaponifiable matter, in the seed oil of *Leucaena glauca*, Benth., an Indian leguminous tree of which the seeds and leaves are used as cattle feed.—A. Hepburn.

Fruits

See also Abst. 5023.

Other Types

- 4735
DALE, A. P. and MEARA, M. L. **The component fatty acids and glycerides of coconut oils.** *J. Sci. Food Agric.*, 1955, 6, 162-166. [Univ. Liverpool.]

Three samples of coconut oils of Indonesian, Solomon Islands and Ceylonese origin were analysed for component fatty acids by the ester fractionation technique. The percentages, by weight, of each acid were, respectively: caproic 0.2, 0.3, nil; caprylic 7.7, 8.1, 7.3; capric 9.7, 8.1, 7.5; lauric 45.0, 46.3, 47.8; myristic 18.0, 17.4, 18.9; palmitic 8.4, 8.6, 7.6; stearic 3.7, 2.0, 2.5; arachidic nil, 1.5, 0.4; oleic 5.8, 5.5, 6.3; linoleic 1.5, 2.2 and 1.7. These data show that the composition of coconut oil does not vary appreciably in widely scattered regions. Systematic crystallisation of the oils from acetone followed by ester fractionation revealed a very complex mixture of mixed triglycerides; only 2 components, myristodilaurin and lauromyristopalmitin, occurred to the extent of over 10 per cent.—G. A. Garton.

- 4736
DALE, A. P. and MEARA, M. L. **The component fatty acids and glycerides of palm-kernel oil.** *J. Sci. Food Agric.*, 1955, 6, 166-170. [Univ. Liverpool.]

Ester fractionation showed a specimen of palm kernel oil to consist of the following fatty acids: caprylic 2.4, capric 3.7, lauric 45.2, myristic 18.6, palmitic 8.5, stearic 2.5, arachidic 1.9, oleic 15.1 and linoleic 2.1 per cent. by weight. The major component glycerides were shown to be myristodilaurin 27.2, caprolauro-olein 12.2 and lauro-myristo-olein 10.6 per cent.—G. A. Garton.

- 4737
TAYEAU, F., FAURE, F., SÉCHET-SIRAT, J. and LÉVY, G. **Sur la valeur alimentaire des protéines de la graine de soumpe (*Balanites aegyptiaca* Del.). [Food value of the proteins of Egyptian balsam seed (*Balanites aegyptiaca*, Del.).]** *C. R. Acad. Sci.*, 1955, 240, 1481-1483.

From the seeds of the edible fruit of Egyptian balsam (*Balanites aegyptiaca*, Del.), a tree of the Simarubaceae family which grows in tropical regions, notably French West Africa, an excellent oil is obtained, and the residual cake contains about 50 per cent. protein. Chromatography of an acid hydrolysate of the protein indicated that it contained the following percentages of amino-acids: aspartic acid 19, glutamic acid 25, glycine 17.3, alanine 1.5, valine 2.5, serine 9.5, proline 2, threonine 2. The following were found by chemical methods: cystine 1.8, methionine 1.7, phenylalanine 2.9, tyrosine 1.8, tryptophan 0.9, histidine 1.8, arginine 4.5, lysine 5.2, and leucine 3.8, isoleucine 2.8 were found by the microbiological method of Lévy and Polonovski (*Bull. Soc. Chim. biol.*, 1952, 34, 221). The percentage digestibility of the protein was 47, slightly less than that of groundnut protein. Although the seed protein is low in methionine, isoleucine, lysine, threonine, valine and tryptophan, it may serve as a useful protein supplement to the diet, since the tree grows in regions where protein is scarce.—W. M. Deans.

4738

WHITE, P. L., ALVISTUR, E., DÍAS, C., VIÑAS, E., WHITE, H. S. and COLLAZOS, C. Nutrient content and protein quality of quinoa and cañihua, edible seed products of the Andes Mountains. *J. Agric. Food Chem.*, 1955, 3, 531-534. [Dept. Nutric., Minist. Salud Pub. Asist. Soc., Lima.]

Quinoa (*Chenopodium quinoa*) and cañihua (*C. pallidiculae*) are widely grown in the Andes. For their seeds analytical data corrected to 12 per cent. moisture are, respectively, per 100 g., protein (N \times 6.25) 11.0, 14.1; ether extract 5.3, 4.1; fibre 4.9, 10.7; ash 3.0, 4.6 g., and Ca 131, 126; P 424, 461; Fe 6.8, 18.8; vitamin B₁ 0.52, 0.78; riboflavin 0.31, 0.55; nicotinic acid 1.60, 1.34 mg. Except for phenylalanine, which is lower, they are similar to wheat in their contents of essential amino-acids.

The results of 3 types of feeding experiment with rats indicated that both by themselves and in comparison with dried skimmed milk powder the seeds had high feeding value. In the districts in which they are produced they would be valuable additions to the vegetarian diets of the Indian population.—D. Harvey.

4739

WIGGINS, L. F. and WILLIAMS, J. H. Amino acid content of West Indies sugar cane. *J. Agric. Food Chem.*, 1955, 3, 341-345. [Dept. Sugar Chem. Technol., Imp. Coll. Trop. Agric., Trinidad, B.W.I.]

Sugar cane juice contained 11 amino-acids. The total content decreased with maturity, but drought

caused a marked increase, and a less pronounced increase in sucrose. Quantitative differences between varieties may have been due to environmental conditions such as availability of water. Sugar cane leaves contained the same amino-acids, but most of the nitrogen was in protein form.

A. Hepburn.

4740

HOLDT, M. M. V., LIGTHELM, S. P. and NUNN, J. R. South African seaweeds: seasonal variations in the chemical composition of some Phaeophyceae. *J. Sci. Food Agric.*, 1955, 6, 193-197. [Nat. Chem. Res. Lab., S. African Council. Sci. Indust. Res., Pretoria.]

Seasonal variations in the composition of 3 brown seaweeds (*Echlonia maxima*, *Laminaria pallida* and *Bifurcaria brassicaeformis*) from 3 places on the Cape Peninsula are shown graphically and in tables. Organic N was very constant. Mannitol in the fronds tended to be higher in winter than in summer. Little laminarin was found except in the fronds of *E. maxima* and it also was higher in winter than in summer. Alginic acid in the fronds of *E. maxima* and *L. pallida*, on the other hand, was higher in summer than in winter. Ash in these species had a maximum in mid-winter (June); that of *B. brassicaeformis* fluctuated irregularly. The variations do not follow the regular patterns found in Scotland, possibly owing to the more constant sea temperature and light intensity in South Africa.

W. M. Deans.

4741

PASCHKE, R. F. and WHEELER, D. H. The unsaturated fatty acids of the alga Chlorella. *J. Amer. Oil Chem. Soc.*, 1954, 31, 81-85. [General Mills, Inc., Minneapolis, Minn.]

Chlorella contained 12.4 per cent. lipid on a dry weight basis. Only half of this was fatty acids, about 80 per cent. of which were unsaturated, 25 per cent. being C₁₆ and 53 per cent. C₁₈. C₁₈ diene and triene, 11 and 34 per cent., appeared to be mainly linoleic and linolenic acids.—A. Hepburn.

See also Absts. 4565, 4766.

Pasture, Hay and Silage

4742

REITH, J. W. S. Effects of calcic and magnesian liming materials on the calcium and magnesium contents of crops and pasture. *Empire J. Exp. Agric.*, 1954, 22, 305-313. [Macaulay Inst. Soil Res., Aberdeen.]

The 2 types of lime applied at from 1 to 2 tons per acre had little effect upon the Ca or Mg content of the root portion of mangold, fodder and sugar beet, swede or turnip, or on kale stems or barley and oat grain. Magnesian limestone increased the Mg content of the root tops, kale leaves and cereal straw, and doubled the Mg content of hay,

N.A. and R., October 1955

also raising Ca by about 20 per cent. Over a 3-year period there was a mean increase in the Mg content of mixed herbage of 55 per cent. over the no-lime or ground limestone treatments, but little effect on Ca. Mg and Ca contents of pasture showed a 60 to 100 per cent. variation during the growing season, rising from the lowest point in mid-May to the highest level during the period August to October.—J. L. Corbett.

4743

WALKER, T. W., ADAMS, A. F. R. and ORCHISTON, H. D. The effects and interactions of sulphur, phosphorus, and molybdenum on the growth and composition of clovers. *N.Z. J. Sci. Technol.* [A], 1955, 36, 470–482. [Canterbury Agric. Coll., Lincoln.]

Trials with CaSO_4 on poor sandy and silty loams in the Canterbury foothills, mainly at altitudes of 1400 ft., showed that S, with P, is necessary for establishment and growth of clover except on one soil where gypsum reduced the clover yield. This effect is attributed to increased Mn uptake and consequent Mn—Mo antagonism, Mo being necessary for N fixation. Thus trials of P fertilisers should include studies of the content of S, which is most needed during the phase of organic matter accumulation under pasture. Applications of 4 oz. Na molybdate per acre had no effect on first-year clover growth but increased Mo in the herbage to levels possibly hazardous for grazing animals.

J. L. Corbett.

4744

MITCHELL, R. L. Trace elements in some constituent species of moorland grazing. *J. Brit. Grassland Soc.*, 1954, 9, 301–311. [Macaulay Inst. Soil Res., Craigiebuckler, Aberdeen.]

Results are given of an extensive investigation of the trace element content of hill grazing in 2 areas in Sutherland from 1946 to 1948, during which period herbage was sampled 10 times. In addition samples of *Narthecium ossifragum*, *Carex panacea*, *Anthoxanthum odoratum*, *Scirpus caespitosus*, *Molinia caerulea* and *Calluna vulgaris* were analysed. The trace elements investigated spectrographically were Co, Mo, Fe, Mn, Zn, Pb, Sn, Cu, Ti, Ba and Sr.—J. S. Thomson.

4745

PRICE, N. O., LINKOUS, W. N. and ENGEL, R. W. Minor element content of forage plants and soils. *J. Agric. Food Chem.*, 1955, 3, 226–229. [Virginia Agric. Exp. Stat., Blacksburg, Va.]

From 2 counties of Piedmont, Virginia, 88 samples from 4 types of soil and 153 samples of forages from the same localities, mainly alfalfa and lespedeza, were analysed for B, Co, Cu, Mn, Mo and Zn. B was estimated by the quinazalin method of Berger and Truog (Abst. 3952, Vol. 9),

Co by the method of Beeson (*J. Assoc. Off. Agric. Chem.*, 1953, 36, 405), Cu, Mn and Zn by A.O.A.C. methods and Mo by the method of Evans *et al.* (Abst. 4659, Vol. 20) for plants and that of Robinson (*Soil Science*, 1948, 66, 317) for soils. The results are tabulated and show great variations for soils, less marked but still considerable variations for plants. There was a tendency for high soil values to be associated with high plant values, but in only one instance, Co content of alfalfa grown on one particular soil type, was the correlation highly significant. The results are discussed in conjunction with the literature on the requirements of grazing animals and it was concluded that forages in the region studied contain adequate amounts of the trace elements, except in a few areas where they are low in Co and Cu.—W. M. Deans.

4746

BASSETT, E. G. and WHITE, E. P. Oestrogens and New Zealand dairy pastures. *N.Z. J. Sci. Technol.* [A], 1955, 36, 485–492. [Ruakura Animal Res. Stat., Dept. Agric., Hamilton.]

The literature is briefly summarised. To test the idea that the stimulation of milk production by spring pasture may be due to oestrogens, samples were taken by the frame method weekly from August to December from 2 adjacent paddocks each used by 50 cows, one grazed rotationally and the other as night paddock. Extracts made by a modification of Robinson's method for subterranean clover (Abst. 3133, Vol. 19) were tested by the method of Evans *et al.* (*Endocrinology*, 1941, 28, 747); 4 mice each had the equivalent of 7 g. pasture, wet weight. Grasses, clover and other leguminous plants, and weeds, 31 species in all, were also tested separately.

No oestrogen was found in any sample of pasture or in individual species; but samples of subterranean clover in early flowering and flowering stages from another locality did show activity, and the leaves of red clover were almost as potent, though 6 ewes grazed on a red clover sward were successfully mated (*ibid.*, p. 437).

The lactation curves of the 2 groups of cows showed peaks of production clearly coinciding with the different periods of lush growth in the 2 paddocks, and the suggestion is made that the sudden change in feed may stimulate the ovaries of the animals themselves to produce additional oestrogens. A sudden increase in teat length of calves associated with a sudden flush of grass is also reported, though again no oestrogen could be detected in the grass.—W. M. Deans.

4747

HARTFEL, W. Der Einfluss von Natrium- und Kaliumdüngung auf den Mineralstoffgehalt von Futterpflanzen. [Effect of fertilising with sodium and potassium on the

mineral content of fodder plants.] *Arch. Tierernährung*, 1955, 4, 349-356. [Inst. Tierzucht, Univ. Bonn.]

There is evidence that animal diseases, notably grass tetany of cattle, may arise from a faulty K:Na ratio in feed or pasture. Preliminary experiments with oat and ryegrass seedlings in pots showed that Na content and K content could be raised by fertilising with Na or K sulphate. Adding Na did not affect K content, and vice versa. There were indications that K was favourable to Ca uptake and Na unfavourable. In larger pots, yield was better with K or a mixture of Na and K than with Na, and adding Na slightly reduced K content and vice versa. Similar but less marked results were obtained from a plot experiment with 4 replicates of 12 treatments. Work is continuing. W. M. Deans.

4748

PHILLIPS, T. G., SULLIVAN, J. T., LOUGHLIN, M. E. and SPRAGUE, V. G. Chemical composition of some plant grasses. 1. Changes with plant maturity. *Agronom. J.*, 1954, 46, 361-369. [New Hampshire Agric. Exp. Stat., Durham.]

4749

SQUIBB, R. L., MÉNDEZ, J., GUZMÁN, M. A. and SCRIMSHAW, N. S. Ramie—a high protein forage crop for tropical areas. *J. Brit. Grassland Soc.*, 1954, 9, 313-322. [Inst. Agropecuario Nac., Guatemala.]

Samples of ramie (*Boehmeria nivea*) cut when the plant had grown to a height of 5, 10, 15, 20, 25, 30 and 35 in. were analysed for total nitrogen, ether extract, crude fibre, carotenoids, ascorbic acid, some minerals, members of the vitamin B complex and amino-acids. Vitamin A and carotenoids in ramie meal were also investigated by chick growth and blood tests. The plant was high in crude protein, which decreased slightly as the height increased. Crude fibre followed an opposite trend. P and ascorbic acid declined throughout the growing period. Fe and carotenoids declined till the plant had grown to a height of 25 in. and then remained constant. The variations in components of the vitamin B complex were not related to the stage of growth. Lysine decreased till 25 in. and then remained constant, tryptophan decreased constantly and methionine decreased till 20 in. and then increased to above the initial levels at 35 in. The trials with ramie meal showed that it was a good source of vitamin A and carotenoids. Ramie as a forage crop compares favourably with

alfalfa, particularly in the tropics, where it is more suited to the climate and conditions.—T. D. Bell.

4750

ULVESLI, O. Kvaliteten av høyavlinga 1954. [Quality of hay harvested in 1954.] *Forskning og Forsøk Landbruken*, 1955, 6, 79-89. [Norges Landbruks Høgskole.] English summary.

Data are given for the composition in terms of crude botanical composition, dry matter, protein, fibre, digestibility in 10 tests with 5 samples, computed feeding value, Ca, P and carotene, of 3 samples of hay from East and 1 each from West Norway and Trøndelag. The results are not considered to be representative of Norwegian hay, but since the samples are taken year by year from the same farms in the same way, they throw some light on year to year variations.—I. Leitch.

4751

SUTOH, H. [Biochemical studies on silage. 12. On the evaluation of quality (2). Correlation between the pH value and various factors.] *Bull. Educat. Res. Inst., Kagoshima*, 1954, 6, 183-190. English summary.

For previous parts see Abst. 309, Vol. 25.

See also Absts. 4625, 4692, 4797, 4838, 5765, 5815.

MISCELLANEOUS

4752

GOLDSCHMIDT, S. and BURKERT, H. Über das Vorkommen einiger in Bienenhonig bisher unbekannter Zucker. [On the occurrence in honey of some hitherto unknown sugars.] *Hoppe-Seyler's Ztschr.*, 1955, 300, 188-200. [Inst. Org. Chem., Tech. Hochsch., Munich.]

A honeydew honey contained glucose 31.4 and fructose 33 per cent. Paper chromatography of a concentrated solution, by methods described, showed the presence of appreciable quantities, from 0.5 to 2 per cent., of maltose, isomaltose, and the trisaccharides raffinose and kestose, and traces of sucrose, erlose, melezitose (reported by other workers to occur in quantity in this type of honey), dextrantriose, 4-glucosyldextrantriose and a higher carbohydrate of dextrin type. Results for 2 ordinary honeys were similar but in 3 others the higher sugars were not detected. In winter honey derived from sugar syrup, only sucrose, maltose, isomaltose and erlose were found. It is believed that sucrose, kestose, melezitose and raffinose come from the nectar but that maltose, isomaltose, erlose and dextrantriose arise from transglucosidation in the bee's body.—W. M. Deans.

3. VITAMINS

GENERAL

4753

MARTEN, G. Ein Beitrag zur quantitativen Auxanographie von Vitaminen. [Quantitative auxanography of vitamins.] *Naturwissenschaften*, 1954, 41, 576-577. [Anst. Vitaminforsch., Potsdam-Rehbrücke.]

An improvement is described in the method of estimating vitamins by a combination of paper chromatography with microbiological tests. Instead of ordinary ascending or descending chromatography on strips, circular paper chromatography was used and narrow radial strips cut from the chromatograms were applied to the culture medium. Comparisons with a standard mixture were made as in the cup-plate test. A figure illustrates the separation of nicotinic acid and nicotinamide by means of *Torula cremoris*, and demonstrates the avoidance of tailing.—W. M. Deans.

4754

GREENE, R. D., SCHAEFER, A. E. and SLOCUM, A. Utilization of topically applied riboflavin, thiamine, calcium pantothenate, pyridoxine and vitamin D. *Federation Proc.*, 1955, 14, 435. *Proc.* [Squibb Inst. Med. Res., E. R. Squibb and Sons, Div. Olin Mathieson Chem. Corp., New Brunswick, N.J.]

4755

QUATTRIN, N., JACOPO, G. and BRANCACCIO, A. Vitamine e metabolismo dei sulfamidici. [Vitamins and sulphonamide metabolism.] 1. Comportamento del tasso sulfamidico in liquidi e tessuti di cavia dopo carico con vitamine del gruppo B e C. [1. Sulphonamide values in body fluids and tissues of guineapigs after administration of vitamins of the B group and vitamin C.] 2. Sull'acetilazione dei sulfamidici dopo carico con vitamine del gruppo B e C. [2. Acetylation of sulphonamides after administration of vitamins of the B group and vitamin C.] *Acta vitaminol.*, 1955, 9, 17-23; 51-56. [Ist. Semeiotica Med., Univ. Naples.] French, English, German and Spanish summaries.

1. Groups of guineapigs were injected subcutaneously with doses of about 500 mg. per kg. bodyweight of sulphacetamide, sulphisoxazole or sulphone N-acetate. The concentration of the drugs, total and in the free state, was estimated in the body fluids and tissues of animals not given, or given half an hour later, an injection of one of 6 vitamins. The animals were killed 1½ hr. after

the injection of the drug. There was some increase in the concentration of sulphacetamide and of sulphone N-acetate after administration of pyridoxine or panthenol or ascorbic acid; particularly marked was the effect of pyridoxine, which increased the concentration of both drugs, total and free, in the lungs, liver, kidneys, brain, blood and urine. In the bile there was an increase with pyridoxine in the concentration of sulphacetamide but not of sulphone N-acetate. There was little effect of any vitamin on the concentration of sulphisoxazole, or of vitamin B₁, riboflavin or nicotinamide on the concentration of the other 2 drugs.

2. With the same technique, the effect on acetylation of the same 3 substances was tested with the same vitamins. By the action of riboflavin and pyridoxine some increase was caused in the acetylation of sulphone N-acetate, very little in that of sulphacetamide and none in that of sulphisoxazole, but the result was not conclusive.

E. M. Hume.

4756

PESCE, G. and ROSSI, O. L'attività contrattile esofagea in alcune avitaminosi sperimentali. [The capacity of the oesophagus to contract in certain experimental vitamin deficiencies.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1709-1711. [Clin. Otorinolaring., Ist. Fisiol., Univ. Genoa.]

4757

HERXHEIMER, H. Protection against anaphylactic shock by various substances. *Brit. J. Pharmacol. Chemotherap.*, 1955, 10, 160-162. [Surg. Unit, University Coll. Hosp. Med. Sch., London.]

No protection against anaphylactic shock from exposure to an antigenic aerosol was conferred on guineapigs by intramuscular injection, per kg. bodyweight, of 10 or 20 mg. ascorbic acid or of 0.05 or 1.0 mg. cyanocobalamin. Other substances, all drugs, were tested in the same way.

E. M. Hume.

4758

BUTTURINI, U. and CASA, G. Modificazioni indotte dall'acido ascorbico, dal tocoferolo e dal bleu di metilene sugli anticorpi antistreptolisini. [Modifications produced by ascorbic acid, tocopherol and methylene blue on antistreptolysin antibodies.] *Acta vitaminol.*, 1955, 9, 65-69. [Ist. Patol. Spec. Med., Univ. Bologna.] French, English, German and Spanish summaries.

Groups of 2 or 3 guineapigs were given a single injection of O-Streptolysin, while at the same time being given daily intramuscular injections of wheat germ oil or α -tocopherol or methylene blue or vitamin C. The titre of antistreptolysin in the blood was estimated up to the 9th day after the injection of streptolysin. The formation of antistreptolysin was inhibited or greatly reduced in most of the animals treated with vitamin E or C or methylene blue. When α -tocopherol was given after a high titre of antistreptolysin had been established, the titre was immediately reduced to nil.—E. M. Hume.

4759

HILL, C. H., GARREN, H. W., KELLY, J. W. and BARBER, C. W. Influence of high levels of vitamins on resistance of chicks to fowl typhoid. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 535-537. [Dept. Poultry Sci., North Carolina State Coll., Raleigh.]

Resistance of 4-week-old chicks to infection with *Salmonella gallinarum* was increased when vitamins were added to the basal diet to give a tenfold excess over requirements. The effects of the vitamin B complex, the fat-soluble vitamins A, D, E and K, and vitamin C were investigated separately but there was no increase in resistance unless all known vitamins were given. Possible explanations of the protective effect of excessive amounts of vitamins are discussed and further studies are planned.—A. M. Copping.

4760

LUCKEY, T. D., PLEASANTS, J. R. and REYNIER, J. A. Germfree chicken nutrition. 2. Vitamin interrelationships. *J. Nutrition*, 1955, 55, 105-118. [Lobund Inst. Res. Life Sci., Univ. Notre Dame, Ind.]

For part 1 see Abst. 1675, Vol. 20.

Groups of germ-free and conventionally reared chicks were given synthetic rations complete or deficient in vitamin B₁, riboflavin, nicotinic acid, biotin, folic acid or vitamin K, and the concentration of the B vitamins in liver and caecum was studied. There was no difference between germ-free and conventionally reared birds in metabolism or requirements of the B vitamins, but the reaction to deficiency of vitamin B₁, riboflavin, nicotinic acid and folic acid was more acute in the germ-free. Birds showing signs of deficiency had in their excreta sufficient vitamins for protection had they been able to utilise them. There was no evidence that microbial synthesis in the caecum was responsible for the presence of the vitamins in the excreta, since they occurred equally in the germ-free and the conventionally reared chicks. Germ-free chicks were able to recover spontaneously from the effects of dietary vitamin K deficiency.—T. D. Bell.

4761

BRÜGEMANN, J., DREPPER, K. and TIEWS, J. Studien über die Verdauungsphysiologie des Schweines. 1. Bilanzuntersuchungen von Calcium, Phosphor, Jod, Vitamin A, Carotin, Vitamin B₁ und Gesamtnikotinsäure an wachsenden Schweinen bei gleichzeitiger Durchführung einer Gesamtnährstoffbilanz. [Physiology of digestion in pigs. 1. Balance experiments with calcium, phosphorus, iodine, vitamin A, carotene, vitamin B₁ and total nicotinic acid in growing pigs with simultaneous total metabolic balance.] *Arch. Tierernährung*, 1954, 4, 133-143. [Inst. Physiol. Tiere, Univ. Munich.]

The pigs were 4 castrated males from 2 litters and at the beginning of the study they were 17 and 19 weeks old. One from each litter was a runt and had a poor appetite, intestinal catarrh, slight pustular dermatitis on the back and thighs and signs of tetany. Two 5-day balance studies were made after preliminary periods of 14 and 9 days, and then, after another 9-day interval, six 2-day balances. On the first of these days a single subcutaneous or intramuscular injection was given of 100 mg. nicotinamide, 10 mg. vitamin B₁, 1.8 g. Ca (as the gluconate) with 1.1 g. P (as Tonophosphanforte), 36,000 I.U. vitamin A, or 764.45 mg. I (as KIO₃).

The initial diet, in g. per head daily, was barley-meal 250 (milo in the third experiment), wheat bran 250, lucerne meal 50 and steamed potatoes to appetite, with 2½ litres skimmed milk as protein supplement. During the 3 balance periods the potatoes were limited to 2, 3 and 4 kg. daily as the pigs grew. They were fed twice daily. The mean weights of the pigs in the 3 balance periods were 30.5, 37.5 and 46.5 kg.

Balance results are given fully in tables. All balances were positive and the unthrifty pigs approached their littermates in weight and condition as the experiment advanced. Retention, as a percentage of intake of crude protein, declined in both members of a pair as the pigs grew. Total digestibility of the ration was less good in the runt pigs to begin with, but almost as good as in the healthy pigs by the last period. Runts retained less Ca, P, phytin P and vitamin B₁ than their littermates. Retention of Ca, P and phytin P increased with growth. Retention of I and carotene was similar in healthy and runt pigs; per kg. bodyweight, I retention fell with age, but carotene retention was steady. Absolute and relative retention of total nicotinic acid increased with growth.

Runts had higher blood sugar and nicotinic acid than normal pigs, but lower blood I.

Injection of nicotinamide increased loss of vitamin A by 5 per cent. Vitamin B₁ increased

excretion of I, but halved that of nicotinic acid and decreased that of Ca by 12 per cent. and loss of vitamin A by from 3 to 9 per cent. Runts excreted less of the injected vitamin B₁. Injection of Ca and P increased loss of vitamin A; vitamin A reduced excretion of nicotinic acid in faeces by 40 per cent. and increased the retention of nutrients generally.

It is concluded that runt pigs have no typical mineral or vitamin deficiency, but a general disturbance of digestion.—D. Duncan.

4762

STEINEGGER, P. and MENZI, M. Versuche über die Wirkung von Vitamin-Zusätzen nach Verfütterung von Adsorbentien an Mastpoulets. [The effect of vitamin supplements after administration of adsorbents to fattening chickens.] *Arch. Geflügelk.*, 1955, 19, 165-176. [Schweiz. Lehr- und Versuchsanst. Geflügelzucht, Zollikofen-Berne.] English summary.

In a preliminary experiment with chicks up to 12 weeks of age, the addition of charcoal or a commercial adsorbent to an adequate practical ration had no significant effect on weight gain or efficiency of feed utilisation. In the third week, however, severe feather-picking and cannibalism occurred in the groups having the adsorbents. In a further experiment, 112 of the chicks which had suffered severe feather-picking were removed from the brooder house into fattening cages and given the basal diet alone, or supplemented with vitamins or charcoal or both or the commercial adsorbent. Feather-picking and cannibalism ceased in all the groups, showing that they were due to environmental conditions and not to diet.

E. M. Cruickshank.

4763

GALICHENKOVA, L. A. [The importance of giving vitamins to horses.] *Konevodstvo*, 1954, 24, No. 12, 19.

VITAMIN A

4764

MORTON, R. A. and BRO-RASMUSSEN, F. Comments on the determination of vitamin A in natural products and especially cod-liver oils. *Analyst*, 1955, 80, 410-418. [Dept. Biochem., Univ. Liverpool.]

The estimation of vitamin A by spectrophotometric methods is discussed in relation to the problems arising out of the presence of neovitamin A₁ and vitamin A₂ as well as of all-*trans*-vitamin A₁ in fish liver oils. Tables are presented of the properties of all-*trans*- and neovitamin A₁ and vitamin A₂ alcohols, and of conversion factors to give aggregate vitamin A activity for mixtures of all-*trans*-vitamin A₁, neovitamin A₁ and vitamin A₂, for solutions in ethanol and cyclohexane. Results are given of analyses at Liverpool and Copenhagen of 3 cod liver oils and 2 richer oils. At Liverpool, vitamin A₂ was estimated by the Carr Price method with correction for neovitamin A₁ by the nine-point correction method of Cama *et al.* (Abst. 4695, Vol. 21). At Copenhagen the method of Bro-Rasmussen *et al.* (see following Abst.) was used for chromatographic separation and estimation of the 3 vitamin A alcohols. It is considered that the two sets of results were in good agreement considering the complexity of the problem.—R. J. Ward.

4765

BRO-RASMUSSEN, F., HJARDE, W. and POROTNI-KOFF, O. Chromatographic separation of vitamin-A-active compounds in cod-liver oil. *Analyst*, 1955, 80, 418-428. [Statens Vitamin Lab., Copenhagen.]

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Neovitamin A, all-*trans*-vitamin A₁ and vitamin A₂ in cod liver oil were separated satisfactorily on a column of specially prepared dicalcium phosphate 50 cm. long and 3 cm. in diameter, and were eluted with a 16:1 v/v mixture of light petroleum and ether and collected in 15-ml. fractions. The spectral absorption curves of the compounds so separated showed good agreement with those for the pure substances obtained from a crystalline neovitamin A preparation, by chromatographic purification from synthetic vitamin A₁, and by chromatographic isolation of vitamin A₂ from carp liver.—R. J. Ward.

4766

LORD, J. W. and BRADLEY, P. M. A modified method for the spectrophotometric determination of vitamin A in margarine. *Analyst*, 1955, 80, 429-438 (with discussion 438-441). [Res. Dept., J. Bibby and Sons, Ltd., Liverpool 3.]

Improvement in the precision of the Carr Price test for estimating vitamin A in margarine was obtained by purifying the unsaponifiable fraction on a column of defatted bonemeal 3 cm. long and 3 cm. in diameter. Light petroleum, b.p. 40° to 60° C., alone or with 5 per cent. ether added, was used to remove pigments, and the vitamin A was removed from the column with acetone. The procedure did not, however, remove substances that had general absorption greatly distorting the absorption band of vitamin A in the ultraviolet region. For estimating vitamin A by its ultraviolet absorption, the unsaponifiable fraction was

subjected to chromatography on a column of defatted bonemeal 25 cm. long and 1 cm. in diameter. The carotene or dye from the margarine was eluted with light petroleum, b.p. 80° to 100° C., and the vitamin A was eluted with light petroleum containing 16 per cent. ether. The eluate was collected in 5-ml. portions and samples were taken from those containing vitamin A, which were identified by testing 0.4-ml. portions of them with the Carr Price reagent. Readings were taken at 315, 325 and 335 m μ . and a simple correction was applied. The method gave results which compared favourably with the official method (*Statutory Instruments*, 1954, No. 613).—R. J. Ward.

4767

SPRUYT, J. P. Accelerated stability test for vitamin A in oils and fats by means of surface-enlarging at room temperature. *J. Amer. Oil Chem. Soc.*, 1955, **32**, 197-200. [Food Products Dept., N.V. Philips-Roxane, Weesp, Holland.]

A rapid test is described for the stability of vitamin A in oils; it reproduced ordinary storage conditions in an accelerated procedure. Rapid oxidation was secured by spreading the oil over glass beads to give a surface about 60 times the original. The progress of oxidation was followed by estimating the vitamin A in the oil at intervals with the SbCl₅ method. About 0.06 g. oil was weighed into a petri dish and dissolved in light petroleum (40° to 60° C.). About 4 g. specially cleaned glass beads of diameter about 2.2 mm. were then added to cover the bottom in a level layer, and the light petroleum was evaporated at room temperature in the dark. Dishes so prepared were kept in an oven at 20° C. for different times. From estimations of vitamin A the time in days was found which the vitamin A content took to fall to 50 per cent. of the original. Halfway values are presented for a number of different oils and synthetic vitamin A preparations. Comparative tests were made with Swift's activated oxygen method, and some striking differences between the methods were found.—I. M. Sharman.

4768

SPRUYT, J. P. Versnelde houdbaarheidsproef door middel van oppervlaktevergroting bij kamertemperatuur voor vitamine A in oliën en tranen. [Accelerated stability test for vitamin A in oils and fats by increasing the surface at room temperature.] *Voeding*, 1955, **16**, 416-429. [Afd. Voeding, N.V. Philips-Roxane, Weesp.] English and French summaries.

See preceding Abst.

4769

YEH, P. Y. Isomerization of β -carotene with sunlight. *Science*, 1955, **121**, 707. [Dept. Chem., Nat. Taiwan Univ., Taipei, Formosa.]

A solution of pure β -carotene in hexane was exposed to mid-day sunlight for 1½ hr. and chromatographed on lime. In addition to neo- β -carotene-B and neo- β -carotene-U, the products included neo- β -carotene-E with maximum light absorption at 480 and 447 m μ .—V. H. Booth.

4770

PAINTER, R. H. and GLOVER, J. Metabolism of carotenoids in the rat: lycopene. *Biochem. J.*, 1955, **60**, xvi. [Dept. Biochem., Univ. Liverpool.]

4771

WALD, G. and BURG, S. P. Crustacean vitamin A. *Federation Proc.*, 1955, **14**, 300. *Proc.* [Biol. Labs., Harvard Univ., Cambridge, Mass.]

4772

HEATON, F. W., LOWE, J. S. and MORTON, R. A. The vitamin A-deficiency syndrome in the rat. *Biochem. J.*, 1955, **60**, xviii. [Dept. Biochem., Univ. Liverpool.]

4773

MOORE, T. and MITCHELL, R. L. Dental depigmentation and lowered content of iron in the incisor teeth of rats deficient in vitamin A or E. *Brit. J. Nutrition*, 1955, **9**, 174-180. [Dunn Nutrit. Lab., Univ. Cambridge.]

Albino and piebald rats were maintained on purified diets lacking in vitamin A or vitamin E. In order to produce chronic vitamin A deficiency small doses of 28 I.U. a week were given as vitamin A acetate. The teeth of the albino rats were almost completely white after 40 days without vitamin E, but in the piebald rats depigmentation was delayed even for 9 months. Deficiency of vitamin A caused depigmentation of the teeth in both strains; the change of colour often appeared after curative doses of vitamin A had been begun and was presumably due to emergence of that part of the tooth which had been formed during the period of deprivation.

The white enamel contained less than from 0.02 to 0.03 per cent. Fe, compared with from 0.07 to 0.27 per cent. in the normal enamel. The content of Fe in the dentine and of Mn in the enamel and dentine was too low for estimation by the method of flame spectrophotometry used.—A. M. Copping.

4774

MIGICOVSKY, B. B. Inhibition of cholesterol formation by rat liver homogenates. *Canad. J. Biochem. Physiol.*, 1955, **33**, 135-138. [Div. Chem., Sci. Serv., Dept. Agric., Ottawa.]

N.A. and R., October 1955

The synthesis of cholesterol by rat liver was measured by incubating homogenates with ^{14}C -acetate, precipitating the cholesterol with digitonin, and measuring the activity of the digitonide in a gas flow counter. No synthesis was detected in homogenates from the livers of rats which had been kept on a diet deficient in vitamin A or starved for 48 hr. and the same homogenates inhibited cholesterol formation when they were added to homogenates from normal livers. The inhibitory power could be demonstrated in both the supernatant and the residual fraction prepared from the abnormal homogenates by centrifuging.

T. Moore.

4775

NICHOLAS, H. J., CRAFA, J., CHUNG, J. W. and ALEXANDER, W. F. Cholesterol level and histopathological changes in the rat brain in hypervitaminosis A. *Federation Proc.*, 1955, 14, 260-261. *Proc. [Central Res. Dept., Anheuser-Busch, Inc., St. Louis, Mo.]*

4776

PLANEL, H., SARDOU, R. and GUILHEM, A. Étude expérimentale de l'action de la vitamine A sur les épithéliums digestifs du rat. [Experimental study of the action of vitamin A on the digestive epithelia of the rat.] *C.R. Soc. Biol.*, 1955, 149, 199-201.

Young rats were killed after being kept for from 45 to 116 days on a diet deficient in vitamin A. Such deprivation did not cause metaplasia in the simple cylindrical epithelium lining the intestines, but in the oesophagus and fore-stomach there was some disturbance in the keratinisation of the lining, which did not amount to metaplasia. Intramuscular injection of 30,000 I.U. vitamin A, given every other day for 80 days, had no effect on the epithelium of the intestinal tract.—T. Moore.

4777

HELGEBOSTAD, A. Eksperimentell A hypervitaminose hos pelsdyr. [Experimental excess of vitamin A in fur animals.] *Nord. Vet.-Med.*, 1955, 7, 297-308. [Norges Vet.-Høgsk., Forsøksgard, Pelsdyr, Heggedal.] English and German summaries.

If a fox was fed on ungutted fish only, it would require 300 or 400 g. daily to cover its protein requirements and that amount would contain from 15 to 20 g. oil, mostly liver oil. With coal-fish that would represent about 3.5 I.U. vitamin A and the question of vitamin A excess does not appear to arise. Yet signs attributed in laboratory animals to poisoning with vitamin A are not uncommon in fur animals.

Experiments are described in which 15 foxes, 3 mink and 2 Siberian mink were given by injection an emulsion with Tween 80 in physiological saline

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of a cod liver oil concentrate or by mouth the concentrate containing 800,000 I.U. vitamin A per g., diluted 1 in 3 with arachis oil.

Both fox and mink tolerated 40 I.U. vitamin A per g. bodyweight daily without disturbance for 3 or 4 months. Fully grown animals could take from 200 to 300 I.U. per g. bodyweight daily for from 6 to 8 weeks but young animals were affected in a shorter time. Signs of excess were anorexia, bone changes with exostoses, decalcification and spontaneous fractures, loss of fur, exophthalmos, cramp and local hyperaesthesia of the skin.

I. Leitch.

4778

Bo, W. J. The effect of ovariectomy on metabolic changes in the uteri of vitamin A deficient rats. *Anat. Rec.*, 1955, 121, 241-249. [Dept. Anat., Coll. Med., Univ. Cincinnati, Ohio.]

Occurrence of uterine metaplasia was confirmed in intact rats which had been reared for about 3 months on a diet deficient in vitamin A. In animals deprived of vitamin A from which the ovaries had been removed, no metaplasia occurred in the undeveloped uterus. The finding may be contrasted with the well established observation that the vagina becomes keratinised during vitamin A deficiency in rats whether the ovaries have been removed or not.—T. Moore.

4779

BIERI, J. G. and EDWARDS, R. J. Effects of octachloronaphthalene on vitamin A metabolism in rat. *Federation Proc.*, 1955, 14, 428. *Proc. [Dept. Biochem. Nutrit., Univ. Texas Med. Branch, Galveston.]*

4780

CLARK, I. and COLBURN, R. W. A relationship between vitamin A metabolism and cortisone. *Endocrinology*, 1955, 56, 232-238. [Merck Inst. Therap. Res., Rahway, N.J.]

The vitamin A content of the livers of rats kept on a stock diet and injected with 3 mg. cortisone daily for 21 days was 307 μg . The mean value for pair-fed untreated rats was 449 μg . and for untreated rats fed to appetite 625 μg . The kidneys of the respective groups contained 5, 10 and 21 μg . vitamin A. The livers of stock rats which were given daily from 500 to 800 "units" of vitamin A and 3 mg. cortisone contained 3790 μg ., pair-fed rats not given cortisone 5386 μg ., and rats fed to appetite and not given cortisone 4508 μg . The vitamin A content of the kidneys of the respective groups was 20, 26 and 35 μg . When male rats were given a diet deficient in vitamin A with 3 mg. cortisone daily the vitamin A content of the liver fell from an initial value of 55 μg . to one of 11 μg . after 13 days. The vitamin A content of the liver

of deprived rats, not given cortisone and fed to appetite, remained constant throughout the 13 days. In a third experiment rats were kept on a deficient diet for 20 days with 3 mg. cortisone daily; rats not given cortisone were pair-weighted as controls. For the last 6 days rats from each group were given 60 μ g. β -carotene daily. The vitamin A content of the liver of the cortisone-treated animals fell from an initial value of 36 μ g. to 0 after 15 days and there was no increase after carotene was given; in the pair-weighted controls it fell from 36 to 3.9 μ g. after 15 days and to 3.5 after 20 days. The carotene content of the livers rose to 12.9 μ g. from an initial value of 6.3 in the cortisone-treated group, and remained constant in the pair-weighted controls.

To study the effect of cortisone on conversion of β -carotene to vitamin A, 4 groups of rats were given 400 μ g. carotene daily; one group was given 3 mg. cortisone daily, one group was pair-weighted to the first group, one group was pair-fed to the first group, and one group was given no cortisone and fed to appetite. After 10 days the total vitamin A content of the livers of rats in the 4 groups, respectively, was 507, 428, 545 and 687 μ g., and after 20 days 717, 724, 776 and 838 μ g. The total carotene content after 10 days was 7.3, 4.3, 5.1 and 4.2 μ g., and after 20 days 11.2, 6.2, 5.5 and 5.2 μ g.

Adrenalectomized rats maintained on a daily dose of 0.5 mg. deoxycorticosterone acetate were given a diet deficient in vitamin A with 100 μ g. carotene 3 times a week for 10 days with or without an injection of 1.5 mg. cortisone daily for 15 days. The animals not given cortisone were pair-weighted to the cortisone group. The total vitamin A in the livers of the rats in the cortisone-treated group was 167 μ g. after 5 days, 101 after 10 days and 64 after 15 days, compared with 167, 156 and 174 μ g. for the pair-weighted controls not given cortisone.—R. J. Ward.

4781

LE GALLIC, P. Précisions nouvelles sur l'activité vitaminique A présentée par les mélanges de caséine et de saindoux dans une ration équilibrée. [New data on the vitamin A activity of mixtures of casein and lard in a balanced ration.] *C.R. Soc Biol.*, 1955, 149, 65-68.

Mice were kept for 37 days on a diet deficient in vitamin A, which contained peptone, starch and dried yeast, and some of them were then given for 4 days a diet containing casein and lard. Livers from such mice were given to rats deficient in vitamin A. From the growth response to 2 livers it was calculated that the liver of mice that had had the diet without lard contained 5 I.U. per liver, but that the livers of those that had had the diet with casein and lard contained 15 I.U. per liver.

Such a content seemed too great to be explained by the presence of vitamin A as such in the lard, and the high value is taken as evidence that a balanced diet containing casein and lard promotes the formation of a chemically unidentified "vitamine A-hormone". (See Absts. 1620, 3345, Vol. 20.)
T. Moore.

4782

WOLF, G., KAHN, S. G. and JOHNSON, B. C. Metabolism of vitamin A-2-C¹⁴ in the rat. *Federation Proc.*, 1955, 14, 306. *Proc.* [Div. Animal Nutrit., Univ. Illinois, Urbana.]

4783

GREENBERG, R., LEVENSON, M. and ROSE, H. Demonstration of conversion of carotene to vitamin A by fluorescent microscopy. *Federation Proc.*, 1955, 14, 63. *Proc.* [Dept. Physiol., Univ. Illinois Coll. Med., Chicago.]

4784

BIERI, J. G. Effect of tocopherol on carotene conversion. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 482-484. [Dept. Biochem. Nutrit., Univ. Texas Med. Branch, Galveston.]

Weanling rats were given a diet deficient in vitamin A alone for 10 days, and then for another 5 days alone or with supplements of 4, 10 or 20 mg. α -tocopherol daily. On the 18th day, when about half the animals had ceased to gain weight, a single dose of 13.6 μ g. of an aqueous dispersion of β -carotene in Tween 40 was injected into the tail vein. Eighteen days later the mean weight gains of the 4 groups were 43.7, 48.1, 46.3 and 49.5 g., respectively. In another experiment the supplements were of 0.01, 0.05 and 0.10 mg. β -tocopherol with a single injection of 12.3 μ g. of α -carotene. The weight gains 15 days after injection were 52.7, 55.3, 48.0 and 50.0 g., respectively. In a third experiment 2 groups of rats were depleted of vitamin A and one group was given 20 mg. α -tocopherol by mouth daily for 3 days. Seven days later both groups were given a single injection of 88 μ g. β -carotene per 100 g. bodyweight, and 24 hr. later they were killed. The combined livers and kidneys of the groups, respectively, had, on the average, per g., 6.3 and 6.7 μ g. carotene and 1.9 and 2.1 μ g. vitamin A. The average tocopherol content, in μ g. per g., of the heart, lungs and testes of the group without supplement was, respectively, 34.2, 23.9 and 13.2, and of the group given the supplement 40.2, 32.5 and 18.6.

R. J. Ward.

4785

ARNRICH, L. The effect of hypothyroidism on the metabolism of carotene in dogs. *J. Nutrition*, 1955, 56, 35-49. [Dept. Home Econ., Univ. California, Berkeley.]

Six purebred cocker spaniels were given a diet free from vitamin A until, at 3 months of age, liver biopsy showed them to have been depleted of their stores of the vitamin. They were then given 12.9 mg. carotene daily for 16 months. At the beginning of an 8-month experimental period which followed, liver biopsy was performed to estimate the vitamin A concentration in the liver and was repeated after 4 months. For the remaining 4 months thiouracil was given to 3 of the dogs as 0.74 per cent. of the diet. Vitamin A, carotene and cholesterol in the serum were estimated at regular intervals throughout the 8-month period.

When administration of carotene began and when the vitamin A concentration in the liver was, on the average, 10.3 $\mu\text{g. per g.}$, the average value for vitamin A in the serum was 108 $\mu\text{g. per 100 ml.}$ During the next few months it rose to an average of 300 $\mu\text{g. per 100 ml.}$ and continued so with little change. When thiouracil was given, the concentration of vitamin A in the serum rose in all 3 dogs, rapidly in one but more slowly in the other 2; at the end of the experiment the mean value was 881 for those given thiouracil and 333 for those not given it. In the serum of treated dogs small amounts of carotene were found; mean values for cholesterol were 551 and 188 mg. per 100 ml., respectively, for the treated and untreated dogs. Absorption of a single dose of carotene was reflected by a peak in the serum vitamin A concentration between 8 and 11 hr. after the dose; the average increase was 87 $\mu\text{g. per 100 ml.}$ in the untreated dogs and 128 in the treated. Before administration of thiouracil the livers of the untreated animals contained, on the average, 234 $\mu\text{g. per g.}$ those of the treated 218; at autopsy the average value for the untreated dogs was 378 $\mu\text{g. per g.}$ and for those treated 335 $\mu\text{g. per g.}$ Vitamin A was found in the urine of only one dog.

R. J. Ward.

4786

ALMQUIST, H. J. and MAURER, S. The effect of antibiotic, antioxidant, and fat on conversion of carotene to vitamin A in the chicken. *Arch. Biochem. Biophys.*, 1955, 55, 297-298. [The Grange Co., Modesto, Calif.]

Crossbred Indian River \times New Hampshire broiler chicks were given a diet containing only plant sources of vitamin A potency, generally as 5 per cent. of dehydrated alfalfa meal giving a total activity of about 11,000 I.U. per kg. diet. Carotene and vitamin A were estimated in the liver after the chicks had received the diet alone or with different supplements for 8 or 10 weeks.

When 55 mg. chlortetracycline was added per kg. diet, the average amount of vitamin A in the liver after 10 weeks was 115 I.U. per g. compared with 83 when no antibiotic was added. For carotene the average content also was higher with the

supplement than without, the respective values being 8.8 and 5.6 $\mu\text{g. per g.}$ Larger amounts of antibiotic did not raise the vitamin A value further, and actually lowered the carotene value. Inclusion of 250 mg. N, N'-diphenyl-p-phenylenediamine per kg. diet gave average vitamin A and carotene values per g. liver of 89 I.U. and 6.8 $\mu\text{g.}$, respectively. Addition of 14.3 g. rice bran oil per kg. diet raised the vitamin A and carotene values in the liver, the averages after 10 weeks on the diet being per g. 103 I.U. and 6.6 $\mu\text{g.}$, respectively. The amount of fat in the diet appeared, therefore, to be of importance in studies of carotene utilization by the chick. No consistent relation was found between the storage of vitamin A in the liver and bodyweight.—I. M. Sharman.

4787

HIGH, E. G. Influence of aureomycin, penicillin, and vitamin B₁₂ on metabolism of carotene and vitamin A in rat. *Federation Proc.*, 1955, 14, 437. *Proc.* [Dept. Biochem., Meharry Med. Coll., Nashville, Tenn.]

4788

MURRAY, T. K. and CAMPBELL, J. A. Effect of aureomycin on apparent utilization of vitamin A by rat. *Federation Proc.*, 1955, 14, 446. *Proc.* [Food and Drug Labs., Dept. Nat. Health and Welfare, Ottawa.]

4789

WILCOX, E. B. and WOOD, P. Effect of various levels of calcium and phosphorus upon utilization of carotene and vitamin A. *Federation Proc.*, 1955, 14, 454. *Proc.* [Utah Agric. Exp. Stat., Logan.]

4790

WILCOX, E. B. and GALLOWAY, L. S. Carotene content of feces of rats fed three levels of phosphorus. *Federation Proc.*, 1955, 14, 454. *Proc.* [Utah Agric. Exp. Stat., Logan.]

4791

KIRSCHMAN, J. C. and MACVICAR, R. Utilization of intravenously administered carotene by ileectomized sheep. *Federation Proc.*, 1955, 14, 439. *Proc.* [Dept. Agric. Chem. Res., Oklahoma Agric. Exp. Stat., Stillwater.]

4792

BIERI, J. G. Utilization of circulating carotenoids in the chick and rabbit. *Arch. Biochem. Biophys.*, 1955, 56, 90-96. [Dept. Biochem. Nutr., Univ. Texas Med. Branch, Galveston.]

Leghorn chicks were fed on a diet deficient in vitamin A. When deficiency signs appeared the birds were grouped and given β -carotene or cryptoxanthin

emulsified in water with Tween 40. Doses were given by mouth or intravenously into the leg. The birds were killed from 6 to 24 hr. later, and total carotenoids and vitamin A were estimated in the blood serum and liver. From 6 to 11 hr. after 90 μ g. carotene had been given intravenously the average values for vitamin A were 1.8 μ g. per g. fresh liver, and 27.2 μ g. per 100 ml. serum; vitamin A was not found in significant amounts in the kidneys. Carotene in the serum rose, on the average, to 971 μ g. per 100 ml. When the amount injected was from 80 to 120 μ g. carotene and the analyses were made 24 hr. later, the average value for the liver was 3.1 μ g. vitamin A per g., and for the serum 27.9 μ g. per 100 ml., a value resembling that after 6 hr.; liver carotenoid values averaged 12.2 μ g. per g. after from 6 to 11 hr. and 5.9 after 24 hr. When the birds were killed 10 hr. after having 90 μ g. carotene given by mouth the liver contained, on the average, 7.9 μ g. per g. Four New Hampshire chicks, also deficient in vitamin A, were injected with 400 μ g. cryptoxanthin and were killed 6 hr. later. Only traces of vitamin A were found in the liver and serum.

Rabbits deficient in vitamin A were injected in the ear vein with 600 μ g. carotene in 0.6 ml. aqueous solution. The animals were decapitated from 4½ to 24 hr. later and the serum, kidneys and liver were analysed for vitamin A. Similar rabbits given no injection showed no carotene or vitamin A in any of the tissues. In treated animals the value for vitamin A ranged from 21.2 to 33.6 μ g. per 100 ml. in serum, from 2.4 to 7.3 μ g. in the whole kidneys, and from 0 to 13.3 μ g. in the whole liver. In the rabbit the metabolism of carotene given intravenously resembled that in the rat although in the blood after 24 hr. carotene remained high in the rabbit but had disappeared completely in the rat.—I. M. Sharman.

4793

VAVICH, M. G., STULL, J. W., RAICA, N. and KEMMERER, A. R. Effect of nonfat milk on the utilization of carotene and vitamin A. *Arch. Biochem. Biophys.*, 1955, 55, 310-314. [Dept. Agric. Biochem., Coll. Agric., Univ. Arizona, Tucson.]

Albino rats from 12 to 14 days old were given a diet deficient in vitamin A. When growth ceased they were divided into groups each of 10 or 12 animals and were given supplements of carotene or vitamin A as emulsions. The supplements were prepared from oily solutions of carotene or vitamin A by dilution with an equal weight of Tween 80, followed by partial emulsification with fresh non-fat milk or distilled water at 100° F., and homogenisation. Another preparation was made from powdered non-fat milk. After being given the

supplements for 12 days the rats were killed and vitamin A was estimated in the liver. When given 56 μ g. carotene daily the group receiving the supplement emulsified in fresh non-fat milk had, on the average, 63.5 μ g. vitamin A per liver, and those receiving the supplement emulsified in water only 41.2 μ g. Others given 60 μ g. carotene daily had 82.8 μ g. vitamin A in the liver when the supplement was emulsified with reconstituted non-fat milk and 67.3 μ g. when emulsified with water. With only 32 μ g. carotene daily there was no difference between the water and milk homogenates in their effect on the storage of vitamin A. When the supplements were of vitamin A there was not usually any significant difference between the effect of the water and milk homogenates, but when 52 μ g. vitamin A was given daily the average storage was lower, 123.2 μ g., when the supplement was emulsified with reconstituted non-fat milk, than the average of 156.6 μ g. when the supplement was given emulsified with water. In general the experiments showed the presence in milk of some constituent which exerted a favourable effect on carotene utilisation, though its nature was not revealed.—I. M. Sharman.

4794

JARL, F. and HELLSTRÖM, V. Utilization of carotene from hay and sugar beet top silage by dairy cows. *Kgl. Lantbrukshögsk. Ann.*, 1954, 21, 31-39. [Nat. Animal Exp. Stat., Uppsala.]

Two groups of Holstein cows were given rations containing, as sole source of carotene, hay or silage made from sugar beet tops. The experiment was repeated in 2 subsequent seasons. The carotene content of the hay and silage varied from year to year but the amount given was adjusted to supply equal amounts of carotene to each group. The milk was tested weekly for carotene and vitamin A.

More carotene and slightly more vitamin A were secreted in the milk of the group given hay than of the group given silage. Possible explanations of the difference are discussed.—V. H. Booth.

4795

FRANKLIN, M. C., McClymont, G. L., BRIGGS, P. K. and CAMPBELL, B. L. Maintenance rations for Merino sheep. 2. The performance of weaners fed daily and weekly on rations of wheat and wheaten chaff at maintenance levels and the effect thereon of vitamin A supplements. *Austral. J. Agric. Res.*, 1955, 6, 324-342. [Div. Animal Health Prod., C.S.I.R.O., McMaster Animal Health Lab., Sydney.]

For part 1, see Abstr. 3084, Vol. 22.

Groups of from 20 to 42 Merino weaners were given a ration providing 3.33 lb. starch equivalent per head weekly to maintain bodyweight at about 40 lb. Three rations, containing equal parts of

wheaten chaff and wheat, or 1 part of wheaten chaff and 9 of wheat, or wheat alone were provided. Deficiency of Ca was corrected by adding finely ground limestone and, for half the sheep, deficiency of vitamin A was corrected by an initial dose of 500,000 I.U. per head. Each ration was given to 2 groups, to one weekly and to the other daily. The trials lasted for 243 days. The average percentage death rate was 39.8 for those fed daily and 35.4 for those fed weekly. The surviving sheep in the groups fed daily maintained mean bodyweight and general condition as well as those fed weekly. Vitamin A in the plasma of those not given vitamin A fell to low values, ranging from 1.7 to 12.0 μg . per 100 ml., and the death rate was 63 per cent. Corresponding values for the animals given vitamin A were from 8.0 to 28.8 μg . per 100 ml. and 16.7 per cent. Post-mortem examination of the animals dying from deficiency of vitamin A showed no pathological signs other than those caused by anorexia and inanition. Bodyweight change and eventual loss were not affected by supplementing the ration of wheat alone with 0.5 per cent. sodium chloride. No significant difference in wool production was found in any of the groups given these simple cereal rations planned for drought, in these amounts, but significant increases were found in similar groups given the diets to appetite.—I. M. Sharman.

4796

HØIE, J. and SANDVIK, Ø. Forsøk med tørrvitamin-preparater til kyllinger. [Experiments with dry vitamin preparations for chickens.] *Tidsskr. norske Landbruk*, 1955, 62, 47-58. [Landbrukshøgsk. Inst. Fjerde Pelsdyr.]

The experiments were designed to test the keeping qualities of 2 dry preparations of vitamins A and D in rations for chickens. They were mixtures of 94 per cent. maize meal with 6 per cent. of a molecular distillate, guaranteed to contain 1000 I.U. vitamin A and 100 I.U. vitamin D per g., or with 6 per cent. of a plant vitamin oil with the same guaranteed activity. They were compared with a medicinal cod liver oil providing about 770 I.U. vitamin A and 77 I.U. vitamin D per g. Three rations were used, one low in carotene and Ca, one with little carotene but normal amounts of Ca and P, and one high in carotene with little Ca. Each diet was given alone or with a supplement of 1.3 per cent. of medicinal cod liver oil, or 1 per cent. of a concentrate, to 12 groups of chickens from 5 to 8 weeks old. The supplements were mixed with the rations of cereal, legume, oil-cake, yeast and minerals at the beginning of the first 2 experiments and for the third the mixture was stored for 4 months.

There was no difference in the rate of growth of the chickens between the supplements, whether

used at once or stored for 4 months, in the generous amounts given. Chickens given the stored feed grew slightly less rapidly than the others, but the difference may have been due to seasonal change in rate of growth.—I. Leitch.

4797

SCHNETZER, L. Über die Beständigkeit des Carotins in frischem und künstlich getrocknetem Gras. [Stability of carotene in fresh and artificially dried grass.] *Mitt. Geb. Lebensmittel. Hyg.*, 1955, 46, 90-96. *Proc.* [Liebefeld, Berne.]

4798

LIVINGSTON, A. L., BICKOFF, E. M. and THOMPSON, C. R. Effect of added animal fats and anti-oxidant on stability of xanthophyll concentrates in mixed feeds. *J. Agric. Food Chem.*, 1955, 3, 439-441. [W. Utilization Res. Branch, Agric. Res. Serv., U.S. Dept. Agric., Albany 10, Calif.]

Storage studies were made on 4 commercial xanthophyll concentrates, 2 made from dried alfalfa meal, 1 from lettuce meal and 1 from maize gluten meal. The stability of the carotenoids was low in one of the concentrates from alfalfa which had been prepared after saponification, perhaps because natural anti-oxidants had been removed. Specimens of the concentrates were treated with 6-ethoxy-1:2-dihydro-2:2:4-trimethylquinoline in 2 concentrations or with white tallow or with the anti-oxidant and white tallow. Treated and untreated concentrates were stored for 4 months at 25°C. as constituents of a series of broiler feeds. Both carotene and "xanthophyll" were estimated before and after storage.

Xanthophyll was more stable in the mixed feed than in the original concentrates. Both carotene and xanthophyll were more stable in material treated with anti-oxidant than in untreated material. The added fat also had a stabilising effect, probably by bringing natural anti-oxidants and carotenoids into more intimate contact. The effects of fat and anti-oxidant were additive.

The specimens described above were stored in containers which allowed access of air. The xanthophyll was completely stable in other specimens stored in closed containers.

V. H. Booth.

4799

HALVERSON, A. W. and HENDRICK, C. M. Effect of trace minerals and other dietary ingredients upon vitamin A stability in stored poultry diets. *Poultry Sci.*, 1955, 34, 355-360. [Dept. Biochem., Exp. Stat., S. Dakota State Coll., College Station.]

Three practical diets, differing in their cereal constituents, were supplemented with vitamin A

from cod liver oil, or a stabilised fish oil in dry fat, or a wax-coated preparation. Each diet was modified by the addition of meat scraps and limestone or by the further addition of Mn alone or with Fe, Cu and Co salts. One diet, a mash concentrate, included, in its modified forms, fishmeal and bonemeal. Samples in paper sacks were stored at 37° C. for 30 and 150 days. Loss after 30 days was in general small, but after 150 days it had increased to 50 per cent. or more. The replacement of one cereal by another, or the addition of meat scraps, limestone, fishmeal and bonemeal did not appreciably affect the stability of the vitamin A, nor did the further addition of Mn, but when Fe, Cu and Co also were present the loss was considerably increased, especially after 150 days' storage. The loss of vitamin A was greatest in the mash concentrate, which was higher in trace minerals than the other 2 diets. In all 3 diets, the stability of vitamin A in the wax-coated supplement was much greater than in the other two, the loss being only from 1/3 to 1/2 as much. The vitamin was equally stable in cod liver oil and stabilised fish oil.—E. M. Cruickshank.

4800

- PATEL, H. S. and PATEL, B. M. Vitamin A potency of colostrum from Kankrej cows. *Indian J. Dairy Sci.*, 1955, 8, 14-18. [Inst. Agric., Anand.]

Samples of colostrum from 8 Kankrej cows and 1 Sindhi × Kankrej crossbred were drawn 4 hr. after parturition, and fat, carotene and vitamin A were estimated. Samples from subsequent milkings up to the eighth were similarly analysed. The yield of the first colostrum ranged from 5 to 18 lb., average 10.4, the percentage of fat from 0.5 to 9.2, average 3.25. The yield is 30 to 40 per cent. above that of some other milk breeds in India; the fat percentage is correspondingly lower. In the second milking the total yield dropped to 5.7 lb. and the fat percentage rose to 5.3. The yield gradually rose to 8.3 lb. at the eighth milking; the fat percentage varied irregularly between 4.5 and 5.5. The average carotene content of the colostrum was 45.7 µg. per g. fat, range 16.5 to 141.0, for the first milking and fell progressively to 7.3 at the eighth milking. The average vitamin A value was 285 I.U. per g. fat, range 175 to 612, for the first milking, and it also fell progressively to 55 at the eighth milking. The total secretions of carotene and vitamin A were 5305 µg. and 39,142 I.U. for the first milking and 1697 µg. and 12,227 I.U. for the eighth. The total carotene and vitamin A secreted in the first colostrum was therefore approximately 3 times that in the eighth milking. The first samples of colostrum were 12 times as rich in carotene and 10 times as rich in vitamin A as milk from normal herds.—I. M. Sharman.

See also Absts. 4749, 4750, 5466.

VITAMIN D

4801

- LAPINA, A. A. Uproshchennyi biologicheskii metod opredeleniya vitamina D₂. [A simplified biological method for estimating vitamin D₂.] *Vop. Pitan.*, 1955, 14, No. 2, 18-21. [Inst. Vitaminol., Minist. Zdravookhran. SSSR, Moscow.]

In 2 series of experiments each with a large number of rats, the minimum prophylactic dose of vitamin D₂ was estimated from the number of animals with normal bones and the number with rickets for the different doses. It made little difference to the results whether the vitamin was administered daily or only twice in the course of a 15-day experiment.—D. W. Taylor.

4802

- BRUNE, H. Zur röntgenographischen Technik bei der biologischen Vitamin D-Bestimmung mit Ratten. [X-ray technique for estimating vitamin D biologically with rats.] *Ztschr. Tierernährung Futtermittelk.*, 1955, 10, 40-44. [Inst. Tierphysiol., Univ. Göttingen.]

The importance is stressed of ensuring that the rat's leg is always in the same position when radiography of the proximal end of the tibia is being used to assess antirachitic potency. Otherwise measurement of the width of the epiphyseal cartilage will not give consistent results. A method is described for securing constancy of position.

E. M. Hume.

4803

- ROSENBERG, H. R. The antirachitic activity of irradiated corbisterol. *Arch. Biochem. Biophys.*, 1955, 56, 256-258. [Stine Lab., E.I. du Pont de Nemours and Co., Inc., Newark, Del.]

At the request of its discoverer, Toyama (*J. Chem. Soc., Japan*, 1943, 64, 326), corbisterol was tested biologically with chicks and rats. Toyama isolated it from the bivalve mollusc *Corbicula leana*, and showed the presence in it of the 5:7-diene structure characteristic of provitamin D. The purity of the sample sent was about 57 per cent. It was saponified and the non-saponifiable fraction in ether was irradiated with ultraviolet light, a

N.A. and R., October 1955

sample of 7-dehydrocholesterol being exposed at the same time for comparison. Both irradiation products were dissolved in maize oil.

Tested on rats by the U.S.P. XIV method, corbisterol had the same antirachitic potency as the sample of vitamin D₃ prepared at the same time. Tested on chicks by the A.O.A.C. method (*Methods of Analysis*, 6th ed., 1945), the antirachitic potency of corbisterol was only about 4 per cent. of that of the sample of vitamin D₃. It is concluded that corbisterol probably belongs to the C₂₈ series of activated 7-dehydrosterols.

E. M. Hume.

4804

FESTENSTEIN, G. N. and MORTON, R. A. **Pro-vitamin D in animal tissues.** *Biochem. J.*, 1955, **60**, 22-25. [Dept. Biochem., Univ. Liverpool.]

It was previously demonstrated (Abst. 1842, Vol. 22) that reversible formation of 7-dehydrocholesterol from cholesterol occurred in the intestinal wall of the guineapig, and the existence of a sterol dehydrogenase was postulated. Animal tissues were investigated with a photo-electric spectrophotometer for the presence of 7-dehydrosteroid, defined as material showing the characteristic absorption of 7-dehydrocholesterol, ergosterol and other 5:7-dien-3-ol steroids. The tissues were extracted with ether, often after saponification, and the material was subjected to chromatography. The presence of 7-dehydrosteroid in the ovaries of mature frogs before hibernation was confirmed (Abst. 4688, Vol. 19), and it was found also in pig skin, pig intestine, horse stomach and intestine, and ox and sheep intestine.

It is considered probable that though the amount of 7-dehydrosteroid in the animal intestines examined was small, it was consistent with the widespread distribution of a special dehydrogenase of which the normal substrate is cholesterol, most probably of endogenous origin.—E. M. Hume.

4805

FESTENSTEIN, G. N. **The effect of ergosterol and ergocalciferol on the anaerobic glycolysis of rat-liver slices.** *Biochem. J.*, 1955, **59**, 605-609. [Dept. Physiol., Univ. Witwatersrand, Johannesburg.]

Rats weighing from 100 to 250 g. were maintained on a diet of, per cent., maizemeal 69, brewer's yeast 8, fat 8 and milk powder 15, with 6 ml. hake liver oil per lb. diet. The animals were killed after fasting for 16 hr., and slices were taken from the liver for measurement of anaerobic glycolysis in a Warburg flask. The incubation medium was bicarbonate Ringer solution containing 0.2 per cent. glucose. To dissolve the sterols, propylene glycol and Tween 80 could not be used since they inhibited glycolysis, but lecithin proved

satisfactory if results were restricted to the first hour. Concentration of ergosterol and ergocalciferol was measured with a Beckman spectrophotometer. Both substances caused inhibition of glycolysis by the liver slices, but ergosterol appeared to have a greater effect on male tissue and ergocalciferol on female. The rate of inhibition by ergosterol of male liver slices decreased with time, otherwise the rate of inhibition was constant. Spectrophotometric examination of the solutions after incubation showed increased absorption at 290 mμ., the significance of which was not determined.—E. M. Hume.

4806

MIGICOVSKY, B. B. and JAMIESON, J. W. S. **Calcium absorption and vitamin D.** *Canad. J. Biochem. Physiol.*, 1955, **33**, 202-208. [Div. Chem., Sci. Serv., Dept. Agric., Ottawa.]

Day-old chicks were given an A.O.A.C. rachitogenic diet. After 2 weeks vitamin D was included in the diet of half the chicks to give 1 "unit" per g. After another week all were given ⁴⁵Ca orally to supply 5 mg. Ca. The chicks were killed at intervals up to 6 hr. later, and blood and bone from the tibia were analysed for ⁴⁵Ca. The specific activity of the blood and bone rose much more rapidly and reached a much higher level when vitamin D had been given. When ⁴⁵Ca was given by intramuscular injection to chicks which had had a diet of Ca percentage ranging from 0.30 to 2.18, half of them having had vitamin D as before, the percentage of the ⁴⁵Ca dose found in the tibia did not differ significantly whether vitamin D had been given or not. It was, therefore, concluded that the percentage of an oral dose of ⁴⁵Ca which appeared in bone could be taken as a measure of an organism's capacity to absorb Ca.

Day-old chicks were reared as before to 3 weeks of age, half of them receiving vitamin D in the diet for the last 2 weeks. After 24 hours' fast, the dose of ⁴⁵Ca was given orally with doses of Ca ranging from 0.7 to 20 mg. The percentage of the ⁴⁵Ca dose found in the tibia fell with increasing dose of Ca, whether vitamin D had been given or not, but the percentage was always higher with vitamin D than without.

When the diet contained percentages of Ca ranging from 0.30 to 2.18, and the dose of ⁴⁵Ca was given orally, the percentage of the ⁴⁵Ca dose in the tibia decreased as the amount of Ca offered increased when vitamin D was given but not when it was not given. The last result is concluded to confirm the finding of Nicolaysen *et al.* (Title 797, Vol. 24), that there is an adaptation mechanism for dealing with a low Ca intake, which operates in presence of vitamin D but not in its absence.

It is suggested that "the action of vitamin D may be explained by a reaction of the vitamin or

a derivative thereof with calcium at the absorp-tion barrier".—E. M. Hume.

4807

VAN KESSEL, H. I. A. M. Invloed van grote doses vitamin D₂ en van vasten op de fosfaat-stofwisseling van de rat. [Effect of large amounts of vitamin D₂ and of fasting on phosphorus metabolism in the rat.] *Chem. Weekblad*, 1952, 48, 731-732. [Lab. Physiol. Chem., Rijksuniv. Utrecht.]

Three groups of 12 rats were normally fed to appetite, one group until 4 hr. before the study of P metabolism; a second was treated like the first but was given a single dose of 2 mg. vitamin D₂ by stomach tube 24 hr. before the study, and the third was fed up to 24 hr. before the study, from which time it fasted. ³²P, carrier-free [amount not stated] was injected into the abdominal cavity of 4 rats in each group 5, 10 or 20 min. before decapitation. Specific activity was measured of inorganic serum P, inorganic intracellular liver P, and phospholipin P of the liver.

The results are presented in graphs and interpreted to mean that fasting accelerates the transfer of inorganic serum P to the P of the intracellular space of the liver, and that vitamin D₂ accelerates the incorporation of inorganic intracellular liver P into the phospholipins of the liver.—I. Leitch.

4808

CRAWFORD, J. D., GRIBETZ, D. and TALBOT, N. B. (with TERRY, M., MACLACHLAN, E. A., VAN LOON, K. and MORRILL, M. F.) Mechanism of renal tubular phosphate reabsorption and the influence thereon of vitamin D in completely parathyroidectomized rats. *Amer. J. Physiol.*, 1955, 180, 156-162. [Dept. Paediat., Harvard Med. Sch., Boston, Mass.]

Parathyroid tissue was removed as completely as possible from male rats weighing from 150 to 400 g. A test for the completeness of the operation was made by loading them with phosphate and accepting for further experiment only those rats in which the serum inorganic P rose to 10 mg. per 100 ml. Rats thus selected were given daily for at least 4 days and sometimes for from 2 to 3 weeks 100, or 10,000 or 100,000 I.U. vitamin D₂. From 2 to 4 days before the beginning of the metabolic studies, rats in each of the 3 groups were given diets containing amounts of phosphate ranging from a trace to the maximum amount tolerable. Blood and urine samples were collected after comparable periods, and inorganic P and creatinine were estimated in them; the rate of glomerular filtration was estimated from the endogenous creatinine clearance.

With each amount of vitamin D there was a general tendency for the amount of P in the urine

to increase as the amount of P filtered by the glomeruli increased; the amount of P in the urine for a given amount of P filtered by the glomeruli tended to be greater, the greater the amount of vitamin D previously given.

The object of the study was to ascertain "whether under conditions of constant parathyroid and vitamin D status, there is a renal tubular transfer maximum for inorganic phosphate or, alternatively, a tendency for the tubules to reabsorb a constant fraction of the phosphate filtered by the glomeruli". The results fitted the latter, not the former hypothesis.—E. M. Hume.

4809

TALMAGE, R. V. and DODDS, B. F. Dihydro-tachysterol (AT-10) and parathyroid function in rats. *Federation Proc.*, 1955, 14, 151. *Proc. [Rice Inst., Houston, Tex.]*

4810

LINDQUIST, B. Studies on the mode of action of dihydrotachysterol on the calcium metabolism. *Helv. paediat. Acta*, 1955, 10, 131-133 (with discussion 133-134). [Paediat. Clin., Univ. Lund, Sweden.]

4811

GORBUNOVA, V. I. and MATZKO, S. N. Razvitie D-gipervitaminosa v zavisimosti ot soderzhaniya v ratzione vitamina C. [Development of vitamin D excess in relation to the vitamin C content of the diet.] *Vop. Pitani.*, 1955, 14, No. 2, 17-18. [Inst. Vitaminol., Minist. Zdravookhran. SSSR, Moscow.]

A decrease of dietary vitamin C from 20 to 2 mg. daily had no effect on the pathological changes in guineapigs given large amounts of vitamin D as irradiated ergosterol.—D. W. Taylor.

4812

FOLLIS, R. H. Studies on hypervitaminosis D. *Amer. J. Pathol.*, 1955, 31, 568-569. *Proc. [Coll. Med., Univ. Utah, Salt Lake City.]*

4813

ENGEL, C. Der Vitamin-D-Gehalt von mit U.V.-Licht bestrahlter Milch. [Vitamin D content of milk irradiated with ultraviolet light.] *Milchwissenschaft*, 1954, 9, 378-379; *Centraal Inst. Voedingsonderzoek T.M.O., Utrecht, Publ.* No. 192. English and Spanish summaries.

Irradiated condensed milk was prepared in Bremen at the *Milchabsatzgenossenschaft* under the supervision of the *Landesgesundheitsverwaltung*, and was tested at Utrecht in the Pharmacological Laboratory of the *Rijksinstituut voor de Volksgezondheid* and in the Hygiene Laboratory of the University.

In tests with rats at the Pharmacological Laboratory, ether-extracted skimmed milk powder was given to negative control animals to balance any antirachitic effect of the constituents of the condensed milk other than vitamin D. In the Hygiene Laboratory the doses of milk given were considered too small for such a procedure to be necessary. The experiments at the Hygiene Laboratory are set out. Groups of 12 rats received 1 or 2 ml. of the condensed milk or one of 5 doses of the International Standard for vitamin

D, daily for 10 days, after which X-ray photographs were taken. The vitamin D content found was 450 I.U. per kg.; the value found at the Pharmacological Laboratory was 400.

Another sample of irradiated condensed milk, brand Sonnenquell, was bought in a retail shop in Bremen and tested on chicks at the *Rijksinstituut voor Pluimveeteelt* in Beekbergen. The value found was 527 ± 107 I.U. per kg.—E. M. Hume.

See also Absts. 5333, 5340.

VITAMIN E

4814

GREEN, J., MARCINKIEWICZ, S. and WATT, P. R. The determination of tocopherols by paper chromatography. *J. Sci. Food Agric.*, 1955, 6, 274-282. [Walton Oaks Exp. Stat., Vitamins, Ltd., Tadworth, Surrey.]

Individual tocopherols were separated by a one-dimensional separation on paper impregnated with zinc carbonate with or without a second-dimensional partition on paraffin-coated paper. The papers were prepared by being immersed for a short time in a solution of zinc ammine carbonate, dried at room temperature and heated to between 95° and 100° C. to decompose the complex. The oil or fat was saponified and, as a rule, was applied to the chromatograms directly. It was sometimes necessary to pass the unsaponifiable matter through Floridin earth to remove sterols. Ascending chromatography was used with cyclohexane as developing solvent. R_F values of the tocopherols were for α -0.66, β -0.43, γ -0.43, and δ -0.20, and for β -carotene and vitamin A alcohol 0.71 and 0.35. Two-dimensional chromatography was achieved by running the tocopherols on the side of a square sheet of zinc-carbonate paper; after development in cyclohexane the unused paper was treated with a solution of liquid paraffin in light petroleum, and development was with 75 per cent. ethanol. Only β - and γ -tocopherols remained unseparated by the method. Recovery of 98 per cent. was obtained when pure tocopherols were applied to the paper.

When the unsaponifiable fraction of coarse bran was chromatographed a new spot appeared which ran with α -tocopherol in the first dimension and with β -tocopherol in the second dimension. The spot was considered to be due to 5:7-dimethyl-tocol, to which the prefix ζ has been given. The substance did not couple with diazotised o-dianisidine and did not form a nitroso-derivative. The new ζ -tocopherol was found to be the main form in barley oil. δ -Tocopherol, previously known

only in soya bean oil, was found to occur in oat and mustard seed oil.—R. J. Ward.

4815

HUI, C. K. The synthesis of α -DL-tocopherol. *J. Vitaminol., Japan*, 1954, 1, 8-12. [Kumamoto Univ. Med. Sch., Ninomaru.]

A meeting of synthesising pseudocumohydroquinone from coal-tar cumene is outlined as a preliminary to synthesis of α -tocopherol.

A. M. Copping.

4816

SCOTT, M. L., HILL, F. W., DOBSON, D. C., NELSON, T. S. and NORRIS, L. C. Vitamin E-like activity of dried brewers' yeast in studies with chicks. *Federation Proc.*, 1955, 14, 449. *Proc.* [Dept. Poultry Husband., Cornell Univ., Ithaca, N.Y.]

4817

SOARDI, V. Attuali conoscenze sul ruolo biochimico della vitamina E. [Present knowledge of the biochemical role of vitamin E.] *Acta vitaminol.*, 1955, 9, 3-8. [Ist. Fisiol. Umana, Univ. Naples.] French, English, German and Spanish summaries.

A review.

4818

LA GRUTTA, G. and CILENTO, A. Metabolismo glicidico e vitamina E. [Carbohydrate metabolism and vitamin E.] 2. Contenuto in glicogeno dei muscoli scheletrici, del fegato e del cuore di ratti normali e diabetici per allosana trattati con vitamina E. [2. Glycogen content of the skeletal muscle, liver and heart of normal rats, and rats made diabetic with alloxan, treated with vitamin E.] 3. Fosforo ematico inorganico e sue modificazioni in rapporto alla somministrazione di vitamina E in conigli normali e diabetici. [3. Inorganic blood phosphorus and its modifications in

relation to the administration of vitamin E to normal and diabetic rabbits.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1573-1575; 1575-1577. [Ist. Fisiol., Univ. Palermo.]

For Part 1 see Abst. 2978, Title 2979, Vol. 24.

2. Glycogen was estimated in the liver, skeletal muscles and heart of male rats weighing about 169 g., maintained on a normal diet. Groups of from 5 to 8 were given no treatment, or a subcutaneous injection of from 3 to 6 mg. vitamin E daily for 7 days without other treatment; 3 other groups were rendered diabetic with alloxan and were given the injections of vitamin E for a week from the onset of diabetes, or for a week before the giving of alloxan till the end of the experiment, or not at all. No significant change in the glycogen values attributable to vitamin E was found except that the glycogen content of the heart muscle was greater in the diabetic rats when vitamin E was given.

3. Inorganic P was estimated in the blood of 7 male rabbits, weighing about 2 kg., before and 60 and 120 min. after intramuscular injection of from 100 to 200 mg. α -tocopherol, given alone or with glucose, and after administration of glucose alone or with insulin. After 30 days' pause the same rabbits were made diabetic with alloxan, and the tests were repeated. No evidence of an effective action of vitamin E on carbohydrate metabolism was obtained from the results of measuring the serum inorganic P. (See also Title 3455, Vol. 25.)

E. M. Hume.

4819

MILMAN, A. E. and MILHORAT, A. T. In vitro studies of glycogen metabolism in vitamin E-deficient rabbits. *Federation Proc.*, 1955, 14, 445. *Proc.* [Dept. Psychiat., Cornell Univ. Med. Coll., New York.]

4820

HORN, Z., BOGSCH, S. and ALTMANN, O. Wirkung des E-Vitamins auf den Kohlenhydratstoffwechsel. [Action of vitamin E on carbohydrate metabolism.] *Ztschr. ges. inn. Med.*, 1955, 10, 140-145. [Lab., Hauptstadt. Károlyi Krankenhaus, Budapest.]

In the course of a general article and review, the results of 2 experiments are reported.

Blood sugar was estimated in rabbits weighing from 2 to 3 kg., injected subcutaneously after 24 hours' fast with 0.1 mg. per kg. bodyweight of an adrenaline preparation, Tonogen. The rabbits were then given 50 mg. *dl*- α -tocopheryl acetate daily for 10 days. The blood sugar curve in response to adrenaline rose much higher after tocopherol treatment than before it, from which it is concluded that vitamin E protects the reserves of glycogen in the liver.

Of 2 groups of rats weighing from 100 to 150 g., one was given 25 mg. *dl*- α -tocopheryl acetate daily for a preliminary period. Rats from both groups were then killed after fasting for 3, 6, 9, 24 and 48 hr., and glycogen was estimated in the liver. The fall was much more rapid in the rats not previously given tocopheryl acetate.

E. M. Hume.

4821

OPPENHEIMER, H., MILMAN, A. E. and MILHORAT, A. T. Electrophoretic studies of nutritional muscular dystrophy in rabbits. *Federation Proc.*, 1955, 14, 109. *Proc.* [Dept. Psychiat., Cornell Univ. Med. Coll., New York Hosp.]

4822

WEINSTOCK, I. M., GOLDRICH, A. D. and MILHORAT, A. T. Enzyme studies in muscular dystrophy. 1. Muscle proteolytic activity and vitamin E-deficiency. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 257-260. [Dept. Psychiat., Cornell Univ. Med. Coll., New York.]

Muscle was collected from young rabbits which had been rendered dystrophic with a diet which had been treated with ferric chloride. Some rabbits having the same diet were given tocopherol. The proteolytic activity of homogenates and extracts of the muscles from the dystrophic and normal animals was compared by incubating them with denatured haemoglobin, with or without the presence of the ferrous ion, and by recording the increase in absorption at 280 m μ . after the precipitation of residual protein with trichloroacetic acid. The proteolytic activity was always greater in the preparations from dystrophic muscles than from normal muscles. The same difference was found whether the ferrous ion was present or not.

T. Moore.

4823

SIME, J. T., DINNING, J. S. and DAY, P. L. Influence of vitamin E deficiency in rabbits on the incorporation of glycine-1-C¹⁴ and formate C¹⁴ into protein in vivo and in vitro. *Federation Proc.*, 1955, 14, 450. *Proc.* [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

4824

KING, J. T., LEE, Y. C. P. and VISSCHER, M. B. Relationship between vitamin E and dietary minerals in mouse "paralysis". *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 406-409. [Dept. Physiol., Univ. Minnesota, Minneapolis.]

Five groups of C₃H male mice were restricted when about 3 weeks old to a diet containing casein, glucose, lard, dried yeast, dried alfalfa, and cod liver oil, with one of 3 different salt mixtures. Three of the groups received wheat germ as a source of vitamin E, and 2 did not. When the

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salt mixture contained ferric phosphate as its source of iron, and no trace element except iodine was included, paralysis appeared after 6 months in all the animals which did not receive wheat germ, but not within 12 months in those which did. When ferrous sulphate was substituted for ferric phosphate, and manganese, zinc, copper and cobalt were included in the salt mixture, there was no paralysis either with or without wheat germ. When ferrous sulphate was substituted for ferric phosphate, but no trace element except iodine was given, the mice became paralysed after 6 months, even with wheat germ in the diet.

T. Moore.

4825

OLSON, R. E., YANG, C. S., RIEGL, M. and STEWART, B. Sulphur amino acid metabolism in dietary hepatic necrosis in rat. *Federation Proc.*, 1955, 14, 447. *Proc.* [Dept. Biochem., Grad. Sch. Pub. Health, Univ. Pittsburgh, Pa.]

4826

RODAN, G. P. and SCHWARZ, K. Dietary necrotic liver degeneration: reversal of defect in oxygen consumption by intraportal α -tocopherol. *Federation Proc.*, 1955, 14, 270. *Proc.* [Nat. Inst. Health, Bethesda, Md.]

4827

ARTOM, C. Effects of dietary cystine and tocopherol on metabolism of fatty acids in liver preparations. *Federation Proc.*, 1955, 14, 174-175. *Proc.* [Dept. Biochem., Bowman Gray Sch. Med., Winston-Salem, N.C.]

4828

OGGIOTI, G. Ricerche sperimentali sull'azione neuroprotettiva della vitamina "E". [Experiments on the neuroprotective action of vitamin E.] Azione protettiva di sostanze lipotrope nelle intossicazioni sperimentali del sistema nervoso. [Protective action of lipotropic substances in experimental intoxication of the nervous system.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1422-1424; 1424-1425. [Osp. Psichiat. Provinciale di Bologna in Imola.]

Vitamin E, 50 or 100 mg. daily, is reported as having a protective action on pigeons fed on polished rice, and on guineapigs given strychnine.

In similar experiments, addition of choline, inositol, methionine and lipocaine, singly or together, prolonged the life of pigeons given polished rice, and of guineapigs given strychnine or apioi.

E. M. Hume.

4829

DE ROSA, R. L'azione dell' α -tocopherolo nella intossicazione sperimentale da piombo. [Effect of α -tocopherol on experimental lead poisoning.] Comportamento della coproporfiruria e della

crasi ematica. [Effect on coproporphyrinuria and the state of the blood.] Comportamento del quadro anatomo-istologico. [Effect on the anatomico-histological picture.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1439-1441; 1441-1443. [Ist. Med. Lavoro, Univ. Naples.]

Of 8 rabbits fed on greenstuff and given orally on alternate days 200 mg. lead acetate, 4 were given every 4 days an intramuscular injection of 200 mg. α -tocopherol. The animals given tocopherol lived 10 days longer than those not given it; they had much less coproporphyrin in the urine, and the degree of anaemia was less.

In rabbits treated in the same way, histological examination of the kidneys, liver, spleen, intestine, lungs, heart and adrenal glands showed that the pathological changes in the animals given vitamin E were much less than in those not given it.

E. M. Hume.

4830

SINGSEN, E. P., BUNNELL, R. H., MATTERSON, L. D., KOZEFF, A. and JUNGHERR, E. L. Studies on encephalomalacia in the chick. 2. The protective action of diphenyl-*p*-phenylenediamine against encephalomalacia. *Poultry Sci.*, 1955, 34, 262-271. [Dept. Poultry Sci., Storrs Agric. Exp. Stat., Univ. Connecticut.]

For other parts see Abst. 4361, Vol. 24; Titles 1890, 3122, Vol. 25.

Chicks deprived of vitamin E were given for 28 days a diet low in the vitamin or a normal diet, both of them supplemented with amounts of fish oil up to 8 per cent., alone or with the further addition of vitamin E up to 16 I.U. per lb. On the deficient diet, which contained less than 3 I.U. vitamin E per lb., the chicks grew normally and had no encephalomalacia although the blood contained only 0.10 mg. per cent. of tocopherol. The inclusion of oil in both diets reduced blood tocopherol and greatly increased mortality and the incidence of encephalomalacia, the effect being greatest with the diet low in vitamin E. Chicks given the normal diet with from 2 to 8 per cent. of added oil frequently showed signs of encephalomalacia though the blood tocopherol was above 0.10 mg. per cent. The results showed that between 7 and 11 I.U. vitamin E per lb. feed was sufficient to prevent the disease in field conditions.

When the ration was low in vitamin E and contained 2 per cent. of oil, 0.025 per cent. of diphenyl-*p*-phenylenediamine completely prevented encephalomalacia; 0.0125 per cent. was not entirely effective, but would probably be so with practical rations. The results suggest that vitamin E prevents encephalomalacia by acting as a biological anti-oxidant and that diphenyl-*p*-phenylenediamine acts in the same way and exerts its main protective action within the body, probably in the

intestinal tract, rather than by protecting vitamin E in the food.—E. M. Cruickshank.

4831

MASON, K. E. and BERGEL, M. Maintenance of *Mycobacterium leprae* in rats and hamsters fed diets low in vitamin E and high in unsaturated fats. *Federation Proc.*, 1955, 14, 442-443. *Proc.* [Dept. Anat., Sch. Med. Dent., Univ. Rochester, N.Y.]

4832

BIAVATI, F. Osservazioni di sterilità nel ratto albino alimentato con dieta prevalentemente maidica. [Sterility in white rats fed on a diet chiefly of maize.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1407-1409. [Ist. Fisiol., Univ. Bologna.]

With a diet of, per cent., maize meal 60, crude casein 15, whole milk powder 12, linseed meal 10, cod liver oil 1, CaCO_3 1, and iron lactate 1, with brewer's yeast 5 per cent. of the whole, and twice a week greenstuff and fresh liver, male and female rats left together failed to produce young, and the male gonads were found to be atrophic.

The same females were then fed on the same diet or the same diet with oatmeal instead of maize meal, or a diet of Randoin with only 15 per cent. maize meal, a mixture of cereals, 5 per cent. wheat germ and no cod liver oil. After a month they were mated with fertile males and all became pregnant. The group of 5 with 60 per cent. maize meal produced dead young or failed to rear them; of 6 in the group with oatmeal, 2 failed to rear their young, and of 5 in the group with the diet of Randoin, 2 failed to rear their young.

E. M. Hume.

4833

ATKINSON, R. L., FERGUSON, T. M., QUISENBERRY, J. H. and COUCH, J. R. Vitamin E and reproduction in turkeys. *J. Nutrition*, 1955, 55, 387-397. [Dept. Biochem., Texas Agric. and Mech. Coll. System, College Station.]

Small White turkey hens in 8 groups were given a diet with all-vegetable protein supplemented with minerals and vitamins except vitamin E. Each group of females was mated with a male of the same breed. Groups 1, 3, 5 and 7 were given the basal diet without supplement or with 5 per cent. condensed fish solubles or 3 per cent. dried whey or both. Groups 2, 4, 6 and 8 were given the same 4 diets with addition of 20 mg. α -tocopherol acetate per lb. After 9 weeks the tocopherol supplement was withdrawn from groups 2, 4, 6 and 8 and given to groups 1, 3, 5 and 7. Records were kept of egg production, number of eggs set, fertility and hatching capacity, and the tocopherol content of the egg yolks was estimated.

Supplements other than tocopherol had no effect on egg production, fertility or hatching capacity. The hatching capacity was higher by about 36 per cent. in the group given tocopherol in the first 9 weeks than in those not given it. The hatching capacity of eggs from the hens without tocopherol increased by 17 per cent. when tocopherol was given; it fell by 9 per cent. after tocopherol was withdrawn from those that had previously received it. Tocopherol had no effect on egg production or fertility.

There were 309 dead embryos in 652 fertile eggs during the first 9-week period from hens not receiving tocopherol but only 83 in 708 fertile eggs from those given tocopherol. In the 9th week, the average tocopherol content per yolk of the eggs from the hens receiving tocopherol was 838 μg . and from those not receiving it 200 μg . In the 17th week, after the diets had been reversed, the values were 215 and 747 μg . per yolk.

R. J. Ward.

4834

SAFFORD, J. W. and SWINGLE, K. F. Plasma and milk tocopherol levels of cows compared with the plasma tocopherol levels of their foster calves. *Amer. J. Vet. Res.*, 1955, 16, 64-68. [Montana Vet. Res. Lab., Bozeman.]

Three cows from ranches in Western Montana where muscular dystrophy occurred and whose calves had died from it were used to rear 3 normal male Jersey calves. Hay of specified quality was the only food of the cows for about 2 months after the adoption of the calves. Tocopherol was estimated weekly in the plasma of each cow and calf and daily in the milk from each cow. In the blood of the calves average values were 78.6, 37.4, and 21.4 μg . per 100 ml. Despite such low values, especially for the last 2, no clinical sign of muscular dystrophy was seen. Electrocardiograms were normal. The average values in the milk for the corresponding cows were 41.7, 26.8 and 42.5 μg . per 100 ml., and in the plasma 252, 244 and 231 μg . per 100 ml. The ratios of the tocopherol values in the cow's plasma, cow's milk and calf's plasma were, for the first cow and calf approximately 7:1:2, for the second 9:1:1.4 and for the third 11:2:1. No correlation was found between the value in the calf's plasma and in the ingested milk. Towards the end of the experiment the cows with their foster calves were allowed out on pasture. After 19 days the tocopherol values for both cows and calves rose to comparatively high levels in the plasma, but not in the milk of the cows.—I. M. Sharman.

4835

ANGLIN, C., MAHON, J. H. and CHAPMAN, R. A. Tocopherol content of Canadian butterfat and its use in detecting adulteration. *J. Dairy Sci.*, N.A. and R., October 1955

1955, 38, 333-339. [Dept. Nat. Health Welfare, Food and Drug Labs., Ottawa, Ont.]

Samples of butter were collected at monthly intervals between June 1953 and May 1954 from 29 manufacturers in 8 different provinces of Canada, and analysed for their tocopherol content. The average tocopherol content for the months, beginning with June, were in p.p.m., 34, 40, 42, 42, 42, 31, 27, 21, 19, 19, 21 and 26. The range was from 10 to 50 and the average for all the samples was 31. The factories supplying the butter obtained their milk from large numbers of cows, from 28,000 to 56,000, and it is, therefore, considered that the findings are representative of butterfat produced commercially in Canada. Examination of confidence limits showed that, for butterfat produced between July and October, 95 per cent. of unadulterated samples should have a tocopherol content below 49, 99 per cent. below 52 and 99-95 per cent. below 57 p.p.m. Of that produced from January to April, on the other hand, 95 per cent. of samples, should have below 27, 99 per cent. below 30 and 99-95 per cent. below 35 p.p.m. The value is emphasised of estimating tocopherol for detecting adulteration of butterfat with small amounts of vegetable fats. The method cannot be used to detect additions of coconut oil.—I. M. Sharman.

4836

RUCCIA, D. Ulteriori indagini sull'eventuale presenza di vitamina E nell'olio di oliva. Ricerche su ratti adulti a dieta priva di tocoferoli, accoppiati tra loro. [Further investigation of the possible presence of vitamin E in olive oil. Experiments with adult rats deprived of tocopherols and mated with one another.] Ricerche su ratti adulti a dieta priva di tocoferoli, accoppiati con ratti adulti normali. [Experiments with adult rats deprived of tocopherols and mated with normal adult rats.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1601-1604; 1604-1607. [Ist. Fisiol., Univ. Bari.]

Four pairs of rats weighing about 140 g. were maintained on a diet deficient in vitamin E, with daily additions of 2 and later of 3 or 4 g. olive oil of varying degrees of refinement. No better evidence for the presence of vitamin E in olive oil was

obtained than in previous experiments of the same type (Abst. 2984, Vol. 24).

When males or females receiving the same diets as in the preceding experiment were mated with normal females or males, no conclusive evidence was obtained, and it is concluded that if vitamin E is present in olive oil the amount is not sufficient to be demonstrated in such a biological test.

E. M. Hume.

4837

LUCKMANN, F. H. and MELNICK, D. Tocopherol retention in oils aerated in glass and iron tubes. *J. Amer. Oil Chem. Soc.*, 1955, 32, 175-176. [Res. Labs., Best Foods, Inc., Bayonne, N.J.]

When hydrogenated soya bean oil was aerated in glass tubes the tocopherol content fell from an initial value of 0.087 per cent. to 0.019 per cent. after 20 hr. The addition of 2.0 p.p.m. Fe as iron stearate caused a fall to 0.011 per cent. after 20 hr. The addition of 0.08 per cent. isopropyl citrate esters retarded the loss of tocopherol in the oil with or without added iron. When the oil was aerated in iron tubes, its tocopherol content fell from 0.087 per cent. to 0.010 per cent. after 20 hr. With isopropyl citrate esters the fall was only to 0.033 per cent.—R. J. Ward.

4838

KOHLER, G. O., BEIER, E. and BOLZE, C. C. The stability of carotene and vitamin E in dehydrated forage crops. *Poultry Sci.*, 1955, 34, 468-471. [Cerophyll Labs., Inc., Kansas City, Mo.]

Dehydrated cereal grass which had been stored for 16 months at — 15° F. was thoroughly mixed and samples were stored in paper bags at 15°, 38°, 77°, 100° and 140° F.; other samples were stored in bottles under N. Carotene, vitamin E and moisture were estimated initially and at fortnightly intervals. The rate of loss of carotene and vitamin E followed the pattern of first order reactions. At 77° F. and above the loss of carotene and vitamin E was significant except in the gas-packed samples, in which the rate of loss of both constituents was negligible. A rise of 10° C. produced a percentage increase in the rate of loss of carotene of 75 ± 12 and of vitamin E of 53 ± 14 .

E. M. Cruickshank.

VITAMIN K

4839

FROST, D. V. and SPRUTH, H. C. Control of haemorrhagic condition in chickens with menadione sodium bisulfite. *Poultry Sci.*, 1955, 34, 56-64. [Abbott Labs., N. Chicago, Ill.]

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The successful control with menadione sodium bisulphite of haemorrhagic conditions occurring in large poultry flocks in the field is described. In laboratory tests on chicks given for 4 weeks a diet low in vitamin K, 0.05 per cent. arsenic acid failed to alter the blood clotting time; menadione

sodium bisulphite, from 90 to 180 mg. per ton diet, effectively reduced it. In chicks given a diet low in vitamin K and containing 0.1 per cent. sulphathiazine, the requirement for vitamin K was greatly increased, and in those conditions menadione sodium bisulphite was at least 4 times as effective as menadione for supplying vitamin K activity.
E. M. Cruickshank.

4840

FROST, D. V., PERDUE, H. S. and SPURTH, H. C. Hemorrhagic syndrome in poultry. *Federation Proc.*, 1955, 14, 434. *Proc. [Abbott Labs., N. Chicago, Ill.]*

4841

GRIMMER, P., MORRISON, W. D. and SCOTT, H. M. Vitamin K activity in vitamin B₁₂-antibiotic supplements. *Poultry Sci.*, 1955, 34, 243-245. [Illinois Agric. Exp. Stat.]

Of 6 supplements of vitamin B₁₂ and antibiotics tested, 2 were effective in restoring to normal the blood clotting time of chicks given a diet deficient in vitamin K. They contained, per lb., 0.056 and 0.17 g., respectively, of vitamin K activity.
E. M. Cruickshank.

4842

ARNON, D. I., WHATLEY, F. R. and ALLEN, M. B. Vitamin K as a cofactor of photosynthetic phosphorylation. *Biochim. biophys. Acta*, 1955, 16, 607-608. [Dept. Plant Nutrit., Univ. California, Berkeley.]

Menadione, vitamin K₃ and phthiocol and some other substituted naphthoquinones were found to act as co-factors in photosynthetic phosphorylation under anaerobic conditions in the presence of magnesium and ascorbate. Dicummarol and other derivatives which inhibited vitamin K activity in blood clotting inhibited its action also in the phosphorylation system. Flavin mononucleotide enhanced the effect of low concentrations of vitamin K in phosphorylating processes. Possible systems of energy transfer in photosynthetic phosphorylation systems are discussed.—A. M. Copping.

4843

DUCCI, H. Trastornos de la coagulación sanguínea. 1. Mecanismo de la coagulación. [Disturbances in the coagulation of the blood. 1. Mechanism of coagulation.] 2. Trastornos de la primera fase de la coagulación. [2. Disturbances of the first phase of coagulation.]

UGARTE, R. K. 3. Trastornos de la segunda fase de la coagulación. [3. Disturbances of the second phase of coagulation.]

HONORATO C., R. 4. Formación, retracción y destrucción de la fibrina. [4. Formation, retraction and destruction of fibrin.] *Rev. méd. Chile*, 1954, 82, 667-675; 675-679; 679-685; 686-689. [Cát. Med. E., Hosp. Salvador, Univ. Chile; Lab. Quim., Esc. Dent., Univ. Chile.]

A review.

VITAMIN B COMPLEX: GENERAL

4844

GIACALONE, O. and MONACO, P. Influenze delle vitamine B₆, PP, B₁₂, sui processi ricostruttivi nella rialimentazione dopo digiuno. [Influence of vitamins B₆, PP and B₁₂ on the processes of reconstruction during refeeding after a fast.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1570-1572. [Ist. Fisiol., Univ. Palermo.]

With the same technique as before (Abst. 2995, Vol. 24), groups of 5 rats of mean weight 170 g., which had been made to lose about 18 per cent. of bodyweight by semi-starvation, were fed to appetite on a diet of rice starch, casein, butter, salts and vitamins A, B, C, D, E and PP and riboflavin, with addition daily of 2 mg. vitamin B₆ (Benadon Roche) or 10 mg. vitamin PP (Benicot Roche), or 8 µg. vitamin B₁₂ (Rubramin Squibb), or no addition. Recovery of weight was no more rapid and food utilisation no better with any of the supplements than without them.

E. M. Hume.

4845

TRIBE, D. E. and GORDON, J. G. Choice of diet by rats. 5. Choice of diets containing various members of the vitamin B complex. *Brit. J. Nutrition*, 1955, 9, 200-202. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

See Abst. 373, Vol. 24.

Three comparable groups of rats were given a diet lacking in the vitamin B complex, or restricted or unrestricted amounts of the same diet with addition of pantothenate, nicotinic acid, inositol and *p*-aminobenzoic acid for a preliminary period. They were then offered for 15 days a different choice every day between pairs of diets including the one without B vitamins and a diet containing vitamin B₁ or the same with pyridoxine, or the same as the last with riboflavin, or the same as the last with pantothenate and nicotinic acid, or the same as the last with *i*-inositol and *p*-aminobenzoic acid. The rats which had been completely deprived of B vitamins showed a definite preference for diets

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containing vitamin B₁ and riboflavin; those partly deprived showed a similar but less marked preference.—A. M. Copping.

4846

TIPTON, S. R., WELDEN, F. and WEISS, A. K. Effect of riboflavin or thiamin deficiency on the response of liver and kidney adenosine-triphosphatase and D-amino acid oxidase to thyroid and adrenal alterations in rats. *Amer. J. Physiol.*, 1955, 180, 321-324. [Dept. Zool. Entomol., Univ. Tennessee, Knoxville.]

Adenosine triphosphatase activity was measured by the method of DuBois and Potter (Abst. 3117, Vol. 13) and D-amino-oxidase by that of Axelrod, Sober and Elvehjem (Abst. 2530, Vol. 10) in liver and kidney from rats having a complete, purified diet or a diet lacking vitamin B₁ or riboflavin or the whole vitamin B complex. On a complete diet both phosphatase and oxidase activity in the liver were increased in rats receiving thyroxine or thyroid gland powder. The kidney enzymes were not affected. Lack of vitamin B₁ or of the whole vitamin B complex did not affect phosphatase activity or its response to thyroid hormone. Lack of riboflavin produced an increase in phosphatase activity of the liver and a decrease in oxidase of both liver and kidney. Thyroid hormone had no effect on the enzyme activities of the kidney in riboflavin deficiency. Adrenalectomy had little or no effect on liver phosphatase activity, but adrenal cortical extract decreased liver phosphatase in rats on a normal diet.

A. M. Copping.

4847

LAMANNA, A. and TAVIANI, L. Influenza dell'acido folico, dell'acido pantotenico e della vitamina B₆ sulla produzione di anticorpi agglutinanti. [Effect of folic acid, pantothenic acid and vitamin B₆ on the production of agglutinating antibodies.] Influenza della vitamina B₆, dell'acido folico e dell'acido pantotenico sulla fagocitosi. [Effect of vitamin B₆, folic acid and pantothenic acid on phagocytosis.] *Acta vitaminol.*, 1955, 9, 57-60; 61-63. [Lab. Direzione Med. Centrale, Lepetit S.p.A., Milan.] French, English, German and Spanish summaries.

Five groups of 12 rats, weighing about 300 g. and maintained on a complete diet, were given by subcutaneous injection daily for 30 days, per kg. bodyweight, 0.6 mg. folic acid or 3 mg. Ca pantothenate or 0.8 mg. vitamin B₆ or all three or no supplement. After 15 days all were given on alternate days 3 intraperitoneal injections of a killed vaccine of *Salmonella typhi* H 901. Seven, 15, 30 and 45 days later the agglutinating titre of the rats' blood was determined, but no difference referable to the vitamins given was found.

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Leucocytes from rat's peritoneal exudate were incubated with cells of *Staphylococcus aureus* 131 in presence of pyridoxine hydrochloride, Ca pantothenate or folic acid or no addition. The number of leucocytes containing bacteria were counted. Pantothenate slightly depressed phagocytosis but otherwise there was no effect.

Fifty male rats weighing about 250 g. were treated for 15 days with the same 3 vitamins, separately or together or not at all. They were then injected intraperitoneally with *Staph. aureus* 131; 3 hr. later peritoneal exudate was removed, and the degree of phagocytosis by the leucocytes in it was estimated as before. There was no effect of the vitamins on phagocytosis except a small inhibitory one by pyridoxine. [Tables 1, 2 and 3 appeared subsequently, pp. 128-129.]

E. M. Hume.

4848

AXELROD, A. E. and PRUZANSKY, J. Effect of vitamin deficiencies upon antibody production. *Federation Proc.*, 1955, 14, 427-428. *Proc. [Dept. Biochem., Sch. Med., Univ. Pittsburgh, Pa.]*

4849

PRUZANSKY, J. and AXELROD, A. E. Effect of B-complex deficiencies on rat serum complement. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 179-181. [Inst. Pathol., W. Reserve Univ., Cleveland, Ohio.]

Serum complement was estimated with sheep's red cells in blood from rats deprived for 6 or 8 weeks of vitamin B₆, riboflavin, biotin or pteroyl-glutamic acid. Deprivation of vitamin B₆ or riboflavin lowered the serum complement value, but the effect appeared to be connected with the low food intake, since similar results were obtained in non-deprived rats, pair-fed with those deprived of riboflavin. The rate of regeneration of serum complement in rats deprived of vitamin B₆ and riboflavin was similar to that in "non-deprived" animals.—A. M. Copping.

4850

KUPKA, E. and NEUHOLD, K. Über die Wirkung einiger Vitamin-B-Faktoren auf die experimentelle Diphtherie-Toxikose des Goldhamsters. [Action of certain vitamin B factors on experimental diphtheria toxicosis in the golden hamster.] *Ztschr. Vitamin-, Hormon- Fermentforsch.*, 1954, 6, 406-421. [Zool. Inst., Univ. Graz.] English and French summaries.

Studies were made with about 600 golden hamsters on the effect of the vitamin B complex on the response to lethal doses of diphtheria toxin. Preliminary tests with commercial preparations suggested that the vitamin B complex gave no protection, but administration of vitamin B₁ or

sodium bisulphite, from 90 to 180 mg. per ton diet, effectively reduced it. In chicks given a diet low in vitamin K and containing 0.1 per cent. sulphathiazine, the requirement for vitamin K was greatly increased, and in those conditions menadione sodium bisulphite was at least 4 times as effective as menadione for supplying vitamin K activity.
E. M. Cruickshank.

4840

FROST, D. V., PERDUE, H. S. and SPURTH, H. C. Hemorrhagic syndrome in poultry. *Federation Proc.*, 1955, 14, 434. *Proc.* [Abbott Labs., N. Chicago, Ill.]

4841

GRIMINGER, P., MORRISON, W. D. and SCOTT, H. M. Vitamin K activity in vitamin B₁₂-antibiotic supplements. *Poultry Sci.*, 1955, 34, 243-245. [Illinois Agric. Exp. Stat.]

Of 6 supplements of vitamin B₁₂ and antibiotics tested, 2 were effective in restoring to normal the blood clotting time of chicks given a diet deficient in vitamin K. They contained, per lb., 0.056 and 0.17 g., respectively, of vitamin K activity.
E. M. Cruickshank.

4842

ARNON, D. I., WHATLEY, F. R. and ALLEN, M. B. Vitamin K as a cofactor of photosynthetic phosphorylation. *Biochim. biophys. Acta*, 1955, 16, 607-608. [Dept. Plant Nutrit., Univ. California, Berkeley.]

Menadione, vitamin K₃ and phthiocol and some other substituted naphthoquinones were found to act as co-factors in photosynthetic phosphorylation under anaerobic conditions in the presence of magnesium and ascorbate. Dicoumarol and other derivatives which inhibited vitamin K activity in blood clotting inhibited its action also in the phosphorylation system. Flavin mononucleotide enhanced the effect of low concentrations of vitamin K in phosphorylating processes. Possible systems of energy transfer in photosynthetic phosphorylation systems are discussed.—A. M. Copping.

4843

DUCCI, H. Trastornos de la coagulación sanguínea. 1. Mecanismo de la coagulación. [Disturbances in the coagulation of the blood. 1. Mechanism of coagulation.] 2. Trastornos de la primera fase de la coagulación. [2. Disturbances of the first phase of coagulation.]

UGARTE, R. K. 3. Trastornos de la segunda fase de la coagulación. [3. Disturbances of the second phase of coagulation.]

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tinic acid, or of vitamin B₁₂ in a certain optimum amount, protected the animals to some extent as shown by prolongation of the survival time.

A. M. Copping.

4851

RAMASARMA, G. B., SHENOY, K. G. and PINTO, P. V. G. Vitamin and essential amino acid content of a domestic proteolysed liver. *J. Indian Med. Assoc.*, 1955, **24**, 575-578. [Res. and Control Div., Raptakos, Brett and Co., Ltd., Bombay.]

A new method for preparing a proteolysed liver product is described. Sixty kg. minced liver and 6 kg. minced pancreas were heated to 53° C. for 3 hr. in 180 litres distilled water. The mixture was then heated at 90° C. for ½ hr. to inactivate enzymes and coagulate the proteins. It was then passed through a filter press and the clear filtrate was concentrated to a syrupy consistency under reduced pressure.

Except for phenylalanine and arginine the content of essential amino-acids was similar to that obtained from beef liver after digestion with papain. The content of B vitamins, estimated microbiologically, was, per g. dry matter, vitamin B₁₂ 8.3 µg., citrovorum factor 9.1 µg., folic acid 10.3 µg., vitamin B₁ hydrochloride 11.8 µg., riboflavin 0.12 mg., nicotinic acid 0.74 mg., vitamin B₆ 20.1 µg., calcium pantothenate 0.32 mg., biotin 7.63 µg. These values were again similar to those found after papain digestion of beef liver.

The therapeutic value of proteolysed liver in the treatment of anaemia is discussed.—J. S. Thomson.

4852

CONRAD, H. R. and HIBBS, J. W. Thiamine and riboflavin in various fractions of rumen contents of young calves. *J. Dairy Sci.*, 1955, **38**, 548. [Ohio Agric. Exp. Stat.]

In young calves analysis of total rumen contents, strained and centrifuged fractions and residues showed that rumen bacteria are a rich source of vitamin B₁ and riboflavin, which are bound in the bacterial cells. Rumen protozoa were rich in riboflavin but their vitamin B₁ content was no higher than that of the feed.—A. M. Copping.

4853

KOTSCHIEVAR, L. H. B-Vitamin retention in frozen meat. *J. Amer. Dietetic Assoc.*, 1955, **31**, 589-596. [Montana State Univ., Missoula.]

The effect of freezing, frozen storage, thawing, and, cooking with or without thawing, on the vitamin B₁, riboflavin and nicotinic acid content of liver was studied. When liver was frozen for 60 days, there was, in general, substantial loss of vitamin B₁ and riboflavin and some gain in nicotinic acid. In liver cooked in the frozen state,

slightly more vitamin B₁ and riboflavin and less nicotinic acid were retained than in liver cooked after thawing.

The quantity and vitamin content of the drip from thawing liver and from some meat cuts are tabulated. The quantity of drip was greater from liver and beefsteak than from other cuts of beef or from cuts of pork and lamb. The vitamin content of the drip was similar to that of the source of the drip before freezing.—F. C. Aitken.

4854

McCLYMONT, G. L. and DUNCAN, D. C. Studies on nutrition of poultry. 5. Comparative value of synthetic riboflavin and natural vitamin B complex rich feeds for supplementing wheat-meal rations for hatchability.

McDONALD, M. W. and McCLYMONT, G. L. 6. The effect of a simplified breeding ration on hatchability, and growth and viability of chickens. *Austral. Vet. J.*, 1955, **31**, 91-92; 93-97. [Nutrit. Res. Lab., Vet. Res. Stat., Glenfield.]

For earlier parts see Absts 5225, Vol. 17; 363, Vol. 18; 2522, Vol. 23; 4542, Vol. 24.

5. Three groups of 10 hens, kept in pens in which the litter was changed every week, were given to appetite a basal ration of meatmeal 10, NaCl 0.5, and ground wheat 89.5 parts with supplements of manganese sulphate and vitamins A and D₃, and with 3 p.p.m. of riboflavin. After a preliminary period of 2 months, all eggs laid during the next 3 months were incubated. In that time egg production was 57 per cent., 93 per cent. of the eggs were fertile, and 80 per cent. of them hatched.

For 6 other groups part of the wheat and meatmeal was replaced by a mixture of alfalfa, bone and liver meals, buttermilk, and whey powders, bran and pollard or by alfalfa meal alone or with combinations of these feeds; for a seventh group pantothenic acid in the basal ration was increased to 10 p.p.m. In none of the groups did the results differ significantly from those for the group given the basal ration.

6. A breeding ration contained, per cent., ground wheat 61, meatmeal 8.5, bran 15, pollard 15, and salt 0.5 with vitamin A emulsion and 1 mg. riboflavin per lb. It was given unmodified or varied by adding a vitamin B complex mixture or by replacing 10 parts of wheat with 5 parts each of alfalfa meal and whey powder, or by removing the riboflavin. All the birds had access to shell grit. For the first 3 groups egg production, fertility and hatching capacity did not differ significantly, being, respectively, per cent., 52, 85, and 82; 55, 91 and 87; 54, 87 and 86. For the fourth group with riboflavin omitted the values, based on only one replication and excluded from the analysis, were 43, 78 and 28.

Chicks from hens in the 4 groups in the order just given were given standard mashers with 20 per cent. meatmeal, and the mean weight in g. and number of chicks were 104, 701; 106, 862; 109, 752, and 104, 61. In good conditions the mortality rates were 6, 6, 5 and 13 per cent., and in 2 hatches in which accidental chilling occurred

the rates were 19, 12, 5 and 11 per cent. The low mortality rate in the third group under the stress of cold, though not statistically significant, is considered as evidence that progeny from the groups getting alfalfa and whey powder did have greater resistance.—K. J. Carpenter.

See also Absts. 4716, 4749.

VITAMIN B₁ (ANEURIN, THIAMINE)

4855

ASAHINA, K., YOSHINAKA, K. and YOSHIDA, T. Statistical quality control for compressed tablets. 2. Variance of vitamin B₁ content in the granule. *J. Pharm. Soc. Japan*, 1954, **74**, 1384-1387. [Takeda Pharmaceutical Industries, Ltd., Tokyo.] English summary.

4856

ROSSI-FANELLI, A., MONDOVI, B. and BOFFI, V. Separazione elettroforetica su carta degli esteri fosforici della tiamina. 1. [Separation by electrophoresis on paper of the phosphoric esters of vitamin B₁. 1.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1330-1333. [Ist. Chim. Biol., Univ. Rome.]

4857

YOSHIDA, S. Studies on the allied compounds of vitamin B₁. 16. S-acylthiamine derivatives. *J. Pharm. Soc. Japan*, 1954, **74**, 993-997. [Takamine Res. Lab., Sankyo Co., Ltd., Tokyo.] English summary.

4858

KAWASAKI, H. Studies on vitamin B₁ and related compounds. 63. Thiol-type thiamine derivatives. (4). *J. Pharm. Soc. Japan*, 1954, **74**, 1189-1193. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.] English summary.

4859

MATZUKAWA, T. and YURUGI, S. Studies on vitamin B₁ and related compounds. 64. On a new derivative of thiamine with cysteine. *J. Pharm. Soc. Japan*, 1954, **74**, 1373-1377. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.] English summary.

4860

MATZUKAWA, T., KAWASAKI, H., IWATSU, T. and YURUGI, S. Synthesis of allithiamine and its homologues. *J. Vitaminol., Japan*, 1954, **1**, 13-26. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

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Allithiamine, an allylsulphide derivative of vitamin B₁ obtained previously by reaction between the vitamin and an extract of garlic, was synthesised by reactions between vitamin B₁ and thiol-sulphates, thiosulphates, thiocyanates and other sulphur compounds in alkaline solution. Various homologues were obtained and characterised.

A. M. Copping.

4861

YURUGI, S. Studies on vitamin B₁ and related compounds. 62. Synthesis of allithiamine homologs (5). *J. Pharm. Soc. Japan*, 1954, **74**, 1157-1161. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.] English summary.

4862

MOURIQUAND, G., EDEL, V. and CHIGHIZOLA, R. Sur l'action antibériberique du monophosphate de thiamine. [Antiberiberic action of vitamin B₁ monophosphate.] *C.R. Soc. Biol.*, 1955, **149**, 131-132.

Vitamin B₁ monophosphate was tested with pigeons and proved to have an effect against beriberi comparable with that of the more commonly used vitamin B₁ chloride hydrochloride. It was less toxic than the hydrochloride if given in excessive doses even up to 1000 mg. An injection of 200 mg. vitamin B₁ chloride hydrochloride was rapidly fatal to pigeons.—A. M. Copping.

4863

GRANA, E. Azione immediata della vitamina B₁ e della cocarbossilasi sul Q.R. e sulla produzione calorica di ratti in avitaminosi B₁. [Immediate action of vitamin B₁ and of cocarboxylase on the respiratory quotient and heat production of rats deprived of vitamin B₁.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1781-1783. [Ist. Fisiol., Univ. Pavia.]

Heat production and R.Q. were measured in rats weighing from 60 to 70 g., deprived and not deprived of vitamin B₁, and before and 4 hr. after injection with 1 mg. or 50 µg. of vitamin B₁ or cocarboxylase. No difference was found between the effects of vitamin B₁ and of cocarboxylase. On injection of either substance, the R.Q.

rose and the heat production fell, more so in the deprived than in the non-deprived animals, except that with the smaller dose the effect on the R.Q. was slightly greater in the non-deprived rats.

E. M. Hume.

4864

CASELLA, C. and DE CARO, L. G. Velocità di conduzione del potenziale d'azione dello sciatico di ratti trattati con neopirithiamina (NP). [Rate of conduction of action potential in the sciatic nerve of rats treated with neopyrithiamine.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1779-1781. [Ist. Fisiol., Univ. Pavia.]

It had previously been found that deprivation of vitamin B₁ did not change the rate of conduction in nerve (Abst. 409, Vol. 24). The same tests were made with rats weighing from 75 to 85 g. given daily for from 5 to 7 days from 5 to 6 mg. neopyrithiamine. The rats lost weight rapidly, and the mean rate of transmission in the sciatic nerve was slower by 13.6 per cent. than in rats not given neopyrithiamine. The difference was significant. The previous failure to demonstrate retardation is ascribed to the incomplete depletion of vitamin B₁ in the nerve.—E. M. Hume.

4865

DE CARO, L. and RENDI, G. On the metabolic significance of blood pyruvate in B₁ avitaminosis. *Experientia*, 1955, 11, 196-197. [Inst. Human Physiol., Univ. Pavia.]

Recent work of Rindi *et al.* (Abst. 3020, Vol. 24) showed that the accumulation of pyruvate in the blood in vitamin B₁ deficiency could be directly correlated with the degree of adrenal hypertrophy. Blood pyruvate was estimated in rats deprived of vitamin B₁ for periods of up to 36 days and in deprived rats after adrenalectomy or hypophysectomy. The pyruvate content of the blood was significantly lower when the pituitary or adrenal glands had been removed. It is suggested that hyperfunction of the pituitary and adrenal system may partly explain the increase of pyruvate in the blood in vitamin B₁ deficiency but that retardation of oxidative mechanisms may slow down the process of removal from the blood. The question is discussed in relation to carbohydrate metabolism in rats deprived of vitamin B₁.—A. M. Copping.

4866

ZAMBOTTI, V. and LORENZI, G. L. Studi sulla biochimica della ossificazione. [Biochemical studies of ossification.] 1. Presenza di cocarbossilasi nella cartilagine preossea del coniglio giovane. [I. Presence of cocarboxylase in uncalcified cartilage of young rabbits.]

LORENZI, G. L. 2. Contenuto in acido piruvico della cartilagine preossea del coniglio in via di

sviluppo. [2. Pyruvic acid content of uncalcified cartilage in the developing rabbit.]

ZAMBOTTI, V. and LORENZI, G. L. 3. Presenza negli estratti di cartilagine preossea di un fattore inibente l'attività cocarbossilasi. [3. Presence in extracts of uncalcified cartilage of a factor inhibiting cocarboxylase.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1953-1954; 1954-1955; 1955-1957. [Ist. Chim. Biol., Univ. Pavia.]

1. In young rabbits the concentration of cocarboxylase in proliferating cartilage was greater the more rapid the growth. In young Giant Belgian rabbits the concentration was especially high.

2. The mean concentration of pyruvic acid in proliferating cartilage of 11 rabbits, 20 days old, was 6.7 mg. per 100 g. fresh tissue. Variation was wide with a maximum value of 18. The concentration appeared to diminish with increasing age.

3. An acidified aqueous extract was prepared from proliferating cartilage of young rabbits. Cocarboxylase was estimated in one portion of the extract: to another portion a known amount of cocarboxylase was added, but on estimation the amount found was less than the sum of that added and that originally found present. The size of the deficit was greater, the smaller the amount of cocarboxylase found to have been originally present. On dialysis through a collodion membrane, all the cocarboxylase was recovered. An inhibitory factor of large molecular size was postulated in the cartilage extract. If the extract was boiled for 5 min. the effect was lost.—E. M. Hume.

4867

MONFOORT, C. H. De invloed van thiamine deficiënte voeding op enige enzymen in de spieren van de duif. [The influence of a vitamin-B₁-deficient diet on some enzymes in the muscles of the pigeon.] *Thesis, Univ. Utrecht*, 1953, pp. 101. English summary.

Literature dealing with the activity of vitamin B₁ pyrophosphate as cocarboxylase in the several reactions in which it takes part is reviewed. The work is a continuation of that of Gruber and Meyer (Abst. 330, Vol. 21). Homogenates of pigeon muscle from breast, left ventricle and leg were incubated at 37°C. anaerobically with pyruvate, α -ketoglutaric acid, acetaldehyde or propionaldehyde, alone or with pyruvate at pH 6.2. CO₂ was estimated by Warburg's method.

The decomposition of pyruvate or pyruvate and acetaldehyde to give acetoin and CO₂ (pyruvic carboxylase), of acetaldehyde to give acetoin (acetaldehyde condensing enzyme) and of α -ketoglutarate to succinic semi-aldehyde and CO₂ (α -ketoglutaric carboxylase) is catalysed by enzymes containing vitamin B₁ pyrophosphate.

N.A. and R., October 1955

Comparison of muscle from pigeons on a diet rich in vitamin B₁ and from pigeons deprived of the vitamin for 4 or 12 days showed that the greater the concentration of vitamin B₁ pyrophosphate in the homogenate, the greater the formation of acetoin or succinic semi-aldehyde. (The acetaldehyde condensing series did not prove suitable for the work.) There was no uniform relation between the rate of disappearance of the pyrophosphate and the enzyme activity either in the several muscles or in the same muscle. Activity was always less in leg muscle. In general α -ketoglutaric carboxylase appeared to survive in vitamin B₁ deficiency longer than pyruvic carboxylase. The prosthetic group alone was lost; addition of the pyrophosphate to the homogenate restored full activity.—I. Leitch.

4868

GOETHART, G. Cytochemische onderzoeken over het thiamine pyrophosfaat. [Cytochemical studies on vitamin B₁ pyrophosphate.] *Thesis, Univ. Utrecht*, 1953, pp. ix + 62. English summary.

Normal and vitamin-B₁-deprived rats and mice were used. Vitamin B₁ pyrophosphate was estimated in nuclear, mitochondrial, submicroscopic and soluble fractions of homogenised liver and mouse hepatoma. The occurrence of complications such as the decomposition of the pyrophosphate during the processing of tissues from the normal but not from the deprived animals is discussed. There were apparently 2 forms of the pyrophosphate of which one disappeared when the diet was deficient. If allowance was made for some degree of impurity of the fractions, it appeared that the pyrophosphate was present chiefly in the mitochondrial and soluble fractions; one fraction was not characterised by one form of the pyrophosphate. The amount in the soluble fraction did not depend on the strength of the solvent, and was not altered by removal of protein; pyrophosphate was not adsorbed on mitochondria or removed by the processing.

Tests in which homogenates and the several fractions from deprived rats were incubated anaerobically with Na pyruvate showed that addition of vitamin B₁ pyrophosphate significantly increased the production of acetoin and CO₂ by the homogenates, but only by the mitochondria and soluble fractions together. There was therefore no clear evidence that any vitamin B₁ pyrophosphate enzyme occurred in the soluble fraction. I. Leitch.

4869

CACIOPPO, F., DELLA PIETRA, G. and COLTORTI, M. Studio di attività enzimatiche nell'avitaminosi B₁ del colombo. 1. Fosfatasi alcalina. [Studies

of enzyme activity in vitamin B₁ deficiency of pigeons. 1. Alkaline phosphatase.]

CACIOPPO, F., COLTORTI, M. and RICCIO, L. 2. Fosfatasi acida. [2. Acid phosphatase.]

COLTORTI, M. and DELLA PIETRA, G. 3. Sulla liberazione di fosfati inorganici dall'ATP. [3. Liberation of inorganic phosphates from adenosine triphosphate.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1829-1831; 1831-1833; 1833-1834. [Ist. Chim., Fac. Med., Univ. Naples.]

1. Pigeons were maintained on a diet of polished rice till signs of deficiency appeared. In comparison with normal pigeons, the mean content of alkaline phosphatase was decreased in the cerebral hemispheres, cerebellum and optic lobes; it was increased in the liver, kidneys and heart muscle, but in pectoral muscle it was the same.

2. Acid phosphatase was estimated in the same way in the cerebral hemispheres, kidneys and liver. The mean amount was increased in the liver of deprived birds, but in the other tissues was unchanged.

3. In a similar experiment the mean amount of inorganic P liberated from adenosine triphosphate by pectoral muscle tissue was somewhat less in deprived than in non-deprived birds.

E. M. Hume.

4870

QUAGLIARIELLO, E., DELLA PIETRA, G. and PORCELLATI, G. Amidazione enzimatica dell'acido nicotinico in colombi normali ed in avitaminosi B₁. [Enzymic amidation of nicotinic acid in normal pigeons and pigeons deprived of vitamin B₁.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1907-1908. [Ist. Chim., Fac. Med., Univ. Naples.]

The capacity to convert ammonium nicotinate into nicotinamide was estimated in homogenates of kidney and liver from pigeons maintained on a diet of polished rice till signs of deficiency occurred, and from normal birds. In the deprived birds the capacity was greatly reduced.—E. M. Hume.

4871

CERRECEDO, L. R. and EICH, S. Studies on thiamine analogues. 4. Neopyrithiamine and oxynopyrithiamine. A comparison of their effects *in vivo* and *in vitro*. *J. Biol. Chem.*, 1955, **213**, 893-897. [Dept. Biochem., Fordham Univ., New York.]

The 4-hydroxypyrimidyl derivative of neopyrithiamine was prepared and termed oxynopyrithiamine. The new compound did not inhibit the phosphokinase of adenosine triphosphate and vitamin B₁ in rat liver *in vitro* (cf. Abst. 4410, Vol. 24). In studies with mice it was observed that oxynopyrithiamine differed from neopyrithiamine in not inhibiting vitamin B₁ *in vivo*. It appeared that the inhibitory properties of

neo-pyrimthiamine were related to the presence of a 4-aminopyrimidyl group, and were lost when a 4-hydroxypyrimidyl group was substituted.

A. M. Copping.

4872

FUJITA, A., NOSE, Y. and KURATANI, K. The second type of bacterial thiaminase. *J. Vitaminol., Japan*, 1954, 1, 1-7. [Biochem. Inst., Kyoto Prefectural Univ. Sch. Med., Kawaramachi.]

A new thiaminase was obtained from *Bacillus aneurinolyticus*, Kimura and Aoyama, and was found to differ from the enzyme obtained from *B. thiaminolyticus*, Matsukawa and Misawa. The new enzyme split vitamin B₁ into its thiazole and pyrimidine components and was not activated by aniline, pyridine, quinoline or other amines which activate the thiaminases previously described. The name thiaminase II is suggested for the enzyme, which has the additional property of forming a base-exchanged pyrimidine derivative from pyrimidinmethanol and a base such as aniline.—A. M. Copping.

4873

MATSUKAWA, T. and YURUGI, S. On thiamine destructive factor. *J. Vitaminol., Japan*, 1954, 1, 27-38. [Res. Lab., Takeda Pharmaceutical Industries, Ltd., Osaka.]

Chemical degradation of vitamin B₁ was obtained in the presence of sulphurous acid in aqueous solution. The reaction was accelerated by addition of pyridine, quinoline, nicotinic acid, aniline, *p*-aminobenzoic acid or indole and, at the same time, the thiazole portion of the molecule was replaced by the amine compound. The reaction depended on pH, and in many respects the action of sulphurous acid resembled that of a thiaminase.

A. M. Copping.

4874

MATSUKAWA, D., CHANG, S., MISAWA, H., FUJIMIYA, M., KOBAYASHI, N., HORIKAWA, Y. and TAKATO, K. Studies on the thiamine deficiency due to bacterial thiaminase. 1. Investigations on intestinal contents. *J. Vita-*

minol., Japan, 1954, 1, 43-48. [Dept. Med., Niigata Univ. Sch. Med., Asahi-machi.]

Thiaminase activity found in the faeces of patients with beriberi or gastro-intestinal disorders was associated with *Bacillus thiaminolyticus*, Matsukawa and Misawa. In 2 patients examined at autopsy, the enzyme occurred mainly in the lower ileum, caecum, colon and rectum. In patients with thiaminase activity in the gut, ingested vitamin B₁ was rapidly destroyed and little was excreted in the urine or faeces.

When 29 healthy subjects were given *B. thiaminolyticus* by mouth only 2 showed thiaminase in the faeces, and it disappeared within 12 days. It was considered that the organism could not grow in the intestine of most healthy persons.

A. M. Copping.

4875

HAWK, E. A. and MICKELSEN, O. Nutritional changes in diets exposed to ethylene oxide. *Science*, 1955, 121, 442-444. [Lab. Biochem. Nutrit., Nat. Insts. Health, Bethesda, Md.]

Rats fed on purified and stock diets which had previously been exposed to ethylene oxide lost weight and some died with their visible stores of fat completely depleted. The treated purified diet was found to be deficient in vitamin B₁. Vitamin B₁ dispersed in starch and treated with ethylene oxide retained its full activity but was destroyed when choline chloride was present. Two groups of rats fed on the treated purified diet with added untreated vitamin B₁ or on a diet deficient in vitamin B₁, similarly treated but with no additional vitamin B₁, did not at first gain weight; later the first group did so, but not as much as rats on an untreated diet. With the treated stock diet, addition of vitamin B₁ or a complete vitamin mixture did not stimulate growth significantly; vitamin B₁ was thought not to be the only substance affected. It is suggested that foods should not be treated with ethylene oxide until the full effects of it have been ascertained.

A. Hepburn.

See also Abst. 4722.

RIBOFLAVIN

4876

YAGI, K., OKUDA, J. and MATSUOKA, Y. Separation of flavins by ion-exchange resins. *Nature*, 1955, 175, 555-556. [Dept. Biochem., Sch. Med., Nagoya Univ.]

Riboflavin, flavin mononucleotide and flavin adenine dinucleotide were separated on a Dowex-1 anion exchange column, 20 mm. high, by frac-

tional elution at a constant pH of 8.8 with borax solution containing increasing amounts of NaCl, or by changing the pH and using different concentrations of NH₄Cl and NaCl.—A. Hepburn.

4877

DE RITTER, E., SCHEINER, J., JAHNS, F. W., DREKTER, L. and RUBIN, S. H. Synthetic

N.A. and B., October 1955

riboflavin-5'-phosphate. *J. Amer. Pharm. Assoc.*, 1955, **44**, 1-5. [Nutrit. Labs., Hoffman-La-Roche, Inc., Nutley, N.J.]

Further confirmation was obtained of the full biological activity of synthetic riboflavin-5'-phosphate in promoting growth of weanling rats when given by mouth or intramuscular injection in curative or prophylactic tests, and in microbiological estimations by the method of Snell and Strong. By comparing its excretion after oral doses with that of riboflavin it was found to be completely available to human beings also. As it is more easily destroyed than riboflavin, careful protection from light must be ensured. Acid hydrolysis also destroys it and the phosphate group is rapidly split away from it by enzymic hydrolysis with clarase at pH 4.5 and 45° C.

K. H. Coward.

4878

GAMBASSI, G. and MAGGI, V. Estere riboflavin-fosforico e frazioni fosforate. [Riboflavin phosphoric esters and phosphorylated fractions.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1644-1646. [Ist. Patol., Univ. Bari.]

4879

GAMBASSI, G. and DEL GATTO, L. Estere riboflavin-fosforico e catalasi. [Riboflavin phosphoric esters and catalase.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1646-1648. [Ist. Patol., Univ. Bari.]

4880

ARNICHI, L. and MORGAN, A. F. Effect of epinephrine on carbohydrate metabolism in riboflavin-deficient dogs. *Federation Proc.*, 1955, **14**, 427. *Proc.* [Dept. Home Econ., Univ. California, Berkeley.]

4881

RODRIGUEZ, N. M. and CERECEDO, L. R. Changes in the size of certain organs of tumor-bearing rats, and the protective effect of riboflavin in rats fed 4-dimethylaminoazobenzene. *Growth*, 1955, **19**, 31-37. [Dept. Biochem., Fordham Univ., New York.]

In rats receiving 4-dimethylaminoazobenzene in the diet, the spleen, liver, kidneys, lungs and testes were enlarged in relation to bodyweight. The effect of the carcinogen on the size of all the organs except the testes was counteracted when a large excess of riboflavin was included in the diet. Enlargement of the spleen, liver and lungs, but not of the kidneys and testes, occurred also in rats bearing Walker carcinoma 256. Enlargement of the spleen was seen in rats with tumours in size up to 30 per cent. of bodyweight; when the tumour was larger the relative size of the spleen

decreased. With tumours amounting to more than 25 per cent. of bodyweight the size of the lungs decreased.—A. M. Copping.

4882

BAIRD, C. D. C., NELSON, M. M., MONIE, I. W., WRIGHT, H. V. and EVANS, H. M. Congenital cardiovascular anomalies produced with the riboflavin antimetabolite, galactoflavin, in the rat. *Federation Proc.*, 1955, **14**, 428. *Proc.* [Inst. Exp. Biol., Univ. California, Berkeley.]

4883

SESSA, T. and FUSCO, M. La riboflavinemia nella intossicazione acuta sperimentale da tallio. [Blood riboflavin in acute experimental thallium poisoning.] *Acta vitaminol.*, 1955, **9**, 14-16. [Ist. Med. Lavoro, Univ. Naples.] French, English, German and Spanish summaries.

The signs of thallium poisoning are considered to be reminiscent of those of riboflavin deficiency.

Riboflavin was estimated by a fluorescence method in the blood of 7 rabbits weighing about 2 kg., before and after administration on alternate days of an oral dose of 0.2 g. thallium carbonate. The animals did not survive more than 3 doses. The values for riboflavin in the blood were on the average 15 per cent., range from 11.1 to 20 with one value of 48 per cent., lower after than before administration of thallium.—E. M. Hume.

4884

TERRILL, S. W., AMMERMAN, C. B., WALKER, D. E., EDWARDS, R. M., NORTON, H. W. and BECKER, D. B. Riboflavin studies with pigs. *J. Animal Sci.*, 1955, **14**, 593-603. [Illinois Agric. Exp. Stat.]

With a purified diet containing only 0.05 mg. riboflavin per lb., 3 groups of 6 weanling pigs were given 0.8 or 1.4 mg. riboflavin per lb. feed or no addition. The trial was preceded by a depletion period of 2 weeks on the purified diet and lasted for 7 weeks. Weight increase and feed consumption were significantly greater in the groups given added riboflavin and, when adjusted for feed intake, the weight increase was still significantly higher. Between the groups given riboflavin there was little difference. Blood counts showed no difference.

In a second experiment 3 groups of 6 pigs received the purified diet with supplements of 0.6, 0.8 or 1.0 mg. riboflavin per lb. feed. There was no significant difference between the groups in feed consumption or final weight.

Supplements of 10 mg. chlortetracycline, 15 µg. vitamin B₁₂, and 0.4 mg. or 1.2 mg. riboflavin, per lb. feed, alone or together, were compared in a

third experiment. Weight increase with 0.4 mg. riboflavin only was significantly less than with the other supplements before adjustment for feed intake, but not after, which suggested that most of the pig's weight response to riboflavin is related to voluntary intake of feed. During the first half of the experiment chlortetracycline caused a significant increase in weight, before adjustment for feed intake. There was no significant interaction between treatments, and it was concluded that the antibiotic and vitamin B₁₂ did not influence the riboflavin requirements of pigs. The requirement of a weanling pig for riboflavin is suggested as about 0.6 mg. per lb. feed, in the readily available form used in the experiments. In normal feeds it may not be so readily available, and to be satisfactory the feed might have to yield greater amounts on analysis.—T. D. Bell.

4885

VILLELA, G. G., MITTIERI, E. and RIBEIRO, L. P. Flavoproteins in the blood plasma of the Brazilian snake *Bothrops jararaca*. *Arch. Biochem. Biophys.*, 1955, 56, 270-273. [Biochem. Lab., Inst. Oswaldo Cruz, Rio de Janeiro, Brazil.]

Fresh or dried samples of venom from *Bothrops jararaca* were almost devoid of xanthine oxidase activity as measured manometrically, and molybdenum was not detected spectrographically. Results showed also that the flavins of blood plasma from *B. jararaca* were linked to the protein fractions in the form of flavin adenine dinucleotide bound only to the L-amino-acid oxidase, since no xanthine oxidase activity was detected. The liver of the snake was poor in xanthine oxidase activity, compared with rat liver.—G. F. Garton.

NICOTINIC ACID (NIACIN)

4886

FISHER, H., SCOTT, H. M. and JOHNSON, B. C. Liver pyridine nucleotide content as related to dietary tryptophan and nicotinic acid in the chick. *Arch. Biochem. Biophys.*, 1955, 56, 130-136. [Div. Animal Nutrit., Dept. Animal Sci., Illinois Agric. Exp. Stat., Urbana.]

Four groups of 7 chicks were given a synthetic basal diet containing no nicotinic acid and 0.15 per cent. tryptophan, the amount found in an earlier experiment (Title 1952, Vol. 25) to be the minimum required by chicks when nicotinic acid was adequate. Three of them were given in addition 0.15 per cent. nicotinic acid, or 0.25 per cent. tryptophan, amounts which are equimolecular, or both. After 3 weeks the average bodyweights for the untreated and treated groups in that order were 126, 157, 147 and 142 g. The birds were killed and pyridine nucleotide was estimated in the liver; mean values for the groups in the same order were 502, 885, 608 and 1457 μ g. per g. fresh tissue.

Livers were analysed also from birds in the earlier experiment (Title 1952, Vol. 25) which was of factorial design with levels of nicotinic acid 0, 2.5, 5, 10 and 20, and of tryptophan 0.1, 0.15, 0.2, 0.3 and 0.4, mg. per 100 g. diet. The level of pyridine nucleotide did not rise as the nicotinic acid was increased but in some groups it was greater with the larger amounts of tryptophan.

It was concluded that in equimolecular amounts nicotinic acid was more efficient than tryptophan in promoting storage of pyridine nucleotide in the liver of chicks but that in ordinary amounts more was contributed to the storage of pyridine nucleotide by tryptophan than by nicotinic acid.

H. Chick.

4887

McDANIEL, E. G., HUNDLEY, J. M. and SEBRELL, W. H. Niacin and anti-niacin activity of 3-acetylpyridine in dogs. *J. Nutrition*, 1955, 55, 623-637. [Nat. Inst. Health, Bethesda, Md.]

The effect of 3-acetylpyridine was studied in dogs having maize or purified diets which produced blacktongue unless nicotinic acid was given. A daily dose of from 25 to 260 mg. 3-acetylpyridine protected dogs from blacktongue over long periods, and daily doses of from 25 to 60 mg. were curative. Urine analysis showed that 3-acetylpyridine had about one-sixth of the activity of nicotinic acid in increasing urinary excretion of N¹-methylnicotinamide in normal dogs having a stock diet. In dogs deficient in nicotinic acid, ability to convert 3-acetylpyridine to nicotinic acid was decreased, as was shown by the small amount of N¹-methylnicotinamide excreted. Large doses of 3-acetylpyridine were toxic for deficient dogs but were tolerated by normal dogs; the toxic effects were prevented if nicotinic acid was given at the same time, but could not be overcome once toxic signs had developed. It seemed that 3-acetylpyridine had activity for dogs both as nicotinic acid and anti-nicotinic-acid, according to the size of the dose and the state of the animals.—A. M. Copping.

4888

McDANIEL, E. G., HUNDLEY, J. M. and SEBRELL, W. H. (Jr.) Alloxan diabetes and tryptophan-niacin metabolism. *Federation Proc.*, 1955, 14, 443-444. *Proc.* [Nat. Inst. Health, Bethesda, Md.]

4889

KHADES, S. I. O mekhanizme deisviya nikotinovi kisloty. [Mode of action of nicotinic acid.] *Vop. Pitn.*, 1955, 14, No. 2, 13-16. [Inst. Med., Archangel.]

Previous work has shown that nicotinic acid, apart from its role as a coenzyme, has a number of secondary effects including changes in carbohydrate metabolism, small doses depressing and larger doses raising the blood sugar level. The hypothesis that a nervous reflex is involved was tested by injecting into the ear veins of rabbits nicotinic acid with novocaine, and again with atropine, and estimating the blood sugar. With novocaine small doses of nicotinic acid, 1 mg. per kg., caused no change, larger doses, 10 mg. per kg., a slight fall of blood sugar. With atropine small doses caused a marked rise and large doses a considerable fall followed by a rise. The results are taken to imply involvement of vascular chemoreceptors and of a parasympathetic effector pathway in the changes caused in carbohydrate metabolism by nicotinic acid.—D. W. Taylor.

4890

VILLA, L. and DI GUARDI, N. Studies on factors influencing the endogenous respiration of liver homogenates. The action of nicotinamide on a keto-oxidase activity of rat's liver. *Experientia*, 1955, 11, 31-33. [Inst. Clin. Gen. Med., Univ. Milan.]

The endogenous respiration of homogenates of liver from rats having a balanced diet or a high protein or high fat intake was studied by a manometric method. The effect reported (Abst. 3038, Vol. 24) of nicotinamide in increasing endogenous respiration occurred only in livers from rats having a high-fat diet or in rats fasting from a normal diet. In a series of tests with different substrates, the marked increase in respiration in presence of nicotinamide was obtained only with acetoacetate. It was therefore postulated that the increased respiration was due to the activity of a keto-oxidase system in the liver.

A. M. Copping.

4891

L'ABBATE, S. Influenza degli estratti epatici, dell'acido nicotinico e degli estratti epatici associati ad acido nicotinico sulla solfoconjugazione. [Influence of liver extracts, of nicotinic acid, and of the two together, on sulphur conjugation.] *Bol. Soc. Ital. Biol. sper.*, 1953, 29, 1342-1344. [Ist. Farmacol., Univ. Catania.]

Free and conjugated S were estimated daily for 10 days in the 24-hr. urine of 4 rabbits weighing 1.5 kg., maintained on a constant, normal diet. For successive periods the animals were given a daily subcutaneous injection of 0.04 mg. resorcinol, or 0.03 g. nicotinic acid per kg. bodyweight, or an

intramuscular injection, per kg. bodyweight, of 1 ml. of liver extract Epatol Dessy, equivalent to 300 g. fresh liver, or the same substances in pairs or all 3 together. The total amount of S in the urine did not vary greatly with the 3 substances, but the proportion of conjugated S was increased by all the substances; they reinforced the effect of one another and were most effective when given all 3 together.—E. M. Hume.

4892

VAN EYS, J., TOUSTER, O. and DARBY, W. J. Isolation and identification of β -nicotinoyl-D-glucuronic acid in rat urine. *Federation Proc.*, 1955, 14, 296. *Proc. [Dept. Biochem., Vanderbilt Sch. Med., Nashville, Tenn.]*

4893

BRAUDE, R., KON, S. K., MITCHELL, K. G. and KODICEK, E. Maize and pellagra. *Lancet*, 1955, 268, 898-899. [Nat. Inst. Res. Dairying, Univ. Reading.]

There is evidence that the nicotinic acid present in maize and other cereals is in a bound form, not available for the rat or chick or for the growth of lactobacilli. The full biological activity can be released by hydrolysis with 0.5 N NaOH (see Abst. 3189, Vol. 14).

In the present work 18 weanling pigs from 4 litters, of weight from 37 to 59 lb., received, for a preliminary period, a pellagra-producing diet of, per cent., ground white maize 79, pea meal 10.5, purified casein 5, cod liver oil 3, and salt mixture 2.5 (see Absts. 4778, Vol. 7; 363 and 1850, Vol. 8). When growth ceased they were divided into 3 groups of 5 or 6; the first continued on a diet which was similar to the previous one, but in which the maize constituent was reconstituted from a complete series of milling fractions; the second group received in addition 6 mg. nicotinic acid daily. The third group had a diet like that of the first group except that the milling fraction which contained most of the aleurone layer and 73 per cent. of the total nicotinic acid (see Abst. 449, Vol. 22) had been hydrolysed for 30 min. with 0.5 N NaOH. The pigs continued to receive the diets for 9 weeks or until they succumbed.

During the preliminary period 17 of the 18 pigs showed signs of nicotinic acid deficiency within from 17 to 63 days; one pig became deficient only after 13 weeks and was not included in the experiment proper.

The deficient pigs in the first group on the average showed no weight increase; 2 died before the fifth week, 2 became moribund by the ninth week and 2 completed the period without signs of deficiency. All the pigs in the second group, given nicotinic acid, recovered from their previous state of deficiency and gained steadily in weight.

The pigs in the third group, receiving the alkali-hydrolysed maize fraction, also recovered but ate less and gained weight more slowly than those given nicotinic acid.

It was calculated that for the pigs in the preliminary period and for those in the 3 groups in the order above, the average daily intake of nicotinic acid was, respectively, 10.8 mg. almost all unavailable, 7.7 mg. with 0.8 mg. available, 20.8 mg. with 7.6 mg. available, and 12.6 mg. with 9.6 mg. available.

It is concluded that the recovery of the pigs in the third group was related to the availability of the nicotinic acid after hydrolysis, as had been shown for rats. The suggestion is repeated that the lime-water treatment of maize, as practised in Mexico, may be responsible for the low incidence of pellagra among maize eaters in that country (see also Absts. 4195, Vol. 16; 4804, Vol. 21; 2921, Vol. 23; Title 5184, Vol. 24).—H. Chick.

4894

SQUIBB, R. L., BRAHAM, J. E., ARROYAVE, G. and SCRIMSHAW, N. S. **Supplementation of low tryptophan-niacin deficient diets with beans and lime-treated corn in rats.** *Federation Proc.*, 1955, **14**, 451. *Proc. [Inst. Agropecuario Nac., Guatemala.]*

4895

SUNDE, M. L. **The niacin requirement of chickens from 6 to 11 weeks.** *Poultry Sci.*, 1955, **34**, 304-311. [Poultry Dept., Univ. Wisconsin, Madison.]

In 4 experiments extending over 2 years, chicks were given from the 6th to the 11th week of age a basal diet low in nicotinic acid and containing either dextrin or sucrose, and casein, gelatine, soya bean oil, methionine, choline, minerals and vitamins. The diet contained, per cent., protein 21 and tryptophan 0.21, and 1.8 mg. nicotinic acid

per kg. Supplements of nicotinic acid, from 5 to 50 mg. per kg. diet, were given. After 2 weeks of the unsupplemented basal diet growth was retarded; after 3 weeks chicks receiving the 5 mg. supplement also showed slow growth. The combined results of the 4 experiments showed that from the 6th to the 11th week of age the chicks required between 7 and 12 mg. available nicotinic acid per kg. diet for optimum growth. In practical rations a certain amount of the nicotinic acid present may be in bound form and unavailable to the chick; it is, therefore, suggested that such rations should be supplemented with 5 mg. nicotinic acid per kg., even after the chicks are 6 weeks old.—E. M. Cruickshank.

4896

CHIANG, Y. T. **Chemotherapy of murine leprosy. 3. The effects of nicotinamide and pyrazinamide (aldinamide) on mouse leprosy.** *Internat. J. Leprosy*, 1954, **22**, 331-346. [Nat. Inst. Arthritis and Metabol. Dis., Nat. Insts. Health, Bethesda, Md.] Spanish summary.

Groups of 20 female mice weighing about 20 g. were inoculated intraperitoneally with *Mycobacterium leprae murium*, and were treated with the drug to be tested from 1 day or 1 month or 2 months after the inoculation. The drugs were mixed with the food except for streptomycin which was injected subcutaneously 5 times a week. After 3 months after inoculation the mice were killed and the degree of protection was assessed from the mortality rate and from the autopsy findings. Nicotinamide, pyrazinamide and isoniazid had the highest activity in suppressing murine leprosy; streptomycin was less active and 4, 4'-diaminodiphenylsulphone was the least effective. The substances were most effective when given from the time of inoculation. They had some activity when started a month later but very little when given for a month after an interval of 2 months.

E. M. Hume.

VITAMIN B₆ (PYRIDOXINE, ADERMIN)

4897

LEVINE, V. E. and SASS, R. N. **Determination of pyridoxal with concentrated sulfuric acid.** *Federation Proc.*, 1955, **14**, 245. *Proc. [Dept. Biol. Chem., Sch. Med., Creighton Univ., Omaha, Nebr.]*

4898

MCGANTY, W. J., TUCKER, R. G., TURNER, T. G., UTLEY, M. H. and DARBY, W. J. **Convulsions occurring in suckling young of maternal rats fed pyridoxine-restricted diets.** *Federation*

Proc., 1955, **14**, 444. *Proc. [Dept. Obstet., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]*

4899

STEPANTSCHITZ, G. and WAGNER, K. **Die Wirkung von Vitamin B₆ auf den Ablauf experimenteller hämolytischer Anämien. [Effect of vitamin B₆ on the course of experimental haemolytic anaemia.]** *Klin. Wochenschr.*, 1955, **33**, 70-72. [Med. Klin., Univ. Graz.]

Haemolytic anaemia was produced in 8 groups of 6 rats by the intramuscular injection of from

0.5 to 2 ml. serum from rabbits previously sensitised to rat's blood; the serum had a high titre of haemolysin and agglutinin. In each group 2 rats were untreated, 2 received 50 mg. vitamin B₆ (Benadon) daily, and 2 Antihistaminica. Previous work had shown that serum from untreated rabbits had no effect on the blood picture of rats. All the rats injected with the serum developed a severe haemolytic crisis associated with a marked drop in the red cell count which, in the untreated animals, fell to 1 million with haematuria and changes in the kidney. In the untreated animals which survived, the blood picture returned to normal in from 2 to 3 weeks. In the animals treated with vitamin B₆ the fall in the red cell count was slightly less and the return to normal more rapid. In the doses used, Antihistaminica had no effect on the anaemia. The mode of action of vitamin B₆ is discussed.

L. Wills.

4900

WOOTEN, E., NELSON, M. M., SIMPSON, M. E. and EVANS, H. M. Decreased response of pyridoxine-deficient rats to hypophyseal follicle-stimulating hormone. *Federation Proc.*, 1955, **14**, 455. *Proc. [Inst. Exp. Biol., Univ. California, Berkeley.]*

4901

BEATON, J. R. Further studies on carbohydrate metabolism in the vitamin-B₆-deprived rat. *Canad. J. Biochem. Physiol.*, 1955, **33**, 161-166. [Dept. Pub. Health Nutr., Sch. Hyg., Univ. Toronto.]

Young rats were given for 1 or 3 weeks a purified diet containing 20 per cent. casein, 20 per cent. fat and no vitamin B₆. Pair-fed rats had the same diet with 50 µg. pyridoxine daily. After fasting for 24 hr. the animals were anaesthetised with Nembutal and blood was taken from the exposed heart for estimation of glutathione, inorganic and acid-soluble phosphorus, and sugar. Liver and muscle also were analysed in some tests. Significant increases were found in the inorganic P and glutathione in the blood and liver from rats deprived of vitamin B₆ for 3 weeks, and in the blood after only 1 week. No significant change in muscle glycogen was found. In deprived rats the changes in the blood sugar value in response to insulin or alloxan were slightly greater than in pair-fed, non-deprived rats.—A. M. Copping.

4902

HOLT, C. V., HEINRICH, W. D. and HOLT, L. v. Zur Frage der diabetogenen Wirkung der Xanthurensäure. [Diabetogenic action of xanthurenic acid.] *Hoppe-Seyler's Ztschr.*, 1954, **297**, 241-246. [Physiol. Chem. Inst., Univ. Hamburg.]

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A single injection of 200 mg. xanthurenic acid per kg. bodyweight caused no significant rise in the blood sugar of rats receiving a complete, purified diet. Repeated injections during 14 days had no effect on blood sugar or on the beta cells of the islets of Langerhans. No rise in blood sugar occurred when large doses of tryptophan and butyrate were given by mouth. In rats deprived of vitamin B₆ administration of tryptophan and butyrate produced a small temporary increase in blood sugar, but no degenerative changes could be detected in the beta cells of the islets of Langerhans.—A. M. Copping.

4903

KOTAKE, Y. (Jr.) and NOGAMI, K. Studies on xanthurenic acid. 9. On the conjugated compounds of xanthurenic acid in the body.

KOTAKE, Y. (Jr.) and IMOTO, Y. 10. Progressive depletion in the reduced glutathione content of the blood following xanthurenic acid injection. *J. Biochem., Tokyo*, 1954, **41**, 621-626; 627-629. [Dept. Biochem., Wakayama Med. Coll.]

9. See Abst. 3529, Vol. 25.

10. Groups of from 5 to 7 male rats weighing about 150 g. were given a diet of, per cent., casein 22, starch 52, yeast 2, agar 3, salt mixture 6, butter 10 and sucrose 5. One group was injected intraperitoneally with 200 mg. xanthurenic acid and another was given adrenaline. Blood sugar was estimated every 30 min. After from 3 to 4 hr., when the hyperglycaemic phase had begun in the rats given xanthurenic acid, they were all killed and the blood was collected. The average value for glutathione in the blood of the rats given xanthurenic acid was about half that in the groups given adrenaline or no treatment.

E. M. Hume.

4904

WILLIAMS, H. L. and WIEGAND, R. G. Xanthurenic acid excretion (B₆ deficiency) in hydrazide treated dogs. *J. Pharmacol. Exp. Therap.*, 1955, **113**, 54. *Proc. [Univ. Illinois Coll. Med., Chicago.]*

4905

ROSEN, F. Effect of isonicotinic acid hydrazide on niacin and pyridoxine metabolism in rats. *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 243-246. [Ortho Res. Found., Raritan, N.J.]

Administration of 50 mg. isonicotinic acid hydrazide per 100 g. diet did not affect the growth or the metabolism of nicotinic acid in rats having diets with or without nicotinic acid. In vitamin B₆ deficiency isonicotinic acid hydrazide inhibited growth, decreased survival time and hastened the onset of convulsions. The increased excretion of

xanthurenic acid after administration of tryptophan, which is characteristic of vitamin B₆ deficiency, did not occur when isonicotinic acid hydrazide was given.—A. M. Copping.

4906

LICHSTEIN, H. C. Mechanism of competitive action of isonicotinic acid hydrazide and vitamin B₆. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 519-522. [Dept. Bacteriol., Univ. Minnesota, Minneapolis.]

A study was made of the effect exerted by isonicotinic acid hydrazide on tryptophanase activity in a mutant of *Bacterium coli* which required vitamin B₆. Inhibition of tryptophanase activity occurred in living cells and in dried preparations, except when the cells had been previously incubated with pyridoxal and the dried preparations with pyridoxal phosphate. The reaction between pyridoxal phosphate and isonicotinic acid hydrazide was competitive and depended on the relative concentrations of the two substances. It is suggested that it is for the apoenzyme of tryptophanase that isonicotinic acid hydrazide competes with pyridoxal phosphate.—A. M. Copping.

4907

BROCKMAN, R. W., SCHABEL, F. M. (Jr.), THOMSON, J. R. and SKIPPER, H. E. Role of pyridoxine in action of acid hydrazides on bacterial and tumor growth. *Federation Proc.*, 1955, 14, 186-187. *Proc.* [Kettering-Mayer Lab., Southern Res. Inst., Birmingham, Ala.]

4908

McDANIEL, E. G. and DAFT, F. S. Effects of penicillin and aureomycin on rats fed pyridoxine-deficient diets. *Federation Proc.*, 1955, 14, 443. *Proc.* [Nat. Inst. Health, Bethesda, Md.]

4909

MARSH, M. E., GREENBERG, L. D. and RINEHART, J. F. The relationship between pyridoxine ingestion and transaminase activity. 1. Blood hemolysates. *J. Nutrition*, 1955, 56, 115-127. [Dept. Pathol., Univ. California Sch. Med., San Francisco.]

The method of Tonhazy *et al.* (Title 3155, Vol. 20) for estimating aspartic-glutamic transaminase was adapted for blood samples from monkeys and man. Administration of graded doses of pyridoxine hydrochloride to monkeys produced corresponding increases in the concentration of vitamin B₆ and transaminase in the blood. The fall in transaminase was slower than in vitamin B₆ when the vitamin was withdrawn. Similar effects were observed with healthy human subjects receiving doses of from 10 to 15 mg. pyridoxine daily.

The transaminase activity of blood haemolysates from monkeys deprived of vitamin B₆ was not increased by addition of pyridoxal phosphate or pyridoxamine phosphate; this, it is suggested, may be due to the presence in the blood of an active phosphatase that cleaves the phosphorylated forms of vitamin B₆.—A. M. Copping.

4910

GREENBERG, L. D., MARSH, M. E. and RINEHART, J. F. Transaminase activity of tissues of control and vitamin-deficient monkeys. *Federation Proc.*, 1955, 14, 221. *Proc.* [Dept. Pathol., Univ. California Sch. Med., San Francisco.]

4911

BERGERET, B., CHATAGNER, F. and FROMAGEOT, C. Quelques relations entre le phosphate de pyridoxal et la décarboxylation de l'acide cystéinesulfonique par divers organes du rat normal ou du rat carencé en vitamine B₆. [Relations between pyridoxal phosphate and the decarboxylation of cysteine sulphonic acid by different organs of the normal or vitamin-B₆-deficient rat.] *Biochim. biophys. Acta*, 1955, 17, 128-135. [Lab. Chim. Biol., Fac. Sci., Paris.] English and German summaries.

The comparative rates of decarboxylation of cysteine sulphonic acid, cysteic acid and glutamic acid were studied under controlled conditions in the presence of homogenates of brain and liver tissue from normal rats, and rats deprived of vitamin B₆ with or without addition of pyridoxal phosphate. With tissue from normal rats the effect of adding coenzyme in the form of pyridoxal phosphate was very slight with liver tissue but marked with brain preparations. Deficiency of vitamin B₆ caused disappearance of apodecarboxylase from the liver but no decrease in the brain; regeneration of it occurred in rats receiving vitamin B₆ after a period of deprivation. Cysteine sulphonic acid was always decarboxylated more rapidly than cysteic acid, a finding held to support the view that, in the rat, taurine arises from oxidation of hypotaurine rather than from decarboxylation of cysteic acid.—A. M. Copping.

4912

OLIVARD, J. and SNELL, E. E. Growth and enzymatic activities of vitamin B₆ analogues. 1. D-Alanine synthesis. 2. Synthesis of miscellaneous amino acids. *J. Biol. Chem.*, 1955, 213, 203-214; 215-228. [Biochem. Inst., Univ. Texas, Austin.]

1. The effect of vitamin B₆ analogues on *Streptococcus faecalis* R was studied in tests in which growth was limited by the ability to synthesise D-alanine from L-alanine by means of alanine

racemase (cf. Absts. 3251, Vol. 17; 4283, Vol. 23). Equivalent growth, measured as dry cell production, was obtained by addition to the basal medium of, in μ moles per 6 ml., pyridoxal 0.003, ω -methylpyridoxal 0.10 or D-alanine 4000. Growth was promoted also by ω -methylpyridoxamine and its 5-phosphate and the 5-phosphate of ω -methylpyridoxal. The maximum rate of racemisation obtained with ω -methylpyridoxal phosphate as coenzyme was less than with pyridoxal phosphate but was increased if the concentration of L-alanine in the medium increased. The comparative affinities of coenzyme and analogue coenzyme for the aporacemase determined the effect of increasing the L-alanine content of the medium. The coenzyme as well as the protein appeared to be important in forming the enzyme substrate complex.

Several analogues of vitamin B₆ competitively inhibited activation of the cell-free racemase by pyridoxal phosphate and also inhibited growth of *S. faecalis* R. Enzyme-inhibitor dissociation constants for the alanine racemase of *S. faecalis* were calculated for 4-nitrosalicylaldehyde, 5-deoxypyridoxal, pyridoxal, ω -methylpyridoxal, pyridoxamine, ω -methylpyridoxamine and pyridoxine. In the conditions of the experiment 4-deoxypyridoxine and its phosphate did not inhibit growth or aporacemase activity.

2. In media containing excess of D-alanine but lacking other single amino-acids, capacity to synthesise the missing amino-acid became the limiting factor for growth of *S. faecalis*, and was shown to depend on the presence of vitamin B₆ or certain of its analogues. In conditions that required synthesis of the L-isomer of leucine, isoleucine, valine, phenylalanine, tyrosine, methionine or serine, growth of *S. faecalis* was supported by ω -methylpyridoxal, ω -methylpyridoxamine and

ω -methylpyridoxamine phosphate with activity ranging from 4 to 25 per cent. of that of pyridoxal or pyridoxamine. The ω -methyl analogues inhibited the growth-promoting activity of vitamin B₆ in media lacking L-cysteine. The cell-free transaminases corresponding with phenylalanine, tyrosine and leucine were activated by pyridoxal phosphate and its ω -methyl analogue; the affinities of the two coenzymes varied considerably for the three enzymes. ω -Methylpyridoxal phosphate was almost inactive in the cysteine desulphhydrase system and was much less active than pyridoxal phosphate in the tyrosine-glutamic acid transaminase system. In the discussion the importance is stressed of steric factors as well as of protein structure in determining the relative affinities of coenzyme and apoenzyme in the reactions studied.—A. M. Copping.

4913

TOMARELLI, R. M., SPENCE, E. R. and BERNHART, F. W. Biological availability of vitamin B₆ of heated milk. *J. Agric. Food Chem.*, 1955, **3**, 338-341. [Res. and Development Dept., Nutrit. Div., Wyeth Laboratories, Inc., Mason, Mich.]

The vitamin B₆ potency of fresh milk, heated milk and infant foods was measured by tests with rats and with *Saccharomyces carlsbergensis*. Heated liquid milk and sterilised liquid infant food gave lower values for vitamin B₆ with rats than in microbiological tests, but values in good agreement were obtained for fresh milk and for a spray-dried, powdered infant food. The possibility is discussed that heat sterilisation of liquid infant foods may lead to deficiency of vitamin B₆.

A. M. Copping.

See also Abst. 5448.

PANTOTHENIC ACID

4914

BROWN, G. M., IKAWA, M. and SNELL, E. E. Synthesis and microbiological activity of some pantothenic acid conjugates. *J. Biol. Chem.*, 1955, **213**, 855-867. [Biochem. Inst., Univ. Texas, Austin.]

Various pantothenic acid conjugates were synthesised from pantoil lactone and the sodium salts of the appropriate β -alanyl peptides. The growth-promoting activity of pantothenamide, pantothenylglycine, pantothenylleucine and pantothenylhistidine for *Acetobacter suboxydans* and for some lactic acid bacteria was compared with that of other pantothenic acid derivatives. Most derivatives were active for *A. suboxydans* but only pantothenic acid, pantetheine and 4'-phosphopante-

theine had high activity for *Lactobacillus helveticus* 80, *L. acidophilus*, *L. casei* and *L. arabinosus* 17-5. The growth-promoting activity of pantothenic conjugates for *A. suboxydans* was associated with the occurrence of hydrolysing enzymes in cell-free extracts from cultures of the organism. The relation of the findings to suggested schemes for the biosynthesis of coenzyme A is discussed.

A. M. Copping.

4915

HURTANEN, C. N. Pantethine and casein hydrolyzate in the growth of certain *Lactobacilli*. *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 311-312. [Nutrit. Physiol. Sect., Amer. Cyanamid Co., Res. Div., Lederle Labs., Pearl River, N.Y.]

Cultures of several lactobacilli from rumen contents, and avian *Lactobacillus bifidus*, none of which could be grown on a completely synthetic medium, were able to grow in such media if they contained pantetheine and an enzymic hydrolysate of casein. In presence of a tryptic digest of casein, synthetic pantetheine could replace natural crude sources of an unidentified growth factor required by the organisms.—A. M. Copping.

4916

FIRKET, H., MOUCHETTE, R. and CHÈVREMONT, M. Comparison de l'action de dérivés du coenzyme A sur la croissance des cellules en culture de tissus. [Comparison of the action of derivatives of coenzyme A on the growth of cells in tissue culture.] *Bull. Soc. Chim. biol.*, 1955, **37**, 155-159. [Inst. Histol., Fac. Méd., Liège.] Growth and mitosis in conjunctiva and muscle tissue from chick embryos was inhibited by cysteamine but favoured by pantothenic acid at all concentrations. Pantetheine favoured growth in very low concentrations of from 1 in 15,000 to 1 in 20,000, but in greater amounts it had an inhibiting effect, due possibly to release of cysteamine by hydrolysis in the culture. A preparation of coenzyme A was toxic because of impurities and no result was obtained with direct tests. Low concentrations of pantetheine were more active than similar concentrations of pantothenic acid, and it is suggested that the tissues convert the first into coenzyme A more readily than the second.—A. M. Copping.

4917

BARTLETT, P. D., GRIMMETT, P., BEERS, L. and SHELATA, S. Growth and coenzyme A. *Federation Proc.*, 1955, **14**, 177-178. *Proc. Edsel B. Ford Inst. Med. Res., Henry Ford Hosp., Detroit, Mich.*

4918

BOXER, G. E., SHONK, C. E. and STOERK, H. C. An antagonist of pantothenic acid and pantetheine active in vitro and in vivo. *Federation Proc.*, 1955, **14**, 185. *Proc. [Res. Labs., Chem. Div., Merck and Co., Inc., Rahway, N.J.]*

4919

BUTLER, L. C. and MORGAN, A. F. The content of adrenocorticotrophic hormone in the pantothenic acid-deficient female rat. *Endocrinology*, 1955, **56**, 322-326. [Dept. Home Econ., Univ. California, Berkeley.]

A diet lacking in pantothenate was given to lactating rats when their young were 14 or 15 days old and subsequently to the female young of the

litters. At the age of 50 days the pituitary and a sample of venous blood were removed and the content of adrenocorticotrophic hormone was estimated biologically with hypophysectomised rats. In comparison with normal or pair-fed rats no decrease in the amount of adrenocorticotrophic hormone was found in rats deprived of pantothenate and not subjected to any stress.

A. M. Copping.

4920

FIDANZA, A. and BONOMOLO, A. Il comportamento del colesterolo nei surreni di ratti alimentati con dieta priva di acido pantotenico addizionata di antibiotici. [Behaviour of cholesterol in the adrenal glands of rats fed on a diet deficient in pantothenic acid with antibiotics added.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1732-1733. [Ist. Fisiol., Univ. Rome.]

Of 3 groups of 15 male rats weighing about 50 mg., maintained on a diet devoid of pantothenic acid, 1 received 1 mg. Ca pantothate daily, 1 received 5 mg. aureomycin daily, and 1 received no supplement. After 6 weeks they were killed and cholesterol, free and esterified, was estimated in the adrenal glands. The mean value in g. per cent. for total cholesterol was for rats given pantothenate 3.84, for deprived rats 1.78, and for deprived rats given aureomycin 3.40; about one-fifth was in the free state in all the groups.—E. M. Hume.

4921

ZUCKER, L. M., SERONDE, J. (Jr.), and ZUCKER, T. F. Acetylating activity in the rat in relation to other signs of pantothenic acid deficiency. *Arch. Biochem. Biophys.*, 1955, **55**, 9-18. [Dept. Pathol., Columbia Univ., New York.]

Acetylating mechanisms, as measured by the urinary excretion of acetylated products of sulphanilamide 1, 2, 3, 4 and 23 hr. after administration of 30 mg. sulphanilamide, were studied in rats deprived of pantothenic acid at weaning or when adult. Deprivation during 15 weeks caused progressive decrease in acetylating capacity. The shape of the acetylation time curves was similar in young and adult rats although other signs of pantothenate deficiency were different in the two age groups. Weanling rats deprived of pantothenate showed increased susceptibility to infection with corynebacterium, and adult rats developed duodenal ulcers (*cf.* Absts. 3404, Vol. 19; 4450, Vol. 24).—A. M. Copping.

4922

CARROLL, H. W. and MORGAN, A. F. Thyroid control of lipid metabolism in pantothenic acid deficiency. *Federation Proc.*, 1955, **14**, 189. *Proc. [Univ. California, Berkeley.]*

N.A. and R., October 1955

4923

- CHERNICK, S. S., MOE, J. G. and SCHWARZ, K. **Coenzyme A and dietary necrotic liver degeneration.** *Federation Proc.*, 1955, **14**, 191-192. *Proc.* [Nat. Insts. Health, Bethesda, Md.]

4924

- DINNING, J. S., NEATROUR, R. and DAY, P. L. **Influence of dietary pantothenic acid and methionine on rat liver coenzyme A levels.** *Federation Proc.*, 1955, **14**, 431. *Proc.* [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

4925

- KRATZER, F. H., DAVIS, P. N., MARSHALL, B. J. and WILLIAMS, D. E. **The pantothenic acid requirement of turkey hens.** *Poultry Sci.*, 1955,

34, 68-72. [Dept. Poultry Husb., Univ. California, Davis.]

In experiments extending over 3 years, turkey hens received a basal diet containing, per kg., about 3.2 mg. pantothenic acid. The hatching capacity of the eggs fell from 57 per cent. to zero in about 5 weeks, but egg production was not affected. A supplement of 16 mg. pantothenic acid per kg. diet was required to maintain optimum hatching capacity. The survival of the poults and the free pantothenic acid content of the eggs were directly related to the amount of pantothenic acid in the diet. When the amount was 16 mg. per kg. diet the eggs contained about 11 μ g. per g. Most of the embryos that failed to hatch were from hens having the unsupplemented basal ration. They had wry down and abnormalities of the legs were frequent.—E. M. Cruickshank.

BIOTIN

4926

- FISCHER, J. E. **Metabolism of β -methyl- C_5 fatty acids by mitochondria of rat liver: effect of biotin nutriture.** *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 227-230. [Inst. Enzyme Res., Univ. Wisconsin.]

Suspensions of liver mitochondria from mature, normal rats and from rats having a diet deficient in biotin were used to study the metabolism of isovalerate, 3-methyl-2-butenate, 3-methyl-3-butenate, n -valerate, α -methylbutyrate and n -caprylate in a medium containing KCl, Mg^{++} , phosphate

buffer and adenosine triphosphate. With mitochondria from normal livers, acetoacetate was readily formed from n -valerate and n -caprylate but addition of bicarbonate was required for metabolism of the two 3-methyl compounds and of isovalerate; malonate inhibited metabolism of the last 3 compounds. Mitochondria from rats deprived of biotin could metabolise n -valerate, α -methylbutyrate and n -caprylate but not isovalerate, 3-methyl-2-butenate or 3-methyl-3-butenate.—A. M. Copping.

See also Absts. 5226, 5291.

FOLIC ACID (PTEROYLGLUTAMIC ACID)

4927

- TANSY, R. P. and SCHNELLER, G. H. **Studies in the stabilisation of folic acid in liquid pharmaceutical preparations.** *J. Amer. Pharm. Assoc.*, 1955, **44**, 34-37. [Calco Chem. Div., Amer. Cyanamid Co., Bound Brook, N.J.]

In concentrations of from 0.02 to 0.05 per cent., nordihydroguaiaretic acid, butylated hydroxyanisole or ethyl hydrocaffeate, whether in presence or absence of light, stabilised folic acid to a substantial degree in presence of riboflavin.

K. H. Coward.

4928

- DONNER, L. **Leukovorin, další krvetvorný činidlo.** [Leucovorin, a new haemopoietic factor.] *Čas. Lék. Čes.*, 1955, **94**, 93-95. [2. Int. Clin., Fac. Med., Karl's Univ., Prague.]

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4929

- DOCTOR, V. M. and TRUNNELL, J. B. **Conversion of folic acid (PGA) to citrovorum factor (CF) by chick liver acetone powder.** *Federation Proc.*, 1955, **24**, 204. *Proc.* [Univ. Texas, M. D. Anderson Hosp., Houston.]

4930

- HEISLER, C. R. and SCHWEIGERT, B. S. **Conversion of pteroylglutamic acid to citrovorum factor by cell-free extracts of *Lactobacillus casei*.** *Federation Proc.*, 1955, **14**, 436-437. *Proc.* [Amer. Meat Inst. Found., Chicago, Ill.]

4931

- COUCH, J. R. and REID, B. L. **Enzymatic formation of folinic acid in vitro by avian liver**

homogenates. *Federation Proc.*, 1955, **14**, 197-198. *Proc.* [Texas Agric. and Mech. Coll. System, College Station.]

4932

ZAKRZEWSKI, S. F. and NICHOL, C. A. Derivatives of pteric and pteroylglutamic acids formed by *Streptococcus faecalis* A. *Federation Proc.*, 1955, **14**, 311. *Proc.* [Dept. Pharmacol., Yale Univ., New Haven, Conn.]

4933

DE BELLA, G. and VACCA, C. Sulla possibilità di sostituire l'acido folico nella dieta del ratto in accrescimento con vari componenti dell'acido desossiribonucleico. [The possibility of replacing folic acid in the diet of growing rats by different components of deoxyribonucleic acid.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1808-1810. [Ist. Fisiol., Univ. Naples.]

Female rats were weaned on the 27th day of life and were given a diet deficient in folic acid. After 10 days groups of from 7 to 9 were given a supplement, per 100 g. diet, of 100 μ g. folic acid or of 15 ml. of a solution containing per ml. 5 mg. of thymine, thymidine, adenine, adenosine, cytosine and cytidine. A third group received no supplement. The respective mean weight increase in g. in 30 days was 69.5, 62 and 52.5.—E. M. Hume.

4934

BARNARD, R. D. and FREEMAN, M. D. Aminopterin toxicity reversal by a hemopoietic fraction of microbial "animal protein factor": some similarities of streptomyces fermentation residue to pituitary erythropoietin. *Amer. J. Digest. Dis.*, 1955, **22**, 76-82. [Professional Pathol. Labs., 1 W. 34 St., New York.]

An acid eluate from a charcoal adsorbate of a dried broth from *Streptomyces griseus* which is marketed as a feed for animals protected weanling rats against the toxic effects of aminopterin and promoted growth and erythropoiesis even when aminopterin was given. The original fermentation broth was found to contain corticotropin and, in view of its haemopoietic effect, the presence of an erythropoietin was suggested. The origin of pituitary erythropoietin is discussed with theories of the interrelationship between the erythropoietic hormone and cholinesterase.—A. M. Copping.

4935

SANSONE, G. and ZUNIN, C. Embriopatie sperimentali da deficienza di acido folico nel ratto, prodotte mediante somministrazione di aminopterina. [Experimental production of pathological embryos in the rat through folic acid deficiency, induced by giving aminopterin.]

Bol. Soc. ital. Biol. sper., 1953, **29**, 1697-1699. [Inst. Clin. Pediat., Univ. Genoa.]
See Abstr. 4473, Vol. 24.

4936

HUTCHISON, D. J. and BURCHENAL, J. H. Some alterations in growth patterns of amethopterin resistant *Streptococcus faecalis*. *Federation Proc.*, 1955, **14**, 438. *Proc.* [Div. Exp. Chemotherap., Sloan-Kettering Inst., New York.]

4937

ARNSTEIN, H. R. V. Biosynthesis of glycine and serine in normal and folic acid-deficient rats. *Biochem. J.*, 1955, **60**, vii. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

4938

YOUNG, R. J., NORRIS, L. C. and HEUSER, G. F. The chick's requirement for folic acid in the utilization of choline and its precursors betaine and methylaminoethanol. *J. Nutrition*, 1955, **55**, 353-362. [Dept. Poultry Husb., Agric. Exp. Stat., Cornell Univ., Ithaca, N.Y.]

Chicks were given a basal diet containing 16 μ g. folic acid per 100 g. and less than 0.007 per cent. of choline; addition of folic acid did not prevent perosis. Inclusion of 0.05 per cent. choline reduced the incidence slightly, but even 0.8 per cent. did not completely prevent perosis or give maximum growth. When the diet was supplemented with folic acid, addition of 0.05 per cent. of choline appeared to be adequate. When the diet contained sufficient choline, about 30 μ g. of added folic acid per 100 g. was required; when the dietary choline was suboptimum, folic acid had to be increased to 80 μ g. per 100 g. diet. Choline was essential for preventing perosis even in presence of large amounts of folic acid. Monomethylaminoethanol combined with betaine was utilised as efficiently as an equimolar concentration of choline, whether folic acid was present or not. Folic acid was not needed for the transfer of a methyl group from betaine to form choline, but it was essential with dietary choline or its precursors for prevention of perosis.—E. M. Cruickshank.

4939

MARCH, B. E. and BIELY, J. (with BURDETT, M. and MOREL, F.) Fat studies in poultry. 3. Folic acid and fat tolerance in the chick. *Poultry Sci.*, 1955, **34**, 39-44. [Poultry Nutrition Lab., Univ. British Columbia, Vancouver.]

Chicks were given for 5 weeks a diet lacking in, or supplemented with, folic acid, with additions of up to 6 per cent. of fresh or strongly heated herring

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oil or of cottonseed oil. When the diet was lacking in folic acid growth was not affected by inclusion of 3 per cent. of fresh or treated oil, but in some experiments it was depressed by inclusion of 5 or 6 per cent., particularly when the oil had been heated. The depression was completely prevented by a supplement of folic acid. The

results showed that a high proportion of fat in the diet increased the chick's requirement for folic acid. Efficiency of feed utilisation was decreased by adding oil when the diet lacked folic acid, but was increased by adding oil when folic acid was given. Folic acid had no lipotropic effect and did not increase fat absorption.—E. M. Cruickshank.

VITAMIN B₁₂

4940

CREMA, A. Sul dosaggio della vitamina B₁₂ nei materiali biologici. [Estimation of vitamin B₁₂ in biological materials.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1514-1516. [Ist. Farmacol., Univ. Pavia.]

A preliminary account is given of an examination of the technique for estimating vitamin B₁₂ with *Bacterium coli* 113/3.—E. M. Hume.

4941

COATES, M. E. and FORD, J. E. The measurement of vitamin B₁₂. *Biochem. J.*, 1955, **59**, xxviii. [Nat. Inst. Res. Dairying, Univ. Reading.]

4942

SMITH, E. L. Isolation and chemistry of vitamin B₁₂. *Biochem. J.*, 1955, **59**, xxvii. [Glaxo Laboratories, Ltd., Greenford, Middlesex.]

4943

BAURIERDEL, W. R., PICKEN, J. C. (Jr.) and UNDERKOFER, L. A. Reactions of cyanocobalamin and aquocobalamin with proteins. *Federation Proc.*, 1955, **14**, 179. *Proc. [Vet. Med. Res. Inst., Iowa State Coll., Ames.]*

4944

MASCHERPA, P. Alcune caratteristiche di un composto di cobalto ottenuto per sintesi, avente attività vitaminica B₁₂. [Characteristics of a compound of cobalt obtained by synthesis and having vitamin B₁₂ activity.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1511-1514. [Ist. Farmacol., Univ. Pavia.]

A compound of cobalt with ribonucleic acid was obtained by a special technique. It had a molecular weight of 1345, was very slightly soluble in water, and contained 0.42 per cent. Co estimated polarographically. The empirical formula was (C₂₈H₄₈N₁₅O₂₃P₄)_nCo. Its maximum absorption was at 306 mμ., its colour was reddish and its growth-promoting effect for *Bacterium coli* 113/3 was modest. It had anti-anaemic potency for the hypochromic anaemia of rats fed on a milk diet, and for the hyperchromic, macrocytic anaemia of

rats given acetylcholine bromide. (See also Abst. 3581, Vol. 25.)—E. M. Hume.

4945

KON, S. K. Other factors related to vitamin B₁₂. *Biochem. J.*, 1955, **59**, xxvii. [Nat. Inst. Res. Dairying, Univ. Reading.]

4946

NIHLÉN, H. and ERICSON, L. E. Electrophoretic studies of vitamin B₁₂-factors. 3. *Acta chem. scand.*, 1955, **9**, 351-352. [LKB Res. Lab., Äppelvik, Sweden.]

Factor III, which had been found to resemble cyanocobalamin in its growth effect on *Bacterium coli*, *Lactobacillus leichmannii* and *Ochromonas malhamensis*, was investigated electrophoretically over a wide pH range. Its electrophoretic mobilities at different pH values were for all practical purposes identical with those of cyanocobalamin.

A. M. Copping.

4947

BURGESS, L. E. and ROLFE, D. T. Comparative study of growth-promoting activity of a pteridine in relationship to thymidine and vitamin B₁₂. *Federation Proc.*, 1955, **14**, 23. *Proc. [Dept. Physiol., Sch. Med., Meharry Med. Coll., Nashville, Tenn.]*

4948

SHENOY, K. G. and RAMASARMA, G. B. Iron as a stabilizer of vitamin B₁₂ activity in liver extracts and the nature of so-called alkali-stable factor. *Arch. Biochem. Biophys.*, 1955, **55**, 293-295. [Res. and Control Div., Raptakos, Brett and Co., Ltd., Bombay, India.]

Vitamin B₁₂ in liver extracts was protected from destruction by heat at pH 10 by addition of Fe. Aqueous solutions of crystalline vitamins B₁₂ and B_{12b} were not protected by ferric chloride. Crystalline vitamins added to a liver extract were destroyed by heating at pH 10 but could be stabilised by adding ferric chloride. The bearing of the results on tests for vitamin B₁₂ activity before and after heat treatment is considered.

A. M. Copping.

4949

BOCCHIOTTI, S. Sulla possibilità di ottenere un estratto epatico ad alto contenuto in vit. B₁₂ mediante il metodo della pressione frazionata. [Possibility of obtaining a liver extract with high vitamin B₁₂ content by fractional pressure.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1522-1524. [Inst. Farmacol., Univ. Pavia.]

A portion of 100 g. fresh calves' liver was subjected in a micro-press to 4 successive degrees of pressure, 150, 400, 600 and 800 atmospheres. The 4 fractions obtained were heated at pH 6.5 and 80° C. for 90 min. Vitamin B₁₂ was estimated with *Bacterium coli* 113/3 in the original material and in the fractions. In 8 experiments, the first fraction, consisting of between 50 and 60 g. of the material, and the last, of from 7 to 9 g., contained no vitamin B₁₂. The second fraction of from 12 to 16 g. contained from 46 to 50 µg. and the third of from 7 to 10 g. contained from 12 to 17 µg. The amount in the whole liver sample was from 67 to 72 µg. The 2 fractions obtained between 150 and 600 atmospheres were purified with the ultra-centrifuge and columns of Permutit, and yielded a clear brown liquid with 30 µg. vitamin B₁₂ per ml.—E. M. Hume.

4950

JANIČKI, J. and PAWEKIEWICZ, J. Wytwarzanie nowej witaminy (vitamin) grupy B₁₂ przez bakterie kwasu propionowego. [Formation of new vitamins of the B₁₂ group by propionic acid bacteria.]

PAWEKIEWICZ, J. Prekursory biosyntezy witamin grupy B₁₂. [Precursors in the biosynthesis of B₁₂ vitamins.] *Acta biochim. polon.*, 1955, 1, 307-312; 313-326. [Inst. Biochem., Rolnej WSR, Poznan.] English and Russian summaries.

In addition to small amounts of vitamin B₁₂, *Propionibacterium shermani* produced another vitamin named vitamin B_{12ap}. It has not yet been crystallised. It did not contain the benzimidazole group, and formed in acid solution a stable complex containing 2 cyanide groups. It was inactive for *Euglena gracilis*, but from twice to four times more active than vitamin B₁₂ for *Bacterium coli*.

When the *Propionibacterium* was grown on a medium containing 5:6-dimethylbenzimidazole it produced vitamin B₁₂ instead of vitamin B_{12ap}. An analogous procedure resulted in the production of a vitamin B₁₂ derivative, 5(6)-methylbenzimidazole cyanocobalamin, when the culture medium contained 5-methylbenzimidazole. The substance was active for *Bact. coli* and *Euglena gracilis*. Other methyl- and dimethyl-benzimidazoles were tested as precursors of B₁₂ vitamins but proved inactive. *Strep. griseus* did not use 5:6-dimethylbenzimidazole for increased synthesis of vitamin B₁₂. (From summaries.)—E. M. Hume.

4951

SAHASHI, Y., IWAMOTO, K. and HAYASHI, J. Biosynthesis of vitamin B₁₂ in domestic ducks. *J. Vitaminol., Japan*, 1954, 1, No. 1, 39-42. [Lab. Biochem., Fac. Agric., Univ. Tokyo, Hongo.]

Actinomycetes found in the digestive tract of ducks were shown to be capable of synthesising vitamin B₁₂. Other organisms similarly isolated had little ability to do so. The highest concentration of vitamin B₁₂ was in the caecum and the greatest total amount in the small intestine. When radio-active ⁶⁰Co was given to ducks, vitamin B₁₂ containing ⁶⁰Co was found in the digestive tract, especially in the small intestine and liver.

A. M. Copping.

4952

DALE, F. H. Ability of the bobwhite to grow and reproduce without a dietary source of vitamin B₁₂. *Science*, 1955, 121, 675-676. [U.S. Fish and Wildlife Serv., Laurel, Md.]

Three groups of 30 bobwhite quail chicks, 2 weeks old, were reared in wire-floored pens. They received the basal mash containing, per cent., soya bean meal 42, yellow maize meal 41, wheat middlings 10, lucerne meal 4, CaCO₃ 2, NaCl (with added iodide and manganese sulphate) 0.5, and vitamin A and D oil 0.5; to each 100 kg. of mash were added 40 g. choline chloride, 40 mg. folic acid, 800 mg. riboflavin and 800 mg. Ca pantothenate. One group received no further supplement, one received 15 µg. vitamin B₁₂ per kg. diet, and one received 20 g. dried soil per kg. diet. There was no significant difference in the growth of the 3 groups. From each group 4 pairs were placed in breeding pens with the same diets. For the 3 treatments, respectively, the mean fertility of the eggs was 81, 83 and 80 per cent.; and of the fertile eggs the hatching rate was 70, 75 and 64 per cent. Eggs were taken for analysis and the mean vitamin B₁₂ value was 22, 42 and 29 µg. per g. yolk.

It is concluded that, since the birds were living in conditions where coprophagy was almost eliminated, the bobwhite quail must be able to utilise vitamin B₁₂ synthesised in the digestive tract.

K. J. Carpenter.

4953

WOOLLEY, D. W. A further study of the apparent synthesis of vitamin B₁₂ by mammary cancers of mice. *Proc. Nat. Acad. Sci., Washington*, 1955, 41, 111-118. [Rockefeller Inst. Med. Res., New York.]

After a careful study of microbiological methods for estimating vitamin B₁₂, the chrysomonad method of Hutner *et al.* (*Ann. N.Y. Acad. Sci.*, 1953,

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56, 852) proved to be the most satisfactory. With that method it was found that the concentration of vitamin B₁₂ per g. bodyweight was 17 $\mu\mu\text{g}$. in mice with mammary tumours and 9 $\mu\mu\text{g}$. in mice with no tumour. All the animals received a diet deficient in vitamin B₁₂, based on cottonseed meal as source of protein. One transplanted cancer strain gave evidence of synthesis of vitamin B₁₂, but another caused active destruction of the vitamin. The findings are discussed in relation to the influence of tumour tissue on the body supply of vitamin B₁₂.—A. M. Copping.

4954

LATNER, A. L. The intrinsic factor. *Biochem. J.*, 1955, **59**, xxviii-xxix. [Dept. Pathol., King's Coll., Univ. Durham.]

4955

CRESSERI, A. Observations on vitamin B₁₂-binding factor from hog gastric mucosa. *Experientia*, 1955, **11**, 111-112. [Biol. Lab., Ist. Carlo Erba Ricerche Terap., Milan.] Italian summary.

A highly concentrated preparation from pig gastric mucosa was further analysed by continuous paper electrophoresis followed by extraction and fractional precipitation from phenol-ethanol mixtures. The highest binding activity for vitamin B₁₂ was in a fraction precipitated with from 50 to 60 per cent. ethanol. The fraction contained, per cent., nitrogen 8.2, hexosamines 17.1, reducing sugars 18.3, non-glucosamine polysaccharides 21.6. Its binding capacity was 22-23 μg . vitamin B₁₂ per mg.—A. M. Copping.

4956

CRESSERI, A. Observations on vitamin B₁₂ binding factor from hog gastric mucosa. *Rev. belg. Pathol. Méd. exp.*, 1955, **24**, 82-85. *Proc.* [Biol. Lab., Ist. Carlo Erba Ricerche Terap., Milan.]

4957

RAINE, L. The binding of vitamin B₁₂ by Castle's intrinsic factor. *Nature*, 1955, **175**, 777-778. [Dept. Pathol., Royal Victoria Infirmary, Newcastle upon Tyne 1.]

Free vitamin B₁₂ was estimated microbiologically after 100 μg . had been added to preparations containing 52.5 μg . and 105 μg . intrinsic factor per ml., and after 200 μg . vitamin B₁₂ had been added to a preparation containing 52.5 μg . intrinsic factor per ml. The free vitamin was estimated in the presence of the complex or in the filtrate after ultrafiltration. The mean specific binding capacity in μg . vitamin B₁₂ per mg. intrinsic factor in these 3 studies was 896, 630.5 and 1980.—F. C. Aitken.

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4958

CAPRARO, V., CRESSERI, A. and BERNINI, G. Studies on intestinal absorption of vitamin B₁₂ in albino rat. *Rev. belg. Pathol. Méd. exp.*, 1955, **24**, 79-81. *Proc.* [Biol. Lab., Ist. Carlo Erba Ricerche Terap., Milan.]

4959

ROSENTHAL, H. L. and HAMPTON, J. K. (Jr.) The absorption of cyanocobalamin (vitamin B₁₂) from the gastrointestinal tract of dogs. *J. Nutrition*, 1955, **56**, 67-82. [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

Absorption of vitamin B₁₂ was studied in dogs fasted from a normal diet for from 16 to 24 hr. before experiment, performed under light nembutal anaesthesia. A polythene cannula was inserted into the portal vein and solutions of crystalline cyanocobalamin were placed in the stomach or duodenum by a tube passed through the oesophagus. In some experiments the vitamin B₁₂ was placed in segments of the duodenum which were tied off, and in others it was injected intravenously. Blood samples were taken from the portal and jugular veins and urine was withdrawn by catheter.

Ligation at the duodenal cap decreased absorption of vitamin B₁₂ from the stomach. During absorption the amount in the portal blood was always greater than in the peripheral blood. Considerable absorption took place from the segments of the duodenum that had been tied off. In the post-absorptive state the amount of vitamin B₁₂ in the portal and peripheral blood was much the same. The amount of vitamin B₁₂ in the urine was very small when it was given by mouth, but large when it was given intravenously. If saline was given by tube to a dog that had been operated on there was no change in the vitamin B₁₂ of plasma or urine.—A. M. Copping.

4960

CSONKA, F. A. Parenteral administration of vitamin B₁₂ into day old chicks. *Federation Res.*, 1955, **14**, 199. *Proc.* [Human Nutrit. Res. Branch, U.S. Dept. Agric., Washington, D.C.]

4961

WILSON, H. E. and PITNEY, W. R. (with LABAW, E. and LONG, M.) Serum concentrations of vitamin B₁₂ in normal and nutritionally deficient monkeys. *J. Lab. Clin. Med.*, 1955, **45**, 590-598. [Dept. Med., Northwestern Univ. Med. Sch., Chicago, Ill.]

Vitamin B₁₂ was estimated with *Euglena gracilis* in serum from monkeys maintained on normal diets, on purified diets lacking in some vitamins, and on homogenised cow's milk in which ascorbic acid was

destroyed with copper sulphate. In 17 young animals on normal diet the value for vitamin B₁₂ in the serum ranged from 50 to 234 $\mu\mu\text{g}$. per ml. with a mean of 120 $\mu\mu\text{g}$. The values were slightly lower than those found in 56 specimens of normal human serum. When folic acid was excluded from purified diets the vitamin B₁₂ value for the serum ranged from 25 to 54 $\mu\mu\text{g}$. per ml. The increase was slight when folic acid was added and much greater when vitamin B₁₂ was given up to 10 μg . daily. Intravenous administration of vitamin B₁₂ produced high values in the serum. Ascorbic acid deficiency was associated with low values, but monkeys having the homogenised milk, which contained appreciable amounts of vitamin B₁₂, had fairly high serum values. Estimation of vitamin B₁₂ in the faeces in some experiments showed that considerable amounts were excreted whether the serum concentration was high or low. In severe folic acid deficiency the vitamin B₁₂ value in the serum was normal; it rose during recovery, possibly because of an increase in absorption. In monkeys receiving synthetic diets after long periods on milk diet vitamin B₁₂ remained high in the serum.

A. M. Copping.

4962

JAFFÉ, W. G. Reproducción, lactacia, crecimiento y niveles de glutación en ratones con una dosis baja de vitamina B₁₂. [Reproduction, lactation, growth and level of glutathione in mice on a diet low in vitamin B₁₂.] *Arch. venezol. Nutricion*, 1954, 5, 305-316. [Inst. Nac. Nutric.] English and German summaries.

Groups of mice received for several generations a commercial rat diet with about 30 μg . vitamin B₁₂ per kg. or a basal diet, containing per cent. soya flour 46, maize 46, vegetable oil 5 and minerals 2, with added vitamins A, D, E and the B complex except vitamin B₁₂; it contained less than 0.1 μg . vitamin B₁₂ per 100 g. Some groups received a supplement of 3 μg . vitamin B₁₂ per kg. diet all the time or only during lactation. Litters were reduced to 6 animals and weaned at 28 days.

Only with the basal diet without supplement was the number of young born in a litter significantly less than for the group having the commercial diet. The age at which females had their first litters was greatest, and the mean number and weight of the young at 28 days were least, on the basal diet alone. An intake of 3 μg . vitamin B₁₂ per kg. diet sufficed for normal reproduction. In young mice having the basal diet alone growth was slower, being less in the fourth and fifth weeks of age and greater in the sixth and seventh weeks than in mice given vitamin B₁₂. With none of the diets was there a significant difference in the glutathione content of the blood or liver in adult mice.—D. Duncan.

4963

FERGUSON, T. M., RIGDON, R. H. and COUGH, J. R. Histological observations on thyroid and liver of B₁₂ deficient embryo. *Federation Proc.*, 1955, 14, 432-433. *Proc.* [Dept. Poultry Husb., Texas Agric. and Mech. Coll., Univ. Texas, Galveston.]

4964

LASCELLES, J. and CROSS, M. J. The function of vitamin B₁₂ in micro-organisms. *Biochem. J.*, 1955, 59, xxix-xxx. [Microbiol. Unit, Dept. Biochem., Univ. Oxford.]

4965

ARNSTEIN, H. R. V. The function of vitamin B₁₂ in animal metabolism. *Biochem. J.*, 1955, 59, xxix. [Nat. Inst. Med. Res., London, N.W. 7.]

4966

VERLY, W. G. and CATHEY, W. J. The influence of vitamin B₁₂ on the biosynthesis of the methyl group of choline from methanol. *J. Biol. Chem.*, 1955, 213, 621-624. [Dept. Biochem., Cornell Univ. Med. Coll., New York.]

Rats were given purified diets deficient in vitamin B₁₂ only or in vitamin B₁₂ and folic acid. When deficiency signs appeared an injection of methanol labelled with ¹⁴C was given. The rats were killed 8 hr. later and choline was isolated from the carcasses as chloroplatinate, degraded to trimethylamine and oxidised to carbonate in which ¹⁴C could be estimated. Rats deficient in vitamin B₁₂ incorporated less ¹⁴C into choline than rats treated with vitamin B₁₂. These deficient in both vitamin B₁₂ and folic acid showed a still lower uptake of ¹⁴C into the methyl group of choline.

A. M. Copping.

4967

SHILS, M. E., DE GIOVANNI, R. and STEWART, W. B. Fatty liver of portal type: effects of choline, methionine, and vitamin B₁₂. *J. Nutrition*, 1955, 56, 95-106. [Sch. Pub. Health, Columbia Univ., New York.]

Young rats having diets containing 74 per cent. maize meal or ground white rice or cassava flour and 17 per cent. of fat developed fatty livers with accumulation of lipid in the portal areas. Treatment with vitamin B₁₂ or choline had no effect on accumulation of fat in the liver. Inclusion of parent per cent. DL-methionine in the diet failed to increase fatty liver and, in male rats, appeared to increase the accumulation of fat. Larger amounts of methionine, 1.0, 1.5 or 2.0 per cent., decreased fat accumulation but had a bad effect on methods. The fatty deposits in the portal areas showed an analysis iodine values and cholesterol *A.*, 1953,

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like those in the fatty livers induced by a choline-deficient diet with casein as source of protein.

A. M. Copping.

4968

ERICSON, L. E., HARPER, A. E., WILLIAMS, J. N. (JR.) and ELVEHJEM, C. A. **Vitamin B₁₂ and metabolism of labile methyl groups.** *Federation Proc.*, 1955, **14**, 208-209. *Proc.* [Dept. Biochem., Univ. Wisconsin, Madison.]

4969

YOUNG, R. J. and LUCAS, C. C. **Dietary betaine and vitamin B₁₂ in choline formation.** *Federation Proc.*, 1955, **14**, 310. *Proc.* [Banting and Best Dept. Med. Res., Univ. Toronto.]

4970

MISTRY, S. P., FERTH, J. and JOHNSON, B. C. **Vitamin B₁₂ and choline synthesis in vivo from formate and other methyl precursors.** *Federation Proc.*, 1955, **14**, 445-446. *Proc.* [Div. Animal Nutrit., Univ. Illinois, Urbana.]

4971

CHANG, I. and JOHNSON, B. C. **The effect of vitamin B₁₂ on some aspects of glycine metabolism.** *Arch. Biochem. Biophys.*, 1955, **55**, 151-156. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

A previous study (Abst. 3590, Vol. 25), showed that glycine protected pigs from choline deficiency only if adequate vitamin B₁₂ was present in the diet. Of 2 pigs from the previous study, maintained on a diet deficient in vitamin B₁₂ and choline, one was given vitamin B₁₂. After 36 days of experiment, when the one deprived of vitamin B₁₂ was showing severe signs of deficiency, both were given glycine marked with ¹⁴C in the α -carbon atom. They were killed 4 hr. later and the livers were quickly frozen and kept at -10° C. until they were analysed. Urine was collected during the 4 hr. after administration of glycine, and serine, choline and aminoethanol were estimated. Serine and choline were estimated also in the liver and the distribution of ¹⁴C was determined. Deprivation of vitamin B₁₂ decreased the incorporation of the α -C of glycine into the methyl group of choline but had no effect on the formation of serine or aminoethanol.—A. M. Copping.

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per 1 CH, E. M., SWIFT, H. and SCHWEIGERT, B. S. **addes Liver nucleoproteins in vitamin B₁₂ deficiency.** *transic Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 637-640. *mated* Whitman Lab., Dept. Biochem., Univ. filtrate neago, Ill.]

binding effect of vitamin B₁₂ deprivation on the intrinsic of deoxyribonucleic acid, ribonucleic acid and 198 topoplasmic protein in the liver was studied

cytochemically in rats having for 6 weeks a diet of maize and soya bean oil with iodinated casein and with or without vitamin B₁₂. A third group of rats had no vitamin B₁₂ for 4 weeks and then a dose of 50 μ g. per kg. diet for 2 weeks. There was no difference in the concentration of total protein in the liver of the 3 groups, but in deficient rats there was an increase in the amount per cell associated with the increased cytoplasmic volume. In deficient rats there was a decreased concentration of nucleic acid but an increase in amount per cell. There was no change in the amount of deoxyribonucleic acid per single tetraploid nucleus, but when the amount was calculated on the basis of the frequency of polyploid classes there was a small decrease associated with a higher frequency of diploid nuclei in deficient rats.—A. M. Copping.

4973

PROSIEGEL, R. **Der Einfluss von Leberschutzstoffen auf den Gehalt der tetrachlorkohlenstoffgeschädigten Rattenleber an Pyridincofermenten (DPN/DPNH₂).** [The effect of liver-protective substances on the content of pyridine coenzymes in the liver of rats poisoned with carbon tetrachloride.] *Ztschr. ges. exp. Med.*, 1954-55, **125**, 323-330. [Med. Poliklin., Univ. Munich.]

Diphosphopyridine nucleotide and its dihydroform were estimated by the method of Helmreich *et al.* (*Hoppe-Seyler's Ztschr.*, 1954, **297**, 2) in the liver of normal adult rats and of rats having CCl₄ for from 3 to 7 days. The poisoned livers showed a lowered content of dihydrodiphosphopyridine nucleotide which could be prevented if vitamin B₁₂ or a liver hydrolysate was given at the same time as CCl₄; even in severely toxic rats administration of vitamin B₁₂ or liver extract exercised a favourable effect on the concentration of the coenzyme. The protective effect of vitamin B₁₂ or liver hydrolysate against carbon tetrachloride poisoning is discussed.—A. M. Copping.

4974

FOX, M. R. S., BRIGGS, G. M. and ORTIZ, L. O. **High dietary fat and the chick's requirement for vitamin B₁₂.** *Federation Proc.*, 1955, **14**, 433. *Proc.* [Nat. Inst. Health, Bethesda, Md.]

4975

GRUNBAUM, B. W., SCHAFER, F. L. and KIRK, P. L. **Lipides of chick heart fibroblasts. Effect of vitamin B₁₂ and folic acid.** *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 459-463. [Dept. Biochem., Univ. California, Berkeley.]

The addition of vitamin B₁₂ and folic acid to the medium in which fibroblasts from chick heart were grown prevented the accumulation of lipid globules

in the cytoplasm and apparently stimulated growth. Freshly excised tissue and vitamin-treated cultures were almost free from neutral fat as shown by the ratio of fatty acids to phospholipin P; in degenerating cultures, in the absence of added vitamins, the ratio increased rapidly.

G. A. Garton.

4976

BRUEMMER, J. H., O'DELL, B. L. and HOGAN, A. G. **Maternal vitamin B₁₂ deficiency and nucleic acid content of tissues from infant rats.** *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 463-466. [Dept. Agric. Chem., Univ. Missouri, Columbia.]

Young born to female rats deprived of vitamin B₁₂ from weaning to maturity frequently showed hydrocephalus. Analysis of blood, brain and liver from such hydrocephalic infant rats and from their littermates showed a high value for blood urea and a low one for liver glycogen. There was an abnormally large amount of deoxypentose nucleic acid in the brain. The concentration of pentose nucleic acid in the brain was low but in the liver it differed little from normal.—A. M. Copping.

4977

FENG, Y. S. L. and MEITES, J. **Mechanisms by which vitamin B₁₂ counteracts certain catabolic actions of cortisone.** *Federation Proc.*, 1955, **14**, 47. *Proc.* [Dept. Physiol., Michigan State Coll., East Lansing.]

4978

MEITES, J. and FENG, Y. S. L. **Effects of insulin on vitamin B₁₂ requirements.** *Federation Proc.*, 1955, **14**, 100. *Proc.* [Dept. Physiol., Michigan State Coll., East Lansing.]

4979

PENHOS, J. C. and FOGLIA, V. G. **Renforcement de l'action de l'hormone de croissance par l'acide folique et la cobalamine. [Enhancement of the action of growth hormone by folic acid and cobalamin.]** *C.R. Soc. Biol.*, 1954, **248**, 2113-2115.

In hypophysectomized rats weighing from 104 to 110 g. administration of growth hormone (Somatropin, Armour) produced an increase in bodyweight and in the weight of the liver, kidneys and uterus. The effect was enhanced by administration of folic acid and less significantly by cobalamin, neither of which had an effect when given without growth hormone. Folic acid increased also the growth in length of the femur and tibia which was induced by the hormone. Cobalamin but not folic acid acted in the same way on the weight of the thymus gland. Both the hormone and folic acid were required to increase the weight of the ovary. They had no effect on the thyroid gland. On the adrenal glands the hormone had

a slight effect which was not significantly greater with folic acid or cobalamin.—A. Hepburn.

4980

MÜCKE, D. and MORCZEK, A. **Der Schutzeffekt von Vitamin B₁₂ und Folsäure auf das Blutbild bei Röntgenbestrahlung. [The protective effect of vitamin B₁₂ and folic acid on the blood picture after exposure to X-rays.]** *Naturwissenschaften*, 1954, **41**, 579-580. [Physiol. Chem. Inst., Univ. Leipzig.]

Seven groups of 8 male guineapigs weighing about 400 g. were given a total body exposure to X-rays of 250 r. Of one group, half were given, daily for 7 days, 50 and half 100 µg. folic acid by intramuscular injection before exposure; a second group was similarly treated with 50 or 100 × 10⁻⁹ g. vitamin B₁₂, and a third with both vitamins; 3 other groups had the same treatments after exposure, and the 7th group was untreated.

In guineapigs treated with folic acid the red cell count did not fall as low as, and returned to normal earlier than, in untreated animals. Treatment before exposure was more effective than treatment after. The white cell count behaved in the same way. Vitamin B₁₂ had a similar but smaller effect. No advantage resulted from combination of the 2 vitamins. The findings will be published in more detail in *Strahlentherapie*.

W. M. Deans.

4981

SURE, B. **Influence of lysine, threonine, and vitamin B₁₂ as a supplement to milled wheat on growth and economy of food utilization.** *Federation Proc.*, 1955, **14**, 452. *Proc.* [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

4982

SURE, B. **Influence of amino acid and vitamin B₁₂ additions on biological value of proteins in milled rice and in processed milled rice.** *Federation Proc.*, 1955, **14**, 452. *Proc.* [Dept. Agric. Chem., Univ. Arkansas, Fayetteville.]

4983

GARD, D. I., TERRILL, S. W. and BECKER, D. E. **Effects of the addition of dehydrated alfalfa meal, fish solubles and a "vitamin B₁₃" concentrate to a purified diet for sows.** *J. Animal Sci.*, 1955, **14**, 562-572. [Illinois Agric. Exp. Stat.]

In 2 experiments the purified diet consisted of, per cent., maize starch 63.9, dextrose 10, maize oil 2, woodflock 3 and alpha-protein 16, with DL-methionine, minerals and vitamins; in the third, Drackett protein 17.2 replaced the alpha-protein [sources of these not specified]. In all 3 trials, groups were given 10 per cent. dehydrated alfalfa in addition to the purified diet, and in the

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second experiment there were also groups getting 3 per cent. menhaden fish solubles or "vitamin B₁₃" in a concentrate extracted from maize distiller's solubles. Gestation performance was judged by the weight, number and strength of the piglets at birth, and lactation by the number of pigs weaned, amount of feed per lb. gain of litter and sow, and individual and litter weights.

The alfalfa supplement had no consistent effect on gestation or lactation. With its conception rates were better than without and fewer services per conception were required after it had been given for 233 days; 88 per cent. of the sows getting the supplement but only 55 per cent. of those without it were able to rear their litters to weaning. After the experiment the sows were slaughtered. Examination of the reproductive tract showed no disorder, and there was no difference between treatments in their effect on rate of ovulation.

Menhaden fish solubles and "vitamin B₁₃" did not appear to have any beneficial effect on gestation or lactation. It was considered that the purified diets used in the experiments were suitable for use in studies of gestation and lactation in sows.

T. D. Bell.

4984

TITUS, H. W., BRUMBAUGH, J. H. and MEHRING, A. L. (Jr.) Evaluation of the effect of additions of vitamin B₁₂, DL-methionine, and procaine penicillin, singly and in combination, to corn-soybean diets for young growing chicks. *Poultry Sci.*, 1955, 34, 167-177. [Lime Crest Res. Lab., Limestone Products Corp. of America, Newton, N.J.]

The results of 2 experiments were analysed by a new method of evaluating the factors in a 2³ factorial nutrition experiment. In the first test, the diet of the chicks contained 46 per cent. of soya bean meal, and in the second, 35 per cent. Addition of vitamin B₁₂ increased the efficiency of feed utilisation and the gain in weight of both sexes. The effect was at its maximum at 4 weeks of age. Weight declined during the next 6 weeks, the decrease being much greater in female chicks. Addition of DL-methionine, purified or of commercial grade, did not improve efficiency of feed utilisation or stimulate growth; in the females it appeared to depress growth. Procaine penicillin, 2.5 mg. per lb. feed, increased the growth of both sexes, but 1.25 mg. was less effective; there was no consistent influence on feed utilisation.

E. M. Cruickshank.

4985

WELCH, B. E. and COUCH, J. R. Homocystine, vitamin B₁₂, choline, and methionine in the nutrition of the laying fowl. *Poultry Sci.*, 1955, 34, 217-222. [Dept. Poultry Husb., Texas Agric. Exp. Stat., College Station.]

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Hens, which in the pre-experimental period received a ration adequate in vitamin B₁₂ and methionine, were given a basal diet lacking in vitamin B₁₂ and containing 0.26 per cent. methionine and 0.145 per cent. choline. The diet was supplemented with vitamin B₁₂, homocystine, methionine and choline, separately and in different combinations. The supply of methionine was found to be the chief limiting factor in the basal diet. Egg production and the results of blood analysis showed that the hen could form methionine through the methylation of homocystine in the presence of vitamin B₁₂, though in the conditions of the experiment the rate of synthesis was insufficient to satisfy the bird's requirement. When the basal diet was supplemented with choline and homocystine with or without vitamin B₁₂, egg production was significantly greater than with homocystine and vitamin B₁₂. When methionine was given, egg production was not influenced by addition of vitamin B₁₂ but was significantly increased by addition of choline. Since the best egg production was obtained by supplementing the basal diet with vitamin B₁₂, choline and methionine, it is considered that the laying hen requires more choline than is needed for the formation of methionine.—E. M. Cruickshank.

4986

KERCHEER, C. J. and SMITH, S. E. The response of cobalt-deficient lambs to orally administered vitamin B₁₂. *J. Animal Sci.*, 1955, 14, 458-464. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

Lambs depleted of Co by 5 months' feeding on a deficient ration were treated with 500 µg. crystalline vitamin B₁₂ daily by mouth, a feed supplement giving 100 µg. vitamin B₁₂ daily, or 100 µg. crystalline vitamin B₁₂ daily by mouth. Some lambs remained as long as possible without treatment before being injected with a total of 500 µg. vitamin B₁₂ in 2 weeks. Bodyweight and appetite were recorded; Hb was estimated, but the results were too variable to be of use.

The lambs given 500 µg. crystalline vitamin B₁₂ by mouth daily for 5 weeks gave as good a response as those treated by injection, which were considered as positive controls. Response was good also with the feed supplement, but it was later found to contain enough Co to invalidate the comparison for the purpose of this experiment. The smaller amount of crystalline vitamin B₁₂ given by mouth daily for 8 weeks was not effective.—T. D. Bell.

4987

WHITE, E. A. Ketosis in dairy cattle: 1. The role of cobalt and the significance of vitamin B₁₂ in this metabolic disturbance. *Vet. Med.*,

1955, 50, 199-202. [Sch. Vet. Med., Michigan State Coll., East Lansing.]

Faulty rumen function and adrenal insufficiency are discussed as causes of primary ketosis. Successful treatment with dextrose or vitamin B₁₂ by vein and cobalt by mouth sulphate is reported. The success of the method seemed to justify it. It is suggested that the additional vitamin B₁₂ formed in the rumen may stimulate the adrenal glands.

T. D. Bell.

4988

HASHIMOTO, Y. Vitamin B₁₂ in marine and freshwater algae. *J. Vitaminol., Japan*, 1954, 1,

49-54. [Lab. Fish. Chem., Fac. Agric., Tokyo Univ., Hongo.]

The vitamin B₁₂ content of edible seaweeds, estimated with *Euglena gracilis*, ranged from 15 to 20 µg. per 100 g. air-dried *usakusanori*, *Porphyra tenera*. The alga was effective as a source of vitamin B₁₂ for chicks. About 30 other species of seaweed were studied and the vitamin B₁₂ values were from 0.1 to 4.0 µg. per 100 g. wet material. Some samples of zooplankton and pond muds also contained considerable amounts of vitamin B₁₂.

A. M. Copping.

See also Absts. 5262, 5296, 5383, 5715.

OTHER B VITAMINS

4989

GANDER, J. E. and SCHULTZE, M. O. Concerning the alleged occurrence of an "animal protein factor" required for the survival of young rats. 1. Studies with unpurified rations.

SCHULTZE, M. O. 2. Reproduction of rats fed protein-free amino acid rations. *J. Nutrition*, 1955, 55, 543-557; 559-575. [Dept. Agric. Biochem., Univ. Minnesota, Inst. Agric., St. Paul.]

1. Diets, based on cereals and exhaustively extracted casein or on sucrose and amino-acid mixtures, were given to rats for several generations in an attempt to demonstrate the need for the

water-soluble, heat-stable animal-protein factor associated with crude casein, not identifiable with any of the known B vitamins, postulated by Piccioni *et al.* (Abst. 3530, Vol. 21) as protecting against poor reproductive performance and promoting the survival of rats. While the syndrome described occurred with some diets, apparently minor changes in the ration, not associated with casein or other animal protein, sufficed to prevent its appearance. The findings remain unexplained.

2. Amino-acid mixtures known to be satisfactory for growth in normal animals were inadequate during reproduction and lactation.—C. Warner.

VITAMIN C (ASCORBIC ACID)

4990

BOGDAŃSKA, H., DESPERAK-SECOMSKA, B. and SZCZYGIŁOWA, M. Badania nad metodą enzymatyczno-mikrobiologiczną oznaczania kwasu askorbinowego i dehydroaskorbinowego w obecności reduktorów. [Studies on the enzymic-microbiological method of estimating ascorbic acid and dehydroascorbic acid in the presence of reducing agents.] *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 327-348. Russian and English summaries.

The method of Stewart and Sharp (Abst. 2309, Vol. 15), in which ascorbic acid and interfering reducing substances are oxidised by ascorbic acid oxidase and the resulting dehydroascorbic acid is specifically reduced again by bacteria, was studied. To obtain results with not more than 3 per cent. error allowance had to be made for the failure of some of the interfering reducing substances to be oxidised and for the observation by Mapson and Ingram (Abst. 1915, Vol. 21) that dehydroascorbic acid is not completely reduced to ascorbic acid by bacteria. (From summary.)—A. Hepburn.

4991

SCHMIDT, H. and STAUDINGER, H. Papierchromatographische Bestimmung von Ascorbinsäure und Dehydroascorbinsäure. [Estimation of ascorbic acid and dehydroascorbic acid by paper chromatography.] *Biochem. Ztschr.*, 1955, 326, 343-349. [Zentrallab., Städt. Krankenhaus, Mannheim.]

The application of paper chromatography to the estimation of ascorbic and dehydroascorbic acid was found to be satisfactory when oxalic acid solutions were employed. With tissue extracts ascorbic acid could be estimated in an atmosphere of CO₂, and total ascorbic acid in one of H₂S. The difference between the two gave the dehydroascorbic acid content. The validity of the method was demonstrated by good recoveries when known amounts of ascorbic or dehydroascorbic acid were added to tissue preparations.—A. M. Copping.

4992

BARAKAT, M. Z., EL-WAHAB, M. F. A. and EL-SADR, M. M. Action of *N*-bromosuccinimide

N.A. and R., October 1955

on ascorbic acid. New titrimetric method for estimation of vitamin C. *Anal. Chem.*, 1955, 27, 536-540. [Dept. Biochem., Fac. Med., Abbassia, Cairo.]

Ascorbic acid was estimated by rapid oxidative titration with *N*-bromosuccinimide solution. Interfering reducing substances were attacked more slowly or not at all and the end-point was reached when an excess of the reagent liberated I from KI. The experimental error did not exceed ± 2 per cent., and as little as 7.04 μ g. ascorbic acid per ml. could be estimated. Recovery of ascorbic acid added to blood and urine was good.—A. Hepburn.

4993

PÁDR, Z., ŠMÍD, M. and ŠCHO, V. Bestimmung der Ascorbinsäure mit Tetrazoliumsalzen. [Estimation of ascorbic acid with tetrazolium salts.] *Naturwissenschaften*, 1955, 42, 210-211. [Forschungsinst. Pharm. Biochem., Tech. Hochschule, Prague.]

Alkaline solutions of 2 : 3 : 5-triphenyltetrazolium chloride or 2 : 2'-*p*-(di-*o*-methoxy)-diphenylene-3 : 3' : 5 : 5'-tetraphenylditetrazolium chloride were used as spraying reagents for ascorbic acid in paper chromatography. The first gave red spots and the second blue. The reaction with ascorbic acid was immediate, but with sugars warming was required.—H. G. Bray.

4994

JEFFAY, H. Occurrence and distribution of bound ascorbic acid in animal tissues. *Federation Proc.*, 1955, 14, 231. *Proc.* [Dept. Biochem., Sch. Med., Univ. Puerto Rico, San Juan.]

4995

MOURQUAND, G. Avitaminosis, vitaminas y prioridades. El caso de la vitamina C. [Vitamin deficiency, vitamins and priorities. Vitamin C.] *Arch. venezol. Nutrición*, 1954, 5, 347-354. [Lyons.] English and German summaries.

The syndrome of vitamin C deficiency is discussed. It is concluded that some tissues receive priority in vitamin C supplies, and that severe nonspecific "collagenosis", produced in advanced deficiency, may be irreversible.—D. Duncan.

4996

ICHIHARA, K. Ascorbic acid and protein metabolism. *J. Vitamins, Japan*, 1954, 1, 55-84. [Dept. Biochem., Osaka Univ. Med. Sch., Nakanoshima.]

Results previously reported in Japanese by a number of observers are summarised. From experiments with guineapigs it was established that onset of scurvy was hastened by a simultaneous deficiency of tryptophan, and delayed if anthranilic

acid was added to the diet lacking in ascorbic acid. From tests *in vitro* with liver homogenates, it was concluded that 5-hydroxyanthranilic acid was the active form of anthranilic acid. A diet containing 40 per cent. casein caused more rapid onset of scurvy than one lower in protein. Administration of tyrosine, cystine and histidine caused a rapid decrease in the ascorbic acid content of the guineapig's liver. Homogentisic acid added to the diet prolonged survival of scorbutic animals. Simultaneous injection of butyric acid and tyrosine into guineapigs deprived of vitamin C caused excretion of benzoquinoneacetic acid in the urine and appearance of cataract.

By chemical methods of estimation relationships between ascorbic acid and diketogulonic acid were investigated. It is suggested that in metabolic reactions between ascorbic acid and amino-acids, diketogulonic acid is an intermediary metabolite.

A. M. Copping.

4997

GREENBERG, L. D. and RINEHART, J. F. Serum iron levels in rhesus monkeys with chronic vitamin C deficiency. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 325-328. [Dept. Pathol., Univ. California Sch. Med., San Francisco.]

Hb, red cell count and serum Fe decreased in 2 rhesus monkeys with acute scurvy after a considerable time on a scorbutogenic diet. Serum Fe remained low for 41 days despite a daily oral supplement of 50 mg. as FeSO₄, although Hb and the red cell count showed a slight to moderate increase. When 25 mg. ascorbic acid were given also, serum Fe, Hb and weight increased rapidly but the response of the red cells was variable.

A. Hepburn.

4998

NADEL, E. M., MULAY, A. S. and SASLAW, L. D. On the failure of glycogen deposition in the livers of scorbutic guinea pigs. *Endocrinology*, 1955, 56, 584-589. [Lab. Pathol., Nat. Cancer Inst., Nat. Inst. Health, Bethesda, Md.]

Six hr. after intraperitoneal injection of fructose, glucose or alanine the livers of scorbutic guineapigs contained less glycogen than those of starved or normal animals treated in the same way. In all 3 groups the deposition of glycogen was less with alanine than with glucose or fructose, which were equally effective. The starved group, which lost about as much weight as the scorbutic group, deposited glycogen normally after injection. Glycogen increased after the injection of ascorbic acid in starved, but not in normal or scorbutic, guineapigs. A. Hepburn.

4999

BANERJEE, S. and GHOSH, P. K. Effect of scurvy on hexokinase activity of tissues of guinea pigs. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 415-416. [Dept. Physiol., Presidency Coll., Calcutta.]

The hexokinase activity of skeletal muscle and liver from scorbutic guineapigs was significantly less than in pair-fed, non-deprived animals; in the kidneys it was greater and in the pancreas there was no difference.—A. Hepburn.

5000

BERNARDINI, A. and CIMINO, G. Il comportamento delle proteine plasmatiche di fronte al calore nel corso dell'avitaminosi C. [The effect of heat on plasma proteins in the course of vitamin C depletion.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1344-1346. [Ist. Patol., Univ. Catania.]

Twenty guineapigs weighing about 500 g., after a preliminary period on a diet rich in cabbage, were given for 30 days a scorbutogenic diet in which vitamin C had been destroyed by heating. Half of them received 1 mg. ascorbic acid daily. At the end of the experiment they were killed and ascorbic acid was estimated in the liver and adrenal glands. At intervals of 10 days during the experiment specimens of the diluted blood plasma were exposed to temperatures of 45°, 50° and 55° C., and the light transmission was measured with filter S53 in the Pulfrich photometer. In the plasma heated at 45° C. the non-deprived animals showed no turbidity, and the deprived ones only a small degree. At 50° and 55° C. the turbidity was progressively more, and was greater in the deprived guineapigs. The liver and adrenal glands of the non-deprived guineapigs contained, respectively, 0.087 and 0.284 mg. ascorbic acid per g. tissue; in the organs of the deprived guineapigs no trace could be found.—E. M. Hume.

5001

UPTON, A. C., ODELL, T. T. (Jr.) and GUDE, W. D. Incorporation of sulfur³⁵-labeled sulfate in healing wounds and in platelets of normal and scorbutic guinea pigs. *Federation Proc.*, 1955, 14, 421. *Proc. [Biol. Div., Oak Ridge Nat. Lab., Tenn.]*

5002

SOKOLOFF, B., EDDY, W. H., BEAUMONT, J., WILLIAMS, J. and POWELLA, R. Effect of ascorbic acid and glucoascorbic acid on nucleic acids in tumor tissue. *Cancer Res.*, 1955, 15, 147-150. [A. P. Cook Mem. Cancer Lab., Florida Southern Coll., Lakeland.]

In guineapigs fed on a scorbutogenic diet the amount of deoxyribonucleic acid in fibrosarcoma tissue and in the nuclei of the tumour cells was reduced. Excess of ascorbic acid tended to increase the amount of deoxyribonucleic acid in the total tissue but had no significant effect on the amount in the nuclei. In rats fed on a scorbuto-

genic diet the amount of total and nuclear deoxyribonucleic acid in Crocker carcinoma tissue was reduced, and was further decreased when a low level of ascorbic acid was produced in the tissues by giving glucoascorbic acid. In guineapigs the deoxyribonucleic acid content of the tumours was not affected by giving glucoascorbic acid. The decrease in nuclear deoxyribonucleic acid was greater in guineapigs than in rats. The amount of total ribonucleic acid in tumour tissue from either species was not significantly altered.—A. Hepburn.

5003

BERNARDINI, A. and CALTABIANO, S. L'azione dei raggi roentgen sul metabolismo dell'acido ascorbico. [Action of X-rays on ascorbic acid metabolism.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1869-1872. [Ist. Patol., Univ. Catania.]

Groups of 10 rats weighing about 160 g. were maintained on a scorbutogenic diet. One group was exposed to X-rays, 350 r., over the whole body. Ascorbic acid was estimated by indophenol titration in the urine beforehand and 18 hr., 40 hr. and 15 days later, and with methylene blue in the adrenal glands, liver and spleen when the rats were killed 15 days after exposure. In the organs of the treated rats the mean content of ascorbic acid was from 57 to 70 per cent. less than in the untreated. In the urine of the treated rats, the amount of ascorbic acid increased progressively, and after 15 days was more than 10 times greater than before treatment.—E. M. Hume.

5004

NIGEON-DUREUIL, M. and RATSIMAMANGA, A. R. Preuves biologiques de la déviation du métabolisme du système enzymatique de la surrénale scorbutique. [Biological proof of a change in the metabolism of the enzyme system in scorbutic adrenal glands.] *C.R. Soc. Biol.*, 1955, 149, 21-24. [Lab. Physiol. Vitamines, Fac. Méd., C.N.R.S., Paris.]

Of 14 guineapigs weighing from 150 to 350 g., given for 30 days a diet deficient in vitamin C, half received 100 mg. ascorbic acid daily. They were all killed and a saline extract of the adrenal glands was incubated with deoxycorticosterone. The resulting material was extracted successively with ethanol, acetone, chloroform and methanol, and the extracts were chromatographed on paper. The substances obtained were eluted and tested on adrenalectomised rats for their protective value against exposure to cold.

Substances from the adrenal glands of normal guineapigs prolonged the life of adrenalectomised rats exposed to cold, but substances from the adrenal glands of the scorbutic guineapigs were toxic and reduced the survival time.

It is concluded that in scurvy the metabolism of deoxycorticosterone in the adrenal glands is changed.—D. Duncan.

5005

NIGEON-DUREUIL, M., RABINOWICZ, M., RAHAND-RAHA, T. and RATSIMAMANGA, A. R. Déviation possible du métabolisme des corticostéroïdes au niveau de la surrénale au cours du scorbut expérimental. [Possible abnormality in the metabolism of corticosteroids in the adrenal glands during experimental scurvy.] *J. Physiol., Paris*, 1955, **47**, 254-256. [C.N.R.S. Hautes-Études, Fac. Méd., Paris.]

5006

BURSTEIN, S., DORFMAN, R. I. and NADEL, E. M. Corticosteroids in the urine of normal and scorbutic guinea pigs: isolation and quantitative determination. *J. Biol. Chem.*, 1955, **213**, 597-608. [Worcester Found. Exp. Biol., Shrewsbury, Mass.]

Urine from scorbutic and normal guineapigs contained cortisol, 6 β -hydroxycortisol and an unknown steroid previously isolated from urine of normal guineapigs that had been given cortisol by mouth. Scorbutic guineapigs excreted the first 2 steroids in concentrations 300 and 80 per cent. above the values for the normal animals; the concentration of unknown steroid was unchanged. Adrenocorticotrophic hormone did not increase the urinary steroids of scorbutic guineapigs.—A. Hepburn.

5007

OERTEL, G. and HEIN, H. Trennung der 17-Ketosteroid im Harn skorbütischer Meerschweinchen. [Separation of 17-ketosteroids in the urine of scorbutic guineapigs.] *Hoppe-Seyler's Ztschr.*, 1954, **297**, 249-253. [Lab. Firma Byk-Gulden-Lomberg, Chem. Fabrik. G.m.b.H., Constance.]

By paper chromatography 25 fractions were separated from the ketosteroid components of guineapig urine. Normal guineapigs excreted on the average 230 μ g. ketosteroids daily. After 10 days on a diet lacking in vitamin C the mean value was 673 μ g. The distribution of the ketosteroids in the different chromatographic fractions was very different in normal and scorbutic animals. The change in ketosteroid excretion in vitamin C deficiency was considered to be connected with changes in adrenal cortical function.

A. M. Copping.

5008

DUNCAN, G. M. and FORBES, J. C. Adrenal response of vitamin-deficient rats to alcohol intoxication. *Federation Proc.*, 1955, **14**, 205. *Proc.* [Dept. Biochem., Med. Coll. Virginia, Richmond.]

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5009

REINFRET, A. P. and HANE, S. The adrenal ascorbic acid-depleting capacity of extracts of the infant rat pituitary gland. *Endocrinology*, 1955, **56**, 341-344. [Metabol. Unit Res. Arthritis and Allied Dis., Univ. California Sch. Med., San Francisco.]

Injection of dilute acid extracts of lyophilised pituitary tissue from rats aged from 4 to 7 days into hypophysectomised rats weighing from 125 to 150 g. or into other rats aged from 4 to 7 days caused depletion of ascorbic acid in the adrenal glands.—A. Hepburn.

5010

KNOBL, E. and FREGLY, M. J. Effect of ascorbic acid on the adrenal gland after hypophysectomy and after exposure to cold. *Endocrinology*, 1955, **56**, 614-616. [Dept. Physiol., Harvard Med. Sch., Boston, Mass.]

Daily injection of 100 mg. sodium ascorbate given intravenously or of 150 mg. buffered ascorbic acid given intraperitoneally for 7 days in rats after hypophysectomy did not significantly affect the decrease in weight of the adrenal glands or the increase in the concentration of adrenal cholesterol which normally follow the operation. Daily intraperitoneal injection of 150 mg. ascorbic acid into rats during and 2 days before their exposure to cold for 24 hr. also had no significant effect.

A. Hepburn.

5011

WEIDMANN, H. Ascorbinsäureherabsetzung in den Nebennieren hypophysectomierter Ratten durch Salicylsäure. [Reduction by salicylic acid in the amount of ascorbic acid in the adrenal glands of rats from which the pituitary gland has been removed.] *Arch. exp. Pathol. Pharmacol.*, 1955, **225**, 342-345. [Pharmakol. Lab., H. Lundbeck and Co. A/S, Copenhagen.]

5012

BOOKER, W. M., DaCOSTA, F. M., TUREMAN, J. R., FROIX, C. and JONES, W. The relation of ascorbic acid to adrenocortical function during cold stress. *Endocrinology*, 1955, **56**, 413-419. [Dept. Pharmacol., Med. Sch., Howard Univ., Washington, D.C.]

Both cortisone and ascorbic acid increased survival of intact and adrenalectomised mice subjected to cold. Ascorbic acid was more effective in intact than in adrenalectomised mice. The effect of cortisone was the same for both groups, since they both survived for 5 hr. A combination of low doses of cortisone with high doses of ascorbic acid was more effective in intact than in adrenalectomised mice, but the opposite combination was more effective with the adrenalectomised mice.

Adrenalectomised mice during stress and recovery had higher blood values for K than intact mice or mice treated with ascorbic acid. The possibility that ascorbic acid might facilitate the "handling" of K in adrenalectomised mice is suggested.

A. Hepburn.

5013

BOOKER, W. M., DaCOSTA, F., SHELTON, M. and ROBINSON, E. Studies on the effects of ascorbic acid and of cortisone on heart muscle.

MITCHELL, S. Q., FUNDERBURK, W., DaCOSTA, F. and BOOKER, W. M. Further studies on the influence of ascorbic acid, glutathione and cortisone on tissue metabolism. *J. Pharmacol. Exp. Therap.*, 1955, 113, 5-6; 40. *Proc. [Dept. Pharmacol., Med. Sch., Howard Univ., Washington, D.C.]*

5014

ALLEGRETTI, N., VUKADINOVIĆ, G. and RABADJICA, L. Insulin sensitivity in adrenalectomised rats treated with ascorbic acid and desoxycorticosteroneacetate (DCA). *Amer. J. Physiol.*, 1955, 180, 508-510. [*Inst. Physiol., Med. Fac., Univ. Zagreb, Yugoslavia.*]

Fasting blood sugar was estimated before, and 1, 2, 3 and 4 hr. after, administration of insulin to adrenalectomised albino rats of both sexes. In the first series of experiments the animals received insulin alone, or with ascorbic acid or subcutaneous implants of desoxycorticosterone acetate (DCA) pellets; in a second series the rats received insulin alone, or with injections of DCA in oil, with the usual laboratory food or with a salt-free diet.

Ascorbic acid did not, but DCA did, produce sensitisation to insulin action. The DCA effect was more pronounced in rats which received a normal diet than in those having the NaCl-free diet. The effects of ascorbic acid and DCA are attributed to the action of Na, DCA preserving Na in the organism, and ascorbic acid decreasing blood K and so producing a relative increase in concentration of Na.—G. F. Garton.

5015

DESMARAIS, A. L'action anti-thyroïdienne de l'acide ascorbique et de l'acétate de desoxycorticosterone (DOC). [Antithyroid action of ascorbic acid and of desoxycorticosterone acetate.] *C.R. Soc. Biol.*, 1955, 149, 214-217. [*Dept. Exp. Physiol., Fac. Méd., Laval Univ., Québec.*]

Of 6 groups of rats weighing from 105 to 175 g. one group had no operation, 4 groups had the adrenal glands and one group had the thyroid gland removed. Immediately after operation one adrenalectomised group was kept, like the intact animals, at 24° C. and given 2.5 mg. cortisone

daily and 1 per cent. NaCl to drink; 3 groups of adrenalectomised rats received the same treatment at 15° C., but rats in one of the 3 groups had in addition 150 mg. Na ascorbate daily and in another of the 3 groups 2.5 mg. desoxycorticosterone daily. The rats from which the thyroid gland had been removed were kept at 12° C. and given 3 µg. thyroxine daily and 1 per cent. sodium lactate. After 6 days the rats were killed, and the thymus, thyroid and adrenal glands not removed initially were examined.

In the rats with the adrenal glands removed, the changes in the thymus and thyroid were not statistically significant at normal temperature, but in the cold there was significant reduction in the weight of the thymus and increase in height of the thyroid epithelium; the effect on the thyroid was prevented by sodium ascorbate and both effects were prevented by desoxycorticosterone. There was no involution of the thymus in the rats with the thyroid removed, although the adrenal glands were significantly enlarged.—D. Dumeau.

5016

BOYD, T. A. S. Influence of local ascorbic acid concentration on collagenous tissue healing in the cornea. *Brit. J. Ophthalmol.*, 1955, 39, 204-214. [*Nuffield Lab. Ophthalmol., Oxford.*]

Twenty guineapigs on a diet rich in ascorbic acid had the lens removed from the left eye and a control operation made on the right eye. The cornea from the left and the right side, after injury by a standard heat treatment, healed in the significantly different mean times of 17.3 and 10.8 days. After healing, the mean ascorbic acid value for the left eye was lower than for the right in the vitreous humour, aqueous humour and cornea. The differences for the last 2 were significant. The results suggested a possible influence by the local concentration of ascorbic acid on the rate of collagen healing.—A. Hepburn.

5017

BREIDENBACH, A. W. and RAY, F. E. Effects of ascorbic acid on gastric secretion in guinea pigs. *Amer. J. Physiol.*, 1955, 180, 637-640. [*Cancer Res. Lab., Univ. Florida, Gainesville.*]

Gastric juice was collected by a gastrocutaneous fistula from normal guineapigs given an intramuscular injection of 13.8 mg. Na ascorbate per kg. daily and from those given the same injection once a week. Intraperitoneal injection of ascorbic acid in saline increased the acidity and concentration of ascorbic acid in the gastric juice of all the animals but did not affect the rate of secretion. Similar injection of saline alone had no effect. Peritoneal injection of histamine increased the acidity and rate of secretion but decreased the concentration

of ascorbic acid, probably by dilution. When histamine was not used the gastric juice from the partly deprived guineapigs had a lower acidity than juice from the non-deprived.—A. Hepburn.

5018

GOSSSELIN, L. Action de l'acide ascorbique sur l'intestin isolé du lapin. [Effect of ascorbic acid on isolated rabbit intestine.] *Arch. internat. Pharmacodyn.*, 1955, **101**, 338-348. [Lab. Pathol., Univ. Liège.] English summary.

The effect on isolated rabbit intestine of ascorbic acid in concentrations between 4×10^{-6} and 4×10^{-3} was generally to increase both the tone and the amplitude of contractions. With successive additions contractions tended to cease. Ascorbic acid had little effect on response to acetylcholine or histamine. When added before salts of Co, Mn or Fe, ascorbic acid did not affect their action if they were in low concentration, about 1×10^{-6} ; if they were in higher concentration it had an immediate inhibitory effect.

With Cu^{++} ions the vitamin had an immediate potentiating effect, with increase of tone, which, it is suggested, may be produced by the action on —SH compounds of some substance formed during oxidation of the vitamin by copper.

D. Harvey.

5019

LAMDEN, M. P. and SCHWEIKER, C. E. Effects of prolonged massive administration of ascorbic acid to guinea pig. *Federation Proc.*, 1955, **14**, 439-440. *Proc.* [Dept. Biochem., Coll. Med., Univ. Vermont, Burlington.]

5020

NARPOZZI, A. and ROSSI, F. L'edema da albume d'uovo nel ratto dopo somministrazione di acido ascorbico. [Egg white oedema in the rat after administration of ascorbic acid.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1991-1993. [Ist. Patol., Univ. Padua.]

Twenty-eight rats weighing from 80 to 250 g. were injected intraperitoneally with 1 ml. egg white, 22 of them having received from 20 to 30 min. previously an intraperitoneal injection of from 200 to 450 mg. ascorbic acid per 100 g. body-weight. With the dose of 450 mg., the characteristic oedema caused by the egg white was completely prevented or greatly retarded in appearing. With the smaller dose also there was some retardation.—E. M. Hume.

5021

OGGIONI, G. Ricerche sperimentali sull'azione antiscorbutica dell'inositol. [Experiments on the antiscorbutic action of inositol.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1421-1422. [Osp. Psichiat. Provinciale di Bologna in Imola.]

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Six guineapigs were maintained on a diet of well dried hay, oats and water. After from 15 to 20 days, 4 were given in addition from 5 to 10 ml. daily of a 10 per cent. solution of *meso*-inositol. The 2 untreated died in from 28 to 30 days. Those given inositol recovered and survived for a couple of months. Three guineapigs given from 3 to 5 ml. of the 10 per cent. inositol solution prophylactically from the start of the experiment for more than 2 months were protected from the major signs of scurvy, though they lost weight and deteriorated slowly, with some swelling of the limbs.

E. M. Hume.

5022

DOESSBURG, J. J. Het vitamine C-gehalte van gesneden groenten. [The vitamin C content of sliced vegetables.] *Voeding*, 1955, **16**, 503-518. [Inst. Bewaring Tuinbouwprod., Wageningen.] English summary.

The effect on the vitamin C content of slicing cabbage, endive, celery, spinach and green beans some hours before cooking was studied in different conditions of temperature and moisture. Loss of vitamin C was greater in spinach than in white or yellow cabbage when stored at 2°, 10°, or 20° C. In cabbage the loss of free or bound ascorbic acid was relatively small even in sliced samples kept up to 9 hr. at 20° C. The other vegetables showed losses of ascorbic acid intermediate between those in cabbage and spinach. Loss of the vitamin appeared to be closely connected with loss of moisture from cut vegetables and with damage caused by crushing in the process of slicing or chopping. The use of moisture-proof containers did not entirely prevent the destruction of vitamin C. The ratio of ascorbic to dehydroascorbic acid decreased during storage of whole and cut vegetables. From the tests it was concluded that ordinary domestic slicing was unlikely to cause much loss of vitamin C and that with good marketing conditions vegetables for sale on the same day could be sliced without serious loss of vitamin C.

A. M. Copping.

5023

ASENJO, C. F. Ensayo biológico de vitamina C en la cereza "antillana" (*Malpighia puniceifolia* L.). [Biological estimation of vitamin C in the West Indian cherry, *Malpighia puniceifolia* L.] *Arch. venezol. Nutricion*, 1954, **5**, 317-325. [Dept. Bioquim., Esc. Med. Trop., Univ. Puerto Rico, San Juan.] English and German summaries.

Of young guineapigs given a scorbutogenic diet, 10 had no supplement and 5 groups of from 5 to 10 animals had daily 0.5 or 1 mg. ascorbic acid, or 0.05 or 0.1 ml. juice of the West Indian cherry, or 0.1 ml. of the same juice canned 3 weeks previously.

Both the groups given fresh juice made much greater weight gains than the group given 1 mg. ascorbic acid daily; the group given canned juice gained slightly less. The canned juice contained about 1000 mg. vitamin C per 100 ml. according

to the biological comparison, and 1100 mg. per 100 ml. by chemical analysis. Similar results were obtained in a curative experiment.

D. Duncan.

See also Abst. 4749.

OTHER VITAMINS

5024

EWERBECK, H. and LEGERSKI, R. Experimenteller Beitrag zur Frage: Verhütet Vitamin P den Transfusionszwischenfall? [Experimental contribution to the question whether vitamin P has a protective action against transfusion accidents.] *Monatsschr. Kinderheilk.*, 1955, 103, 21-23. [Kinderklin., Univ. Cologne.]

In 33 tests on 20 rabbits sensitised to human red cells or whole blood, no evidence was obtained that vitamin P as rutin could protect against anaphylactic shock. No effect was observed whether rutin was administered before, at the same time as, or after, the shock dose of blood or red cells. In view of the findings it was considered unlikely that vitamin P would protect against anaphylactic shock occurring during blood transfusion.

A. M. Copping.

5025

BOOTH, A. N., MURRAY, C. W., DEEDS, F. and Jones, F. T. Metabolic fate of rutin and quercetin. *Federation Proc.*, 1955, 14, 321. *Proc. [W. Utilisation Res. Branch, U.S. Dept. Agric., Albany, Calif.]*

5026

AMERSE, A. M., DEEDS, F. and MARSH, P. V. Effects of rutin on experimental cold injury. *Federation Proc.*, 1955, 14, 314. *Proc. [W. Utilisation Res. Branch, U.S. Dept. Agric., Albany, Calif.]*

5027

STELZER, W. Der Einfluss des Vitamin-T-Komplexes auf Fische. [Effect of the vitamin T

complex on fishes.] *Ztschr. Vitamin-, Hormon-Fermentforsch.*, 1954, 6, 391-405. [Zool. Inst., Univ. Graz.] English and French summaries.

Experiments are described with guppies (*Lebistes reticulatus*) in which the fish were fed with vitamin T or bathed in a solution of it. The results are considered to show that vitamin T had a favourable effect on growth.—E. M. Hume.

5028

HURLBERT, R. B. and REICHARD, P. The conversion of orotic acid to uridine nucleotides *in vitro*. *Acta chem. scand.*, 1955, 9, 251-262. [Dept. Biochem., Karolinska Inst., Stockholm.]

Particle-free extracts of rat, pigeon and chick tissues were tested for their ability to convert orotic acid containing ^{14}C into the nucleotides of 5'-uridine monophosphate and 5'-uridine pyrophosphate. Ribose-5-phosphate, adenosine triphosphate and Mg were required for the conversion. Extracts of liver, pancreas and spleen were the most active in the process; extracts of tumour and kidney were less so, and heart muscle had almost no effect. It was shown that ribose-5-phosphate and adenosine triphosphate reacted to produce ribose triphosphate which was the source of the ribose phosphate moiety of the uridine nucleotides. The nucleotide of 5'-uridine monophosphate appeared to be formed first; other nucleotides were produced later by phosphorylating enzyme systems present in the tissue extracts.—A. M. Copping.

4. PHYSIOLOGY OF NUTRITION

ENZYMES

5029

GAVINI, R. and DISERTORI, A. Studio della fibrinolisi ematica in bambini allattati al poppatoio e al seno. [Fibrinolysis in the blood of infants fed from the bottle and from the breast.] *Lattante*, 1954, 25, 683. *Proc. [Clin. Pediat., Padua.]*

5030

MIKHILIN, S. YA. and LEVITSKII, L. M. Soderzhanie fermentov v duodenal'nom soke i kale bol'nykh, perenessikh operatsiyu resektzii zheludka po povodu raka. [Enzyme content of duodenal secretion and of faeces in patients subjected to gastric resection for cancer.] *Vop.*

N.A. and R., October 1955

Pitan., 1955, 14, No. 2, 34-35. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

5031

GRANT, N. H. and ROBBINS, K. C. **A new pancreatic proteinase.** *J. Amer. Chem. Soc.*, 1955, 77, 2027-2028. [Biochem. Res. Labs., Armour Labs., Chicago, Ill.]

5032

LEUBNER, H. and SHWACHMAN, H. **Studies of duodenal fluid in nutritional disorders. Alkaline phosphatase.** *Amer. J. Dis. Child.*, 1955, 89, 341-345. [Child. Med. Centre, Div. Labs. Res., Harvard Med. Sch., Boston, Mass.]

Fasting values of alkaline phosphatase in duodenal fluid are tabulated for 9 adults, 17 healthy children and 94 children suffering from nutritional and other disorders. Estimations of digestive enzymes, bile concentration and acid phosphatase in duodenal fluid showed no relation between either alkaline or acid phosphatase and the digestive enzymes or bile concentration. It is suggested that much of the alkaline phosphatase in duodenal fluid arises from the duodenal mucosa itself.

The lack of association between alkaline phosphatase and bile in duodenal fluid from fasting subjects was found also in subjects given intra-duodenal instillations of olive oil.—F. C. Aitken.

5033

ZORZOLI, A. **The influence of age on phosphatase activity in the liver of the mouse.** *J. Gerontol.*, 1955, 10, 156-164. [Dept. Physiol., Southern Illinois Univ., Carbondale.]

Alkaline and acid phosphatase in the liver remained relatively constant in young and adult mice. Senile mice aged from 17 to 24 months had significantly more alkaline and less acid phosphatase. Females had significantly more alkaline phosphatase than males at all ages, but acid phosphatase did not differ between the sexes.

A. Hepburn.

5034

SYMONS, N. B. B. **Alkaline phosphatase activity in the developing teeth of the rat.** *J. Anat.*, 1955, 89, 238-245. [Univ. St. Andrews Dent. Sch., Dundee.]

5035

BLOCK, W. D. and JOHNSON, D. V. **Factors influencing xanthine oxidase activity in rat skin.** *Arch. Biochem. Biophys.*, 1955, 56, 137-142. [Dept. Dermatol., Med. Sch., Univ. Michigan, Ann Arbor.]

Details are given of a method for preparing skin extracts from rats which were weaned at 21 days and maintained on a standard Rockland rat diet.

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The method gave reasonably consistent values for skin xanthine oxidase when tested on a large number of adult rats. Skin and liver xanthine oxidase were estimated at 7, 14, 21, 28, 36, 45 and 90 days of age.

Xanthine oxidase in skin did not change significantly during the first 21 days after birth; an increase occurred from 21 to 28 days of age, corresponding to the first 7 days on the stock diet. The effect of the change in diet on liver xanthine oxidase was less; there was a gradual increase in activity with age. A 72-hr. fast did not affect the level of xanthine oxidase in skin extracts; liver xanthine oxidase was depleted.—G. F. Garton.

5036

BEGG, R. W. and BURTON, A. F. **Maintenance of liver xanthine oxidase activity in rats on low protein diets.** *Federation Proc.*, 1955, 14, 180. *Proc.* [Dept. Med. Res., Univ. W. Ontario, London.]

5037

NILSSON, G. **Studies concerning the reducing properties of milk. The role of xanthine oxidase.** *Kgl. Lantbrukshögsk. Ann.*, 1954, 21, 445-456. [Inst. Microbiol.]

5038

BÉRAUD, T. and VANNOTTI, A. **Variations du taux du cytochrome C dans les états d'inanition chez le lapin. [Variations in the concentration of cytochrome c in inanition in the rabbit.]** *Schweiz. med. Wochenschr.*, 1955, 85, 174-178. [Clin. Méd., Univ. Lausanne.]

Cytochrome c was estimated by a photometric method in the liver of fed and fasting rabbits. The presence of large amounts of glycogen or fat in the liver did not appear to affect the extraction of cytochrome c, which showed a difference in distribution in the cell elements between fed and fasting animals. There was a large increase in cytochrome c of the liver after a 48-hr. fast. The effect of fasting was still apparent in rabbits poisoned with lead or allyl-isopropylacetylcarbamide, though the amount of cytochrome c was diminished. The relation of cytochrome c to the formation of haem in normal and abnormal conditions is discussed.

A. M. Copping.

5039

GAMBASSI, G. and PIRRELLI, A. **Citocromo C e frazioni fosforate. [Cytochrome c and phosphorylated fractions.]** *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1648-1649. [Ist. Patol., Univ. Bari.]

See also Absts. 4701, 4709, 5004, 5175, 5176, 5207, 5394.

DIGESTION AND ABSORPTION

5040

NESSENT, R., LECHT, M. and SCHEVEN, B. Über die Durchgangszeit des Futters beim Silberfuchs. [The rate of passage of feed in the silver fox.] *Arch. Tierernährung*, 1955, 5, 26-32. [Inst. Tierzuchtforsch., Rostock, Dummerstorf.]

Foxes fed twice daily were given a meal marked with carbon black and faeces were collected until the marker disappeared. Whether the meal so marked was given in the morning or the evening, the marker appeared in the faeces after about 8 hr. in adult foxes and after about 6½ hr. in 4 foxes 4 months old. The marker was eliminated by 18 or 19 hr. in both young and adult foxes when it was given in the morning and by 29 to 30 hr. when it was given in the evening. The digestion time of the evening feed was thus nearly twice that of the morning feed.

In foxes fed only once daily the first marked faeces appeared in 5 to 10 hr. and the last in 31 to 32 hr., irrespective of age and sex.

The emptying time of the stomach was studied in 36 foxes given a meal marked with stained straw particles 2 to 26 hr. before they were killed. Not more than 10 per cent. of the meal usually left the stomach in the first 8 or 10 hr., but 10 per cent. remained after 26 hr., by which time 68 per cent. was in the large intestine.

It is concluded that fluid may pass through the digestive tract of foxes at 90 cm. an hour, and the whole meal at 12, 7 or 6.5 cm. an hour when feeding is twice daily in the morning or afternoon or once daily.—D. Duncan.

5041

THACKER, E. J. and BRANDT, C. S. Coprophagy in the rabbit. *J. Nutrition*, 1955, 55, 375-385. [U.S. Plant, Soil and Nutrit. Lab., Bur. Plant Indust., U.S. Dept. Agric., Ithaca, N.Y.]

Pairs of rabbits, male and female, were given at 4 weeks of age diets consisting mainly of dried grass (roughage diet) or of purified components (purified diet). At 14 weeks the animals were given a maintenance level of feed and one from each pair was tied up to prevent coprophagy. After 10 days radio-active Cr_2O_3 was given mixed with one day's feed. Faeces were collected for 10 days from the tied rabbits and for 30 days from the others. After this time the situation was reversed and the procedure was repeated. Urine and faeces for the fourth to tenth days were pooled for digestibility and N balance estimations. Throughout 2 years 3 groups, each of 4 rabbits, were studied.

The prevention of coprophagy produced an apparent decrease in protein digestibility and in N retention and in the digestibility of dry matter on both diets. The effect of coprophagy on the utilisation of other dietary nutrients depended on the diet. In rabbits practising coprophagy there was greater digestibility of the cellulose of the purified diet and a longer half-life of feed residues in the digestive tract.

A physiological mechanism to explain the production of soft and hard faeces is suggested; differences in composition are accounted for by the production of a protein-containing caecal secretion.

G. F. Garton.

5042

MÜTING, D. Über den Aminosäuregehalt des menschlichen Magen- und Duodenalsaftes. [The amino-acid content of human gastric and duodenal secretion.] *Naturwissenschaften*, 1954, 41, 580. [Forschungs Inst. Diabetes Karlsburg, Kr. Greifswald.]

By methods described elsewhere (Abst. 626, Vol. 25), 18 amino-acids were estimated by chemical methods or paper chromatography in 35 samples of gastric secretion, fasting and after stimulation with caffeine, and 15 samples of duodenal secretion from 10 normal persons and 40 controlled diabetics without stomach trouble. The results are tabulated. The total amounted to rather less than 6.25 times the α -amino-N estimated by the method of Moore and Stein (Abst. 3939, Vol. 18), since the latter includes peptides that react with ninhydrin. Gastric secretion after caffeine contained more α -amino-N than fasting secretion, and highly acid secretion more than normal or anacid secretion.

W. M. Deans.

5043

PERSIDSKII, V. YA. Vliyanie kakao na sekretornuyu i evakuatornuyu funktsii zheludka. [Influence of cocoa on secretion and emptying of the stomach.] *Vop. Pitan.*, 1955, 14, No. 2, 30-34. [Inst. Med., Kiev.]

The response of the stomach to cocoa was tested by fractional aspiration in 18 subjects whose gastric function varied from hypersecretion, through the normal range, to complete achylia. Cocoa stimulated gastric secretion, mainly in the second phase. Cocoa left the stomach more slowly than water, ethanol or meat broth. Cocoa prepared with milk left the stomach more slowly and led to a lower concentration of free acid than did cocoa prepared with water.—D. W. Taylor.

5044

BRACKNEY, E. L., THAL, A. P. and WANGENSTEIN, O. H. Role of duodenum in the control of

N.A. and R., October 1955

gastric secretion. *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 302-306. [Dept. Surg., Univ. Minnesota, Minneapolis.]

After the preparation and standardisation of Heidenhain gastric pouches, 5 dogs were subjected to removal of the duodenum and the first 20 to 30 cm. of jejunum, the common bile duct and pancreatic duct being anastomosed to the jejunum. In 3 more dogs the same length of duodenum and jejunum was transplanted to a site about half way down the remaining small intestine. The dogs had good appetites and maintained their weights. Study of gastric secretion from the pouches commenced 3 weeks after the second operation.

All dogs showed a large increase in the amount of free HCl secreted during 8-hr. collections after removal or transplantation of the duodenum. The increase was from 84 to 820 per cent. of the pre-operative secretion and was always statistically significant.—D. Duncan.

5045

HERTING, D. C. and AMES, S. R. On the gastric lipolysis of fat. *Arch. Biochem. Biophys.*, 1955, **55**, 295-297. [Res. Labs., Distillation Products Industries, Div. Eastman Kodak Co., Rochester, N.Y.]

Adult rats were fed for 5 or 6 days on diets which contained 22.1 per cent. of cottonseed oil, I value 110, steam-rendered lard, I value 55, or fully hydrogenated lard, I value 0. Lipids were then extracted from the stomach contents and free fatty acids were titrated.

Values of 7.7 and 8.8 per cent. free fatty acids were found in the lipids after cottonseed oil and lard, respectively, and 49.9 per cent. after saturated fat. It is suggested that this may be explained by delayed emptying of the stomach or by slow dissociation of lipase-substrate complex.

G. A. Garton.

5046

VIDAL-SIVILLA, S. Sobre los resultados de absorción intestinal en los animales adrenalectomizados. [Intestinal absorption in adrenalectomised animals.] *Rev. española Fisiol.*, 1954, **10**, 203-223. [Inst. Fisiol., Fac. Med., Barcelona.] English summary.

5047

VIDAL-SIVILLA, S. Efecto de la cortisona sobre la absorción intestinal de glucosa en ratas adrenalectomizadas y normales. [Effect of cortisone on absorption of glucose from the intestine in adrenalectomised and normal rats.] *Rev. española Fisiol.*, 1954, **10**, 189-201. [Inst. Fisiol., Fac. Med., Barcelona.] English summary.

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5048

TRULL, M. L. Influencia del aporte de oxígeno en la absorción intestinal de glucosa. [Effect of oxygen supply on absorption of glucose from the intestine.] *Rev. española Fisiol.*, 1954, **10**, 275-314. [Lab. Fisiol. Animal, Fac. Cienc., Univ. Barcelona.] English summary.

5049

ORTEN, A. U., WANG, H. L. and SMITH, A. H. Absorption of a protein hydrolysate from Thiry loops in human subjects. *Federation Proc.*, 1955, **14**, 447-448. *Proc. [Dept. Physiol. Chem., Coll. Med., Wayne Univ., Detroit, Mich.]*

5050

HÉDON, L. and MACABIES, J. Étude quantitative de l'absorption intestinale des protides chez les chiens ayant subi différentes sortes d'altérations pancréatiques. [Quantitative study of absorption of protein from the intestine in dogs subjected to interference with the pancreas.] *C.R. Soc. Biol.*, 1955, **149**, 159-161.

The 6 dogs were fed on lean horsemeat and bread. In one the pancreas had been removed a month before the experiment and insulin was given; 3 had part of the pancreas removed and required no insulin, although one had glycosuria; 2 had diabetes produced by alloxan and were maintained with insulin. The absorption of protein was estimated from the calculated composition of the diet and from the total N content of the faeces.

The alloxan-diabetic dogs absorbed protein normally. The dog with all the pancreas removed and the 2 with part removed and no diabetes excreted from 20 to 35 per cent. of their protein intake in the faeces, but in the other, which was left with about 2 g. of pancreatic tissue round the canal of Wirsung, and thus secreted into the intestine some pancreatic juice, the loss of protein was only 8.6 per cent. Pancreatic juice given to one dog and raw beef pancreas to another did not improve protein digestion, but further experiments of this sort are proposed.—D. Duncan.

5051

HARRIS, R. S., CHAMBERLAIN, J. W. and BENEDICT, J. H. Digestion of neutral fats by human subjects. *J. Clin. Invest.*, 1955, **34**, 685-689. [Dept. Food Technol., Massachusetts Inst. Technol., Cambridge.]

Free fatty acids, total monoglycerides, and 1-monoglycerides were estimated in the lipids recovered by intubation from the intestinal lumen of 7 healthy young men at intervals up to 2 hr. after each had drunk 45 ml. of a 3:1 mixture of

soya bean oil and cottonseed oil hydrogenated to I value 80.

Monoglycerides totalled up to 13 per cent. of the total lipids; 50 to 66 per cent. of the monoglycerides was 2-monoglyceride. The free fatty acid content of the lipids was 2 to 3 times the total monoglyceride content.

In further experiments, each of 3 subjects was given a meal containing 45 g. of the same triglyceride mixture; no significant difference in the proportions of products of fat digestion was found.

G. A. Garton.

5052

COURMOULIS, M., GISINGER, E. and NEUMAYR, A. Eisenmangel und Fettresorption. Zur Störung der Fettresorption nach Magenresektionen. [Iron deficiency and fat absorption. Disturbance of fat absorption after resection of the stomach.] *Deutsch. med. Wochenschr.*, 1955, 80, 810-812. [2. Med. Klin., Univ. Vienna.]

Estimations of fat absorption, serum Fe and total Fe-binding capacity, Hb and red cell count were made on 26 patients who had had their stomachs removed by the Billroth II operation and had little or no sign of jejunitis; the results are tabulated and shown graphically. The patients were classified in 3 groups. Five had almost normal fat absorption, no anaemia, no Fe deficiency. Ten, of whom 8 were women, had much reduced fat absorption; all but one had anaemia and Fe deficiency; in the exception the condition was masked, but was revealed by the improved values after treatment with Fe. Eleven with moderately reduced fat absorption had anaemia but no Fe deficiency. Possible ways in which Fe deficiency can affect fat absorption are discussed.

W. M. Deans.

5053

FRAZER, A. C. Mechanism of intestinal absorption of fat. *Nature*, 1955, 175, 491-493. [Dept. Pharmacol., Univ. Birmingham.]

A review.

5054

AMES, S. R., HERTING, D. C., KOUKIDES, M. and HARRIS, P. L. Digestion of acetylated monoglycerides and triglycerides. *Federation Proc.*, 1955, 14, 173. *Proc. [Res. Labs., Distillations Products Industries, Div. Eastman Kodak Co., Rochester, N.Y.]*

A study with rats.

5055

SWELL, L., FLICK, D. F., FIELD, H. (Jr.) and TREADWELL, C. R. Role of fat and fatty acid in absorption of dietary cholesterol. *Amer. J. Physiol.*, 1955, 180, 124-128. [Gen. Med. Res. Lab., Veterans Admin. Centre, Martinsburg, W. Va.]

Groups of rats were fed for 21 days on cholesterol-free diets containing 25 per cent. soya bean oil which had been partly hydrogenated to yield products of I value 14.2, 34.2, 60.9 and 81.0. Total and ester cholesterol were estimated weekly in whole blood. Blood cholesterol varied with the I value of the dietary fat; animals given the most unsaturated oil had 16 per cent. more blood cholesterol than control animals; the increase was greatest in the ester fraction.

In further experiments the diets contained 2 per cent. cholesterol, 1 per cent. Na taurocholate and 25 per cent. linoleic acid, oleic acid, stearic acid, peanut oil, maize oil or linseed oil. The blood cholesterol rose in all animals, particularly in those given free fatty acids. *In vitro*, cholesterol was more rapidly esterified with free fatty acids, especially unsaturated acids, than with fatty acids derived from intact triglycerides, with a homogenate of fresh pig pancreas as the enzyme system.

In other experiments groups of rats were given diets containing cholesterol 2, Na taurocholate 1, and olive oil 25 per cent., separately or in combinations. Blood cholesterol was estimated weekly for 3 weeks. The results showed that fat need not be present in the diet for the absorption of dietary cholesterol, provided that enough bile salt is present.—G. A. Garton.

5056

SWELL, L., BOITTER, T. A., FIELD, H. (Jr.) and TREADWELL, C. R. Absorption of dietary cholesterol esters. *Amer. J. Physiol.*, 1955, 180, 129-132. [Gen. Med. Res. Lab., Veterans Admin. Centre, Martinsburg, W. Va.]

Groups of rats were fed for 21 days on diets containing 25 per cent. olive oil and 2 per cent. of either cholesterol, cholesterol butyrate, cholesterol oleate or cholesterol linoleate, both with and without 1 per cent. Na taurocholate. Blood cholesterol was estimated weekly.

Rats given cholesterol or cholesterol butyrate showed greater increases in blood total and ester cholesterol than those given cholesterol oleate or linoleate; the increases were greater when Na taurocholate was included in the diet.

Cholesterol butyrate was hydrolysed more rapidly *in vitro* by pig pancreas homogenate than was oleate or linoleate.

It is suggested that cholesterol must be in the free form before it can be absorbed.—G. A. Garton.

5057

KARVINEN, E. and LIN, T. Effect of mineral oil on cholesterol absorption. *Federation Proc.*, 1955, 14, 83. *Proc. [Dept. Clin. Sci., Univ. Illinois Coll. Med., Chicago.]*

A study with rats.

5058

- BRUNE, H. Einfluss erdiger Adsorbentien auf die Resorption. [Effect of adsorbent earths on absorption.] *Ztschr. Tierernährung Futtermittelk.*, 1955, 10, 61-62. [Proc. [Göttingen.]

5059

- EDWARDS, D. C. The biochemistry and microbiology of the rumen. *J. Dairy Res.*, 1955, 22, 232-250. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

5060

- BRUNAUD, M. and NAVARRO, J. Action de quelques ions minéraux sur la motricité gastrique du mouton. [Effect of some mineral ions on gastric motility in the sheep.] *J. Physiol., Paris*, 1955, 47, 112-115. [Lab. Physiol., Ecole Nat. Vét., Toulouse.]

5061

- NICHOLS, R. E., MOORE, W. E. C. and DILLON, R. D. The effective buoyancy of the rumen juice of cattle fed hay, grass and fresh legumes. *J. Animal Sci.*, 1955, 14, 276-278. [Wisconsin Agric. Exp. Stat., Madison.]

The effective buoyancy of rumen juice may be measured by its specific gravity. This will be changed by the type of feed, since heavier feeds sink before rumen digestion is completed, and the subsequent gaseous action will give rise to a frothy rumen fluid with low sp. gr. This was demonstrated in a test with 2 cows with rumen fistulae. The sp. gr. of the ventral sac fluid was measured before, $\frac{1}{2}$ hr. after and 2 hr. after they had been given feeds of hay, fresh grass, fresh alfalfa or fresh clover. The last 2 were considered to be the heavier types of feed, and the results showed that they reduced effective buoyancy, as indicated by sp. gr. of the rumen juices.—T. D. Bell.

5062

- TURNER, A. W. and HODGETTS, V. E. Buffer systems in the rumen of the sheep. 1. pH and bicarbonate concentration in relationship to p_{CO_2} . 2. Buffering properties in relationship to composition. *Austral. J. Agric. Res.*, 1955, 6, 115-124; 125-144. [Div. Animal Health Prod., C.S.I.R.O., Animal Health Res. Lab., Parkville, Victoria.]

1. Rumen fluid collected through a fistula and cooled under liquid paraffin to room temperature maintained its pH of 6.60 for about 3 hr. In air the pH rose and stabilised after about 150 min. at 8.90; it behaved similarly when gassed with

hydrogen, but the change was partly reversed when rumen gases were bubbled through.

Ruminal gas obtained by puncture contained 58.5 per cent. CO_2 . Contents in contact with the gas had a pH of 6.63, but when the rumen fistula had been open for 9 min. the percentage of CO_2 in the gas had fallen to 3.2, and the pH of fluid at the surface had risen to 6.82. In sheep on different diets the ruminal gas contained from 28.3 to 72.8 per cent., mean about 50, a p_{CO_2} about 5 to 13 times that of arterial blood. The pH of fluid collected by stomach tube was higher than that of fluid collected through a fistula. The effects of p_{CO_2} on the pH and bicarbonate ion content of rumen fluid according to the Henderson Hasselbalch equation are tabulated.

For routine estimation of pH in rumen contents a mixture of equal part of CO_2 and nitrogen is recommended.—D. Duncan.

2. A detailed examination of the buffering systems in rumen liquor is described. Titration curves show that the liquor is well buffered on the acid side of neutrality and poorly buffered on the alkaline side. The important components are bicarbonate and phosphate. The time spent in feeding, the nature of the feed and the consumption of drinking water all affect buffering capacity.

In the fasting animal bicarbonate is the most important component; after feeding, as the pH falls and loss of CO_2 occurs, phosphate becomes more important, and the volatile fatty acids contribute significantly only when the pH falls below 6.

A. T. Phillipson.

5063

- HOWARD, B. H. Ruminal fermentation of pentosan. *Biochem. J.*, 1955, 60, i. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

5064

- DE VUYST, A. and VANBELLE, M. Le métabolisme azoté au niveau du rumen. [Nitrogen metabolism in the rumen.] *Zootechnia*, 1955, 4, 5-17. [Centre Recherches Zootech., Univ. Louvain, Belgium.] English and German summaries.

5065

- ANNISON, E. F., HILL, K. J. and LEWIS, D. Portal blood analysis in the study of the absorption of ruminal fermentation products. *Biochem. J.*, 1955, 60, xix. [Agric. Res. Coun. Inst. Animal Physiol., Babraham, Cambridge.]

See also Abstracts. 4852, 5017, 5244, 5266, 5268, 5270, 5271, 5390.

COMPOSITION OF BODY FLUIDS AND TISSUES

BLOOD

5066

PASSARO, G. and SICILIANO, G. Il volume del liquido extracellulare nel neonato. [Volume of the extracellular fluid in the newborn.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1322-1325. [Ist. Clin. Pediatr., Univ. Rome.]

The volume of extracellular fluid was estimated by the thiocyanate method within 3 hr. of birth in 30 infants weighing from 2200 to 4370, mean 3456 g. The mean volume of extracellular fluid was 1055 ml. with range 827 to 1447, representing a mean percentage of bodyweight of 30.7 with range 24.5 to 39.8. The proportion did not differ significantly for different bodyweights unless the infant was premature, when the percentage was higher. The percentage was 50 per cent. higher than that accepted as normal for adults.—E. M. Hume.

5067

IKKOS, D., LJUNGGREN, H., LUFT, R. and SJÖGREN, B. Content and distribution of potassium and chloride in adults. *Metabolism*, 1955, 4, 231-237. [Div. Endocrinol., Dept. Int. Med., Serafimerlasarettet, Stockholm.]

Exchangeable K and Cl were estimated in 21 adult subjects by the dilution of the radio-active isotopes ^{42}K and ^{82}Br . Extracellular Cl was calculated as the product of plasma water chloride concentration and extracellular water volume estimated with inulin or thiosulphate. Intracellular Cl was taken as the difference between total and extracellular values. Intracellular K was computed by subtracting 50 m. equiv. from the exchangeable K.

Exchangeable K was on the average, in m. equiv., 45 per kg. bodyweight, 1661 per sq. m. surface area and 81.2 or 87.9 per litre of total body water measured with D_2O or antipyrine. Corresponding values for exchangeable Cl were 29.5, 1087, 53.4 or 56.1. Extracellular Cl contained 58.2 or 56.6 per cent. of the total, depending on whether inulin or thiosulphate was used for estimation. The mean intracellular Cl was 31.3, 32.0, 34.0 and 33.7 m. equiv. per litre when measured with D_2O and inulin, D_2O and thiosulphate, antipyrine with inulin and antipyrine with thiosulphate, respectively. Corresponding values for K were 111, 110, 121 and 122. The accuracy of the calculations is discussed.—A. Hepburn.

5068

SCRIMSHAW, N. S., BEHAR, M., GUZMÁN, M., VITERI, F. and ARROYAVE, G. Biochemical and haematological findings in infantile pluri-

carencial syndrome (kwashiorkor). *Federation Proc.*, 1955, 14, 449-450. *Proc. [Inst. Nutric. Centro América y Panamá, Guatemala.]*

5069

GARROW, J. S. Some haematological and serum protein values in normal Jamaicans. *West Indian Med. J.*, 1954, 3, 104-107. [Univ. Coll. West Indies, Jamaica.]

The serum protein values found in apparently normal and well nourished male and female Jamaicans did not correspond with those of similar Europeans. The most marked differences were in the mean corpuscular Hb concentration and in the mean values for serum albumin and globulin. In the Jamaicans the range of the mean corpuscular Hb concentration was from 26 to 36 per cent., compared with from 32 to 36 per cent. in Europeans and the values in g. per 100 ml. for serum albumin and globulin, respectively, ranged for Jamaicans from 2.4 to 5.5 and from 2.0 to 5.5, and for Europeans from 4.3 to 5.0 and from 1.1 to 3.1. The erythrocyte sedimentation rate had a greater range in Jamaicans than in Europeans.—L. Wills.

5070

KEITEL, H. G., BERMAN, H., JONES, H. and MACLACHLAN, E. The chemical composition of normal human red blood cells, including variability among centrifuged cells. *Blood, J. Hematol.*, 1955, 10, 370-376. [Child. Med. Serv., Massachusetts Gen. Hosp., Boston.]

5071

TURNBULL, E. P. N. and WALKER, J. Haemoglobin and red cells in the human foetus. 2. The red cells.

WALKER, J. and TURNBULL, E. P. N. 3. Foetal and adult haemoglobin. *Arch. Dis. Childhood*, 1955, 30, 102-110; 111-116. [Dept. Midwifery, Univ. Aberdeen.]

For earlier work [not numbered as Part 1] see Title 590, Vol. 24.

2. Packed cell volume, mean cell diameter and reticulocyte count were measured and absolute values were calculated for red blood cells in the cord blood of human foetuses from the 10th to the 43rd week of clinically normal pregnancy. The changes occurring as pregnancy advanced were, in the Price Jones curve, movement to the left with narrowing of base and increase in height and, in the numbers of cells under $9\ \mu$. in diameter, a steady increase, those $9\ \mu$. or more remaining nearly constant in number. Deficiency of oxygen

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supply in the later weeks altered the picture and variations in that supply are considered responsible for the wide distribution of packed cell volumes and mean volumes and perhaps for variations in the numbers and proportions of cells of different sizes found in individual foetuses.

3. The percentages of foetal and adult Hb were estimated in the blood of human foetuses. No difference in the proportion of the adult form, first detected at the 13th week, was found between the normal and abnormal pregnancies studied. The increase in total Hb in later weeks of pregnancy, which was stimulated by anoxia, was found to be almost wholly in the foetal form. The findings are discussed in relation to those in the previous paper and to the view that the two forms of Hb are contained in separate foetal and adult types of corpuscle.—D. Harvey.

5072

HUISMAN, T. H. J., JONKIS, J. H. P. and VAN DER SCHAAF, P. C. **Amino-acid composition of four different kinds of human haemoglobin.**

PRINS, H. K. and HUISMAN, T. H. J. **Chromatographic estimation of different kinds of human haemoglobin.** *Nature*, 1955, 175, 902-903; 903-904. [Dept. Paediat., Univ. Groningen.]

Electrophoretically pure samples of different haemoglobin, from blood from normal adults, the umbilical cord, patients with sickle cell anaemia (Hb B) and patients with the homozygous character Hb C were analysed. Foetal Hb contained almost 6 times as much isoleucine as adult Hb, more threonine, serine and methionine, and less proline, valine, tyrosine and histidine. Hb B was not different from the normal and Hb C differed only in having more lysine and histidine.

The 4 types were quantitatively separated by ion-exchange chromatography.—A. Hepburn.

5073

VAN DER SCHAAF, P. C. and HUISMAN, T. H. J. **The amino-acid composition of human adult and foetal carbonmonoxyhaemoglobin estimated by ion exchange chromatography.** *Biochim. biophys. Acta*, 1955, 17, 81-91. [Dept. Paediat., Univ. Groningen.] French and German summaries.

Hb from normal adults and purified foetal Hb were saturated with CO and analysed by ion-exchange chromatography for 17 amino-acids. Foetal carboxyhaemoglobin contained more threonine, serine, methionine and isoleucine and less proline, alanine, valine and tyrosine than adult. The greatest differences were in serine, isoleucine and valine. Serine, threonine, aspartic acid, methionine, tyrosine and lysine decreased linearly with the time of hydrolysis from 24 to 144 hr. and the original amounts were obtained by extra-

polaration. The yields of the other amino-acids remained constant and it was therefore considered unlikely that isoleucine and valine were combined in peptide linkage. As the numbers of amino-acid residues calculated for a molecular weight of 68,000 were not all divisible by 4, adult and foetal globins were considered not to consist of 4 identical polypeptide chains.—A. Hepburn.

5074

AFONSKY, D. **Blood picture in normal dogs.** *Amer. J. Physiol.*, 1955, 180, 456-462. [Dept. Dent. Res., Sch. Med. Dent., Univ. Rochester, N.Y.]

5075

RUSOFF, L. L., SCHEIN, M. W. and VIZINAT, J. J. **Blood studies of red Sindh-Jersey crosses: 3. Effect of a fixed hot environment on blood constituent levels of Jerseys and Sindh-Jersey crosses.** *Science*, 1955, 121, 437-438. [Louisiana Agric. Exp. Stat., Baton Rouge.]

For part 1 see Abstr. 669, Vol. 22.

Jersey and Sindh \times Jersey cows with $\frac{3}{4}$, $\frac{1}{2}$, or $\frac{1}{4}$ Sindh blood were used to compare Hb, haematocrit, plasma Ca and plasma inorganic P values. These values were estimated 3 times during a year, 18 hr. before, immediately after and 18 hr. after 6 hr. of exposure to a high temperature, 92° F. wet bulb, 105° F. dry bulb.

There was no significant difference with breed or season between the values, which therefore could not serve as indicators of heat tolerance.

T. D. Bell.

5076

MORRIS, B. and COURTICE, F. C. **The protein and lipid composition of the plasma of different animal species determined by zone electrophoresis and chemical analysis.** *Quart. J. Exp. Physiol.*, 1955, 40, 127-137. [Kane-matsu Mem. Inst. Pathol., Sydney Hosp.]

Plasma from man, dog, cat, rat, mouse, rabbit, guinea-pig, sheep, horse, ox and goat was examined. There were specific differences in absolute amounts of protein and lipids and their relative distribution. In man most lipids were associated with the β -globulins; in the dog and cat almost all the lipids were bound by the α -globulins. The herbivora in general had low levels of lipids and lipoprotein, but relatively much α -lipoprotein; the horse had higher levels of lipids and lipoproteins than the ruminants.—A. Hepburn.

5077

CUMMINGS, A. J. and FLYNN, F. V. **Amino-acid composition of serum proteins in health and disease.** *J. Clin. Pathol.*, 1955, 8, 153-159. [Dept. Clin. Pathol., University Coll. Hosp., London.]

The albumin and α_2 , β - and γ -globulin fractions were separated by electrophoresis of serum from 6 healthy young adults and 6 patients with liver disease, nephrotic syndrome or myelomatosis, and 13 amino-acids were estimated. There was no gross or characteristic difference in amino-acid composition. The possible significance of minor deviations is discussed.—A. Hepburn.

5078

SALAZAR DE SOUSA, C. Les altérations de la coagulabilité sanguine chez le nouveau-né. [Changes in the coagulability of the blood in newborn infants.] *Pédiatrie*, 1954, 9, 787-796. [13 Avenida da Liberdade, Lisbon.]

The author summarises his previously published work, which is listed. The importance of the diminution in certain defensive mechanisms, such as the decrease in antithrombin and the increase in thromboplastic substances found in the normal newborn infant, in the development of haemorrhagic disease is stressed.—L. Wills.

5079

BALLABRIGA, A. Plasma protein and aminoacids in malnutrition. *Helv. paediat. Acta*, 1955, 10, 285. [Barcelona.]

5080

DOBSON, H. L. Paper electrophoretic studies on serum proteins and lipids. *Federation Proc.*, 1955, 14, 39. *Proc.* [Dept. Int. Med., Baylor Univ. Coll. Med., Houston, Tex.]

5081

SCHULTZ, J., GRANNIS, G., KIMMEL, H. and SHAY, H. The characterization of proteins of animal sera separated by zone electrophoresis on starch. *Arch. Biochem. Biophys.*, 1955, 55, 169-174. [Samuel S. Fels Res. Inst., Sch. Med., Temple Univ., Philadelphia, Pa.]

5082

HERMAN, J. A. Analyse électrophorétique du plasma du chien normal. [Electrophoretic analysis of the plasma of the normal dog.] *Rev. belg. Pathol. Méd. exp.*, 1955, 24, 224-229. [Fond. Méd. Reine Elisabeth, Brussels.]

5083

CALLISON, E. C. and FISHER, M. Alteration of rats' serum protein produced by diet. *Federation Proc.*, 1955, 14, 429. *Proc.* [U.S. Dept. Agric., Agric. Res. Serv., Human Nutrit. Res. Branch, Washington, D.C.]

5084

RADOJČEVIĆ, M., SOKOLIĆ, A., DJURIĆ, I., PAVLOVIĆ, D., DJORDJEVIĆ, D. and

STOŠIĆEVA, N. Prilog izučavanju proteinemije ovaca. [Blood proteins in sheep.] *Acta vet., Belgrade*, 1954, 4, No. 4, 3-12. [Fiziol. Inst., Vet. Fak., Belgrade.] German summary.

5085

DUNLAP, J. S. and DICKSON, W. M. The effect of age and pregnancy on ovine blood protein fractions. *Amer. J. Vet. Res.*, 1955, 16, 91-95. [Dept. Vet. Pathol., State Coll. Washington, Pullman.]

Serum total protein, albumin and globulin were estimated weekly during gestation in 5 pregnant ewes over a year old. Serum globulin values fell during the second half of pregnancy. Serum albumin fell slightly during the first half, but returned to initial values at parturition. Total protein fell throughout, probably reflecting the changes in fractions.

In 6 lambs, from these ewes and one other, serum protein, albumin and globulin were estimated weekly from 7 to 17 weeks of age. Globulin increased steadily, but there was no change in albumin.

Ewes had significantly higher serum globulin values than lambs, but there was no difference in albumin.—T. D. Bell.

5086

DINGLEDEINE, W. S., PITT-RIVERS, S. and STANBURY, J. B. Nature and transport of the iodinated substances of the blood of normal subjects and of patients with thyroid disease. *J. Clin. Endocrinol.*, 1955, 15, 724-731. [Dept. Med., Harvard Med. Sch., Boston, Mass.]

The binding powers of serum proteins for thyroxine, triiodothyronine and iodide were compared in an attempt to detect abnormal constituents in the sera of hyperthyroid patients. The serum came from 27 patients, 17 of whom had thyrotoxicosis, and sometimes serial samples were obtained over the first 6 days after administration of ^{131}I . Some of the doses of ^{131}I were therapeutic, others were only tracer doses.

Thyroxine was transported in the plasma mainly by the protein which has electrophoretic mobility between α_1 - and α_2 -globulin. In addition, a small fraction of serum thyroxine was bound to albumin. The sera of thyrotoxic and normal subjects did not differ in this respect. Triiodothyronine was found *in vitro* in all the proteins, but this may have been due to overloading *in vitro*, as the absolute amount of triiodothyronine relative to thyroxine *in vivo* is unknown. There was no evidence of an abnormal iodine-containing component in the sera of the hyperthyroid patients, but the possibility remains that a non-iodinated constituent may exist in the serum of patients with Graves' disease.

The electrophoretic and chromatographic methods are given in detail.—B. W. Simpson.

5087

WOLFF, H. P., LANG, N. and KNEDEL, M. Hemopoietic active metals as bound by different serum protein fractions. Electrophoretic studies with Fe⁵⁹, Cu⁶⁴, Zn⁶⁵ and cobalt in animals, normal and anemic subjects. *Rev. belg. Pathol. Méd. exp.*, 1955, **24**, 98–100. *Proc. [Med. Poliklin., Univ. Marburg a.d. Lahn.]*

5088

CHARKEY, L. W., KANO, A. K. and HUGHAM, D. F. Effects of fasting on blood non-protein amino acids in humans. *J. Nutrition*, 1955, **55**, 469–480. [Dept. Chem., Colorado Agric. and Mech. Coll., Fort Collins.]

Leucine and valine in the blood of 6 adults increased after they had fasted for 48 hr. Lysine, threonine, methionine, arginine and tryptophan decreased. These amino-acids responded differently to a fast in chickens (Absts. 485, Vol. 24; 2014, Vol. 25). D-Leucine is not utilised by man, the D-isomers of lysine, threonine, methionine, arginine and possibly tryptophan are utilised, but no information is available for D-valine. It is suggested that those amino-acids not metabolically derivable from their D-isomers are increased in the blood during fasting.—A. Hepburn.

5089

BALDRIDGE, R. G. Blood ergothioneine and dietary oats. *J. Nutrition*, 1955, **56**, 107–113. [Dept. Biol. Chem., Med. Sch., Univ. Michigan, Ann Arbor.]

Male rabbits and rats were given several diets and blood ergothioneine was estimated after several weeks. Ergothioneine appeared in the red blood cells of all animals after they had been fed on oats. In the rat the blood level was related to the percentage of oats in the diet; none was found in rats given purified diets or such diets supplemented with cabbage. The administration of vitamin B₁₂ had no effect on blood ergothioneine in the rat. Elevated levels of blood ergothioneine were not related to thyroid function, as far as was shown by histological examination and relative weight of thyroid tissue.—G. F. Garton.

5090

RAFSTEDT, S. Studies on serum lipids and lipoproteins in infancy and childhood. *Acta paediat.*, 1955, **44**, Suppl. 102, pp. 109. [Paediat. Clin., Univ. Lund.]

Methods are described whereby total lipids, total and free cholesterol, lipid P and lipoproteins could all be estimated in a total of 0.6 ml. serum,

so that serial analyses could be made even in newborn premature infants.

Serum lipids and lipoproteins were estimated in the first 10 days of life in 30 full-term infants delivered normally from healthy mothers and 2 delivered by caesarean section. In cord blood all the values were lower than those of normal adults. α -Lipoproteins represented 43 and β -lipoproteins 33 per cent. of the total, against about 30 and 50 per cent. in adults. In the first 12 hr. of life total lipids, cholesterol and phospholipids increased by 10 or 15 per cent., possibly because of dehydration. In the first few days all the serum lipids increased steadily, but by the fourth day α -lipoproteins had fallen to 20 and β -lipoproteins had risen to 46 per cent. of the total. The ratio of combined to free cholesterol was from 1.3 to 2.3:1 in cord blood, and remained unchanged for the first few days despite absolute increases in both combined and free cholesterol.

The second group consisted of 37 infants in the first year of life, admitted to the hospital or infants' home on social grounds. In individual infants there was wide variation in values for serum lipids and lipoproteins, but the spread was less than that of the whole group. Values tended to rise towards the end of the first year and so did the ratio of combined to free cholesterol. The ratio of cholesterol to phospholipids was lower than in adults.

The third group contained 25 children 2 to 14 years old, healthy or referred to hospital for examination or for mental disorders. All the results differed very significantly from those in the infants, falling in the range of adult values.

The premature group consisted of 19 infants who weighed at birth from 1350 to 2340 g. Prematurity was not due to any known disease. Lipid values in cord blood were similar to those for full term infants, but phospholipids were lower. The increases in total lipids and cholesterol in the first days were less than in full-term infants, but there was no other difference. After the first month there was no difference between full-term and premature infants.

In 7 pairs of twins, mostly premature, all the values in cord blood were closely similar between the twins, but they did not always follow the same course later.

Three small groups consisted of infants not given breast milk, mostly infants from unmarried mothers and destined for immediate adoption. For the first 3 or 4 days they received either low-fat milk with citric acid, or sugar and a casein hydrolysate, or maltose solution alone. On the first 2 of these diets increases occurred in serum lipids and lipoproteins, but the increases were less than those on normal diet; with maltose alone there was no increase in serum lipids, and in some

infants even a decrease, and the relative percentage of the lipoprotein fractions remained steady. Normal values were quickly reached when the infants were given ordinary diet.—D. Duncan.

5091

DANGERFIELD, W. G. and SMITH, E. B. **An investigation of serum lipids and lipoproteins by paper electrophoresis.** *J. Clin. Pathol.*, 1955, 8, 132-139. [Dept. Pathol., St. Bartholomew's Hosp., London.]

The lipid and lipoproteins in about 400 samples of human serum were examined. Methods are described for preparing and staining electrophoretic strips for protein, fat and cholesterol; the distribution of these components in normal and pathological sera is illustrated in photographs and discussed in relation to electrophoretic studies by other investigators.—G. A. Garton.

5092

HELLYARD, L. A., ENTENMAN, C., FEINBERG, H. and CHAIKOFF, I. L. **Lipide and protein composition of four fractions accounting for total serum lipoproteins.** *J. Biol. Chem.*, 1955, 214, 79-90. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Serum of man, dog, rabbit, rat and chicken was separated by ultracentrifugal flotation into 4 fractions which accounted for all the lipoprotein present; each fraction was analysed for protein, free and esterified cholesterol, phospholipins and triglycerides. The amount of each lipoprotein fraction differed considerably among the 5 species studied; in the dog, rat, rabbit and chicken the range of intraspecific variation was small, but the human sera showed considerable variation. There was much more total lipoprotein in man, chicken and dog than in the rat and rabbit. The identity of the lipoprotein fractions is discussed.

G. A. Garton.

5093

BILLING, B. H., HASLAM, R. M., HEIN, D. E., CONLON, H. J., HAMILTON, D. L., MYNDRUM, G. M. and SCHIFF, L. (with DOHM, L. and STARR, C.) **Serum and liver lipids in patients with and without liver disease.** *J. Lab. Clin. Med.*, 1955, 45, 363-370. [Dept. Int. Med., Coll. Med., Univ. Cincinnati, Ohio.]

The material consisted of 85 liver samples obtained by needle biopsy and classified on histological diagnosis. There were 20 without liver abnormality, 11 with cirrhosis of nutritional type, 13 with other types of cirrhosis or fibrosis, 12 with viral hepatitis and smaller numbers with other liver disorders. Estimations of serum lipids were made usually within 2 days of liver biopsy.

Individual results are tabulated. The only group in which there was significant association between

total lipid values of serum and liver was the group with cirrhosis, but even here the serum lipid could not be used to predict the liver lipid.—D. Duncan.

5094

EVANS, J. D., OLEKSYSHYN, N. L. and WALDRON, J. M. **Unsaturated fats in human blood.** *Federation Proc.*, 1955, 14, 45-46. *Proc. [Dept. Physiol., Sch. Med., Temple Univ., Philadelphia, Pa.]*

5095

GOLZKENER, S. L. **[Fat and the lipids of the blood in patients with arteriosclerosis.]** *Terap. Arkh.*, 1954, No. 5, 83.

5096

COURTICE, F. C. and MORRIS, B. **The exchange of lipids between plasma and lymph of animals.** *Quart. J. Exp. Physiol.*, 1955, 40, 138-148. [Kanematsu Mem. Inst. Pathol., Sydney Hosp.]

Zone electrophoresis and chemical analysis were used in a study of the protein and lipid composition of lymph collected from different ducts of the dog, cat, rabbit and rat. All the components present in the plasmas were identified in the lymph, but in lower concentrations. The plasma to lymph gradients for lipids and proteins were similar and were greater in cervical duct lymph than in thoracic duct lymph. With the high-speed centrifuge (20,000 g), large amounts of fat which appeared in thoracic duct lymph were removed without any significant change in the post-absorptive lymph protein and lipoprotein electrophoretic patterns.

The disappearance of particulate fat from the circulation is discussed, and it is suggested that during alimentary lipaemia some chylomicrons may escape through capillary membranes without degradation to smaller lipoprotein complexes.

G. A. Garton.

5097

SWANSON, P., LEVERTON, R., GRAM, M. R., ROBERTS, H. and PESEK, I. **Blood values of women: cholesterol.** *J. Gerontol.*, 1955, 10, 41-47. [Home Econ. Res., Iowa Agric. Exp. Stat., Ames.]

Cholesterol in serum from 184 healthy women aged from 18 to 92 years had a mean value of 209 ± 48.2 mg. per 100 ml. The mean rose from 163 in the third to 260 mg. in the seventh decade (mean ages 20.0 and 63.4 years) and then declined. The cholesterol concentration was not significantly related to bodyweight, basal metabolic rate, diastolic blood pressure or fat or protein intake.

A. Hepburn.

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5098

KEYS, A., FIDANZA, F. and KEYS, M. H. Further studies on serum cholesterol of clinically healthy men in Italy. *Voeding*, 1955, 16, 492-498. [Lab. Physiol. Hyg., Sch. Pub. Health, Univ. Minnesota.]

5099

ANDERSON, J. T., GRANDE, F. and KEYS, A. Serum cholesterol concentration of men in semistarvation and in refeeding. *Federation Proc.*, 1955, 14, 426-427. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

5100

TJONG, B. K. Onderzoekingen over de invloed van de voeding en van enkele andere factoren op het cholesterolgehalte van het bloedserum, in verband met het vraagstuk der atherosclerose. [Studies of the effect of diet and certain other factors on the cholesterol content of blood serum, with reference to the problem of atherosclerosis.] *Thesis, Amsterdam*, 1954, pp. 78. English summary.

Sixty healthy volunteers took, in varying succession, an almost exclusively vegetable diet, a plain ordinary diet and a rich diet of about the same energy value. Weight, B.M.R., electrocardiograms and clinical data were recorded as well as blood cholesterol. The results are presented as individual and composite charts. Individuals differed greatly in their reactions to the diets. In general blood cholesterol rose or sank with the cholesterol intake, but some subjects maintained a high level even on the vegetarian diet and some a low level on the rich diet. Basal metabolism and electrocardiogram showed no change. Body-weights varied by small but significant amounts with cholesterol intake. Infections and emotional upset or extra exercise tended to reduce blood cholesterol irrespective of diet; sometimes the changes during infection were considerable and were followed by increases during convalescence to levels above that to be expected from the diet in question. There was no sex difference in the reactions.—I. Leitch.

5101

POMERANZE, J. and CHESSIN, M. Decholesterolizing agents. *Amer. Heart J.*, 1955, 49, 262-266. [New York Med. Coll. Flower and Fifth Ave. Hosps.]

The effects of several substances on serum cholesterol were studied. In 18 untreated subjects serum cholesterol was estimated every 7 to 10 days for from 2 to 13 weeks and considerable fluctuation was found, especially in subjects with high levels. No effect on serum cholesterol was observed in 25 subjects given 7 g. sitosterol daily for 6 weeks, or

13 given Chophytol, a Jerusalem artichoke preparation, for 3 weeks, 12 given polysorbate-80-choline-inositol complex for 6 weeks, or others given eggplant, Tween 80, pancreatin concentrate, Resion or vitamin E.—D. Duncan.

5102

WISSLER, R. W., SOULES, K. H., SCHROEDER, M. A. and BRADFORD, W. L. (Jr.) Effects of acute dietary imbalances on serum cholesterol and lipid phosphorus concentrations in rat. *Federation Proc.*, 1955, 14, 423. *Proc. [Dept. Pathol., Univ. Chicago, Ill.]*

5103

SCHJEIDE, O. A. Studies of the New Hampshire chicken embryo. 5. Lipides of whole plasma and of plasma lipoproteins. *J. Biol. Chem.*, 1955, 214, 315-321. [Atomic Energy Project, Sch. Med., Univ. California, Los Angeles.]

5104

SENAPATI, J. M., SUBRAHMANYAM, K. and BANERJI, S. N. Lipid phosphorus in plasma. *Indian Med. Gaz.*, 1954, 89, 406-407. [Sri Ram Chandra Bhenj Med. Coll., Cuttack.]

Lipoid P in the plasma of 20 apparently healthy male Indian students aged from 20 to 30 years ranged from 9.8 to 12 mg. per cent.—G. A. Garton.

5105

JOVANOVIĆ, M., KENTERA, D. and VUČO, J. Uticaj hipotermije na frakcije fosfora u krvi pacova. [Influence of hypothermy on the phosphorus fractions in the blood of rats.] *Acta vet., Belgrade*, 1954, 4, No. 4, 63-67. [Fiziol. Inst., Vet. Fak., Belgrade.] French summary.

5106

SECKFORT, H. and ANDRES, E. Über den Fett-säuregehalt des Blutserums Gesunder. (Mit einem methodischen Erfahrungsbericht). [Fatty acid content of blood serum of healthy subjects. With a note on technique.] *Deutsch. Ztschr. Verdauungs- u. Stoffwechselerk.*, 1955, 15, 49-50. [Med. Klin., Johannes Gutenberg Univ., Mainz.]

Mean fasting values for fatty acids in the serum of 20 healthy subjects in m. equiv. per litre were 10.14 ± 3.11 for men and 7.29 ± 1.99 for women. The method was a modification of that of Stern and Shapiro (Abst. 3885, Vol. 23).—W. M. Deans.

5107

SAARINEN, P. On the nutritional factors affecting the level of volatile fatty acids in cows' peripheral blood. *Acta agral. fenn.*, 1955, 83, 133-146. [Dept. Animal Husb., Univ. Helsinki.] Finnish summary.

The total volatile fatty acid and cholesterol of the plasma of arterial blood of 18 Ayrshire cows at different stages of lactation were estimated at intervals during 4 months. The cows were divided into two groups, the one receiving 450 to 500 g. and the other 200 g. of crude fat daily. The ratio of both groups was varied in its fibre and protein content.

The volatile fatty acid of the blood increased with the fibre content of the ration with one variation, namely, temporary depression when the protein of the ration was high. The cholesterol of the blood usually varied inversely as the volatile acid.—A. T. Phillipson.

5108

GITTLEMAN, I. F., PINCUS, J. B., KRAMER, B., SOBEL, A. E. and SCHMERZLER, E. **Citric acid metabolism in infants during the neonatal period.** *Pediatrics*, 1955, 15, 124-134. [Dept. Paediat., Jewish Hosp., Brooklyn, N.Y.] Spanish summary.

Ca, P and citric acid levels in serum were estimated in 275 infants on the day of birth and the day of discharge from hospital, usually the fifth day. The infants were grouped according to diet, which was breast milk with or without vitamin D, or powdered milk mixtures differing in Ca:P ratio, with or without vitamin D.

In all 9 groups mean citric acid level fell significantly during the first 5 days of life. The fall was not related to Ca:P ratio, citric acid content of diet or vitamin D intake. Serum Ca levels fell in some infants. There was a positive correlation between citric acid and Ca levels in serum in 6 groups, the correlation being statistically significant in 4. There was a negative correlation in the remaining 3 groups.—F. C. Aitken.

5109

REDA, H. and SALEM, H. **Variation in the calcium and inorganic phosphorus contents of blood, urine and colostrum of Egyptian buffaloes and cattle associated with parturition.** *Indian J. Dairy Sci.*, 1955, 8, 19-25. [Fac. Agric., Univ. Cairo.]

Calcium and inorganic P were estimated in the serum, urine and milk of pregnant Egyptian buffaloes and cows fed on dry rations or green fodder. Diet caused significant differences in the serum and milk values, particularly of Ca.

In milk Ca and inorganic P were high at parturition, fell during the next 10 days and then remained constant. Serum Ca and P fell at parturition and then returned to pre-parturient levels. Urine values did not vary noticeably or regularly. The changes followed the same pattern in both cows and buffaloes.—T. D. Bell.

5110

SALEM, H. and REDA, H. **The study of inorganic phosphorus in blood in Egyptian buffaloes, native and cross breed cattle.** *Brit. Vet. J.*, 1955, 111, 260-263. [Fac. Agric., Univ. Cairo.]

Serum inorganic P in Egyptian buffaloes was higher than in Egyptian or crossbred cattle. There was little difference between the breeds of cattle. Values were higher in calves and heifers than in older stock, and in cattle they were higher in bulls than in cows. During pregnancy the tendency was the same in buffaloes and cows: there was a small regular increase until parturition, and at parturition values fell, rising to normal within a few weeks.—T. D. Bell.

5111

HALLEMAN, N. **Natrium- und Kaliumkonzentration von Erythrocyten während der Dehydratation.** [Sodium and potassium concentrations of the red cells during dehydration.] *Helv. paediat. Acta*, 1955, 10, 64-66. [Kinderklin., Univ. Helsinki.]

5112

WAUGH, D. and STUART, J. R. **Sodium and potassium content of rabbit plasma and erythrocytes in relation to age and to blood pressure.** *Amer. J. Pathol.*, 1955, 31, 575. *Proc. [Pathol. Inst., McGill Univ., Montreal, Que.]*

5113

CANTARUTTI, F. and PANIZON, F. **Le modificazioni della cupremia nel periodo postnatale. [Changes in blood copper in the period just after birth.]** *Lattante*, 1954, 25, 721-723. [Clin. Pediat., Univ. Padua.] English summary.

Copper was estimated in the blood of infants from the first day of life to the second month. In $\mu\text{g. per } 100 \text{ ml.}$, the values for 13 specimens of umbilical cord blood ranged from 60 to 105, with only 2 values over 100. From 2 to 4 specimens tested on the 2nd, 3rd and 4th days the values were from 72 to 105, in the second week from 72 to 105, and subsequently from 98 to 130, with only one value below 100.—E. M. Hume.

See also Absts. 4557, 4653, 4709, 4885, 4997, 5153, 5165, 5177, 5214, 5268, 5275, 5358, 5367, 5371, 5404, 5424, 5444-46, 5505, 5560, 5562, 5594, 5595, 5648, 5712, 5728, 5817.

LYMPH, CEREBROSPINAL FLUID, ETC.

5114

ROBINSON, D. S. **The chemical composition of chylomicro in the rat.** *Quart. J. Exp. Physiol.*, 1955, 40, 112-126. [Sir William Dunn Sch. Pathol., Oxford.]

Lipid particles from rat chyle, free from soluble lymph proteins, contained ether-soluble neutral fat, phospholipin and cholesterol, but no ether-insoluble nitrogen. The preparation, like whole chyle, was a stable emulsion and resisted the clearance of turbidity by pancreatic lipase. Both these properties were destroyed in the lipid particles and in whole chyle by pre-incubation with *Clostridium welchii* lecithinase and also in the lipid particles by incubation with normal plasma for 12 hr. After incubation with plasma the lipid particles contained phospholipin not extractable by ether and also some N in the aqueous residue. The stability of lipid particles in chyle was considered to depend on a phospholipin surface layer. A. Hepburn.

5115

WALKER, B. S., TELLES, N. C. and PASTORE, E. J. **Amino-acids of the cerebrospinal fluid: normal paper chromatographic pattern and its duplication in multiple sclerosis.** *Arch. Neurol. Psychiat., Chicago*, 1955, **73**, 149-157. [Dept. Biochem., Sch. Med., Boston Univ., Mass.]

The free amino-acids of cerebrospinal fluid from patients with multiple sclerosis or similar neurological disease were not significantly different from normal.—A. Hepburn.

5116

HARRIS, W. H. and SONNENBLICK, E. H. **A study of calcium and magnesium in the cerebrospinal fluid.** *Yale J. Biol. Med.*, 1955, **27**, 297-303. [Clin. and Neuropathol. Lab., Connecticut State Hosp., Middletown.]

The cerebrospinal fluid of 40 patients without neurological disorder or psychosis or neurosis contained Ca 4.95 ± 0.11 and Mg 3.01 ± 0.06 mg. per cent., ratio Ca ions : Mg ions 1.64 ± 0.03 . In 10 similar patients the mean values were for cerebrospinal fluid 4.97 ± 0.01 , 3.14 ± 0.25 , 1.61 ± 0.07 , respectively, and for serum 9.97 ± 0.15 , 2.49 ± 0.18 and 4.1 ± 0.7 .

The constancy of the ratio Ca ions : Mg ions in cerebrospinal fluid suggests rigid control by some highly selective mechanism. There is evidence that the ratio may be different in patients with mental disturbance.—W. M. Deans.

5117

WOLDRING, M. G. **Free amino acids of human saliva; a chromatographic investigation.** *J. Dent. Res.*, 1955, **34**, 248-256. [Dept. Dent. Material, Univ. Groningen, Netherlands.]

5118

HILDES, J. A. and FERGUSON, M. H. **The concentration of electrolytes in normal human saliva.** *Canad. J. Biochem. Physiol.*, 1955, **33**, 217-

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225. [Dept. Physiol. Med. Res., Univ. Manitoba, Winnipeg.]

5119

TÓTH, K. **Calcium, phosphorus and magnesium content of the saliva of caries active and caries resistant individuals.** *Acta med. hung.*, 1954, **6**, 493-500. [Clin. Dent. Oral Dis., Med. Sch., Univ. Szeged.] Russian summary.

Saliva from 21 gypsies, caries-resistant, and from 18 caries-active subjects was analysed for Mg, Ca and P. The mean values for the 2 groups were 1.59, 13.38 and 16.5 and 0.52, 8.31 and 13.7 mg. per 100 ml. saliva, respectively.—A. Hepburn.

5120

HUNGERLAND, H., QUENZLEIN, I. and WEBER, H. **Über das Verhalten der Natrium- und Kaliumkonzentration des Speichels im Säuglings- und Kindesalter. [Concentration of sodium and potassium in the saliva of infants and children.]** *Klin. Wochenschr.*, 1955, **33**, 44. [Kinderklinik, Justus Liebig-Hochsch., Giessen.]

5121

PRADER, A., GAUTIER, E., GAUTIER, R. and NAEF, D. **Die Na- und K-Konzentration im gemischten Speichel. 1. Der Einfluss von Sekretionsgeschwindigkeit, Stimulations- und Sammelmethode, Geschlecht, Alter, Tageszeit und Salzgehalt der Nahrung. [The sodium and potassium concentration in mixed saliva. 1. The effect of rate of secretion, method of stimulation and collection, sex, age, time of day and salt content of the diet.]**

PRADER, A. and GAUTIER, E. **2. Erhöhte Werte bei der Pankreasfibrose. [2. Increased values in fibrosis of the pancreas.]** *Helv. paediat. Acta*, 1955, **10**, 29-55; 56-62. [Kinderklinik, Univ. Zürich.] French, Italian and German summaries.

See also Absts. 5096, 5594, 5595, 5650.

TISSUES

5122

GARN, S. M. and HARPER, R. V. **Fat accumulation and weight gain in the adult male.** *Human Biol.*, 1955, **27**, 39-49. [Fels Res. Inst., Antioch Coll., Yellow Springs, Ohio.]

The results of X-ray measurements of subcutaneous fat thickness at 9 sites in 85 active men between 20 and 69 years (Abst. 5132, Vol. 24) were analysed according to age. All but anterior leg fat increased with age; iliac fat most of all, both absolutely and relatively. The changes in both fat thickness and bodyweight were most rapid between the third and fourth decades. The estimated weight of body fat, computed from

trochanteric fat, rose from 11.5 kg. in the third decade to 17.3 kg. in the sixth, or from 15.6 to 22 per cent. of bodyweight. All the fat thicknesses rose with the estimated weight of fat. The age changes corresponded closely to ordinary fattening; older men of average weight for age had the surface contours of younger men 5 kg. (7 per cent.) overweight for their age.

Over and above nutritional causes, decreased output of ketosteroids is suggested as a cause for fat deposition. It is pointed out that what is gained is not fat alone but fat-containing tissue, and that body fat also changes in composition with age.—W. M. Deans.

5123

BOLLIGER, A. and GROSS, R. **Non-keratins of avian and mammalian skin flakes.** *Austral. J. Exp. Biol. Med. Sci.*, 1954, **32**, 747-756. [Gordon Craig Res. Lab., Dept. Surg., Univ. Sydney.]

Total N.P.N. in skin flakes from mammals and birds was several times greater than in the corresponding hair or feathers. Ammonia was the greatest N fraction in mammals, but birds had most uric acid and no urea. Free amino-acids, at least 9 in number, increased after hydrolysis. Much of the non-keratin material was reducing in nature and increased after hydrolysis. Glucose and, after hydrolysis, arabinose, xylose and deoxyribose were identified chromatographically. Polysaccharides other than glycogen seemed to be present.—A. Hepburn.

5124

BOLLIGER, A. and GROSS, R. **Non-keratins of human head hair.** *Austral. J. Exp. Biol. Med. Sci.*, 1954, **32**, 739-745. [Gordon Craig Res. Lab., Dept. Surg., Univ. Sydney.]

The aqueous extract of human head hair from normal children and adults, hospital patients and cadavers was analysed for pentose, reducing substances, total N, NH_3 , amino-acids, urea and uric acid. Most samples had about the same amounts of pentose and reducing substances. The latter increased after hydrolysis in only 6 of 26 samples. Total N in normal subjects and in some patients was far below general mammalian levels. Some patients and children had higher than normal values. N was in greatest quantity as NH_3 . It rose proportionately with total N and was usually higher than urea N. Uric acid values were raised in moribund patients with chronic renal insufficiency and gout. Amino-acid N was about 10 to 20 per cent. of total N and frequently increased after hydrolysis.—A. Hepburn.

5125

COHEN, M. M. **Quantitation of phosphorus compounds in the normal and pathologic human**

brain. *J. Neuropathol. Exp. Neurol.*, 1955, **14**, 70-83. [Sect. Neurol., Veterans Admin. Hosp., Minneapolis, Minn.]

Inorganic, acid-soluble, lipid, nucleic acid and total P were estimated in 73 normal and pathological human brains and in 22 surgical specimens. Lipoid P decreased when there was demyelination. It was also present intracellularly. Deoxyribonucleic acid P increased greatly and ribonucleic acid P less in neoplasm or other cellular growth and both decreased in necrosis and other conditions producing a decrease of metabolising cells. Their ratio was a better indicator of tissue cellularity than acid-soluble P, which exhibited similar changes.—A. Hepburn.

5126

SETCHELL, B. P. and McCLEYMONT, G. L. **Depression in brain potassium in ovine pregnancy toxæmia.** *Nature*, 1955, **175**, 998. [Nutrit. Res. Lab., Vet. Res. Stat., Glenfield, N.S.W.]

The mean K content of slices of cerebral cortex from sheep dead of pregnancy toxæmia was significantly less than that of slices from normal sheep; that of slices from sheep dying from prolonged treatment with insulin was even lower. The values were 433, 388 and 314 millimoles K per kg. dry matter. The low blood sugar is thought to be responsible. The depression must be mainly in intracellular K. With whole brain, as opposed to cerebral cortex, no significant difference in K content was found.—D. Duncan.

5127

BRAASCH, J. W., ALBERT, A., KEATING, F. R. and BLACK, B. M. **A note on the iodinated constituents of normal thyroids and of exophthalmic goiters.** *J. Clin. Endocrinol.*, 1955, **15**, 732-738. [Lab. Endocrinol., Sect. Physiol., Mayo Clin., Rochester, Minn.]

A study of the distribution and turnover of I in the thyroids of 5 euthyroid subjects and 4 patients with exophthalmic goitre before and after I treatment showed no hitherto unknown iodinated compound in the patients. Unknown or abnormal compounds might nevertheless be present which could not be identified by the chromatographic method employed. The 4 patients were given by mouth 300 to 600 μCi . of ^{131}I . After 5½, 7½, 41 and 93 hr. biopsy specimens were taken from the thyroid of each patient. The patients were treated with Lugol's solution, 10 drops 3 times daily for 7 to 10 days. Subtotal thyroidectomy was then performed and second samples of each thyroid were obtained. The euthyroid controls, who were suspect of having tumours, were treated in a similar way. The mean percentage distribution of I in normal glands was thyroxine 35, triiodothyronine 8, diiodotyrosine 25 and

moniodotyrosine 17. The distribution in the glands before and after treatment was similar, but the rate of transfer of I to thyroxine was higher in the abnormal glands. Iodine treatment seemed to slow the formation of thyroxine, after which involution of the gland occurred.—B. W. Simpson.

5128

CALET, C. and JACQUOT, R. Influence de l'aureomycine sur la composition corporelle du Rat blanc. [Effect of aureomycin on the composition of the body of the white rat.] *C.R. Acad. Sci.*, 1955, **240**, 1370-1372.

Previous work (Abst. 3102, Vol. 24) suggested that the improved weight gains of rats given aureomycin were due to deposition of fat. This was confirmed by analysis of the carcasses of young rats from groups given a basal diet low in protein, 10.5 per cent., but otherwise adequate, of white flour 85, oil and margarine 8, salt mixture 4 and cellulose 2 per cent., and optimum amounts of all known vitamins, with or without 100 mg. aureomycin per kg. Growth on these diets was much slower than normal. Rats not given aureomycin were killed at 54 g.; those given aureomycin then weighed 70.2 g. For comparison, carcasses of rats of about those weights which had had a balanced diet were analysed also. At the lower weight there was no difference in carcass composition, but at the higher weight rats on the basal diet with aureomycin contained significantly more fat and less protein than those on the balanced diet. For the same amount of food consumed rats on the basal diet with aureomycin elaborated 3 times as much fat as those on the basal diet only. W. M. Deans.

5129

MARCH, B. and BIELY, J. Fat studies in poultry. 4. The effect of Triton WR-1339 on tissue lipid levels in cockerels. *Poultry Sci.*, 1955, **34**, 293-295. [Poultry Nutrit. Lab., Univ. British Columbia, Vancouver 8.]

For part 3 see Abst. 4939, Vol. 25.

A single subcutaneous injection of Triton WR-1339, a surface-active agent, produced a temporary rise in blood fat in cockerels. Repeated injections at 6-day intervals maintained blood fat at a high level. Liver fat was increased from 12 to 19 per cent. and tibial muscle fat decreased from 10 to 5.6 per cent. The weight of depot fat fell from 5.1 g. to 0.7 g.—J. S. Thomson.

5130

COLLINS, F. D. and WHEELDON, L. W. Chromatography of phospholipids. *Nature*, 1955, **175**, 772-773. [Dept. Biochem., J. Curtin Sch. Med. Res., Australian Nat. Univ., Canberra.] In a typical experiment fat was extracted from the liver of a rat 1 hr. after it had received an

intravenous injection of 0.8 mC. $\text{NaH}^{32}\text{PO}_4$. The fat was treated in benzene with fluoro-2:4-dinitrobenzene in the presence of triethylamine. The dinitrophenyl-lipid was then methylated with diazomethane and the product was chromatographed. Four main fractions were eluted and were distinguished by their absorption spectra: (1) light petroleum eluted glycerides and vitamin A; (2) benzene or benzene-chloroform mixtures removed a fraction showing λ_{max} at 328 m μ (light petroleum), which further chromatography showed to consist of a mixture of phospholipins containing ethanolamine and serine; (3) chloroform containing 10 per cent. ethanol eluted material showing λ_{max} 345 m μ (light petroleum), which further chromatography revealed to be a mixture of cephalins and lecithins which varied in radioactivity; and (4) ethanol alone removed predominantly choline-containing phospholipins.

It is concluded that in addition to phosphatidyl serine, phosphatidyl ethanolamine, phosphatidyl choline and traces of sphingomyelin and inositol phospholipins, phospholipins probably contain additional, as yet unidentified, molecular species.

G. A. Garton.

5131

ACHAYA, K. T., ALPIN-SLATER, R. B. and DEUEL, H. J. (Jr.). Nature of fatty acids in liver lipid fractions of the rat. *Federation Proc.*, 1955, **14**, 170. *Proc.* [Dept. Biochem., Sch. Med., Univ. S. California, Los Angeles.]

5132

WHITE, H. L. and ROLF, D. Whole tissue electrolyte analyses in normal and adrenalectomized rats. *Amer. J. Physiol.*, 1955, **180**, 287-295. [Dept. Physiol., Sch. Med., Washington Univ., St. Louis, Mo.]

There were 4 groups of rats. A control group of 15 was fed to appetite and rats were killed at a weight of about 225 g. A group of 5 was restricted to the amount eaten by a third group of 7, from which adrenals were removed; they were killed from 5 to 7 days after restriction of feeding or operation. Rats in the fourth group of 8 were killed from 12 to 22 days after removal of adrenals, during which time no or only inadequate treatment with adrenal cortex hormone was given. After preparation by methods described in detail estimations were made of Na, K, Cl, water and fat-free solids in skeletal muscle, skin, viscera, skeleton and blood. Mean results with standard deviations are tabulated for total amounts of these constituents per kg. fresh tissue and for total amounts of tissue and of constituents per rat of original weight 250 g. Additional calculated data on extra- and intra-cellular water and on amounts of electrolytes per 100 g. fat-free solids are also presented.

Physico-chemical equilibria in extra- and intracellular fluids in different tissues are discussed. The losses, in m. equiv., of Na 2.67, K 1.2 and Cl 1.75 by a rat weighing 250 g. in the 5 days after adrenalectomy agree with data from balance experiments. The findings for Na and Cl in skeleton and for Na in muscle do not support the view that the fall of concentration which occurs in these elements in extracellular fluid after adrenalectomy results from their being deposited in the bone or muscle cells. The methods of estimating extracellular fluid *in vivo* are thought not to be sufficiently accurate for measuring changes in concentrations of electrolytes which follow adrenalectomy.

D. Harvey.

5133

UJEWSKI, L. and GLEGG, R. E. **Carbohydrates in thyroglobulin and the lens capsule.** *Canad. J. Biochem. Physiol.*, 1955, **33**, 199-201. [Dept. Anat., McGill Univ., Montreal, Que.]

The carbohydrate content of thyroglobulin from thyroids and of the lens capsule from eyes of cattle was estimated qualitatively by the paper chromatography of hydrolysates. Quantitative estimations were made by the carbazole and sulphuric acid technique. Thyroglobulin contained 4.2 per cent. carbohydrate, made up of galactose, mannose and fucose; the lens capsule 11.8 per cent., made up of galactose, glucose, mannose and fucose.

G. F. Garton.

5134

ENGFELDT, B. and HJERTQVIST, S. O. **Biophysical studies on bone tissue. 15. A histochemical and microradiographic study on normal bone tissue.** *Acta pathol. microbiol. scand.*, 1955, **36**, 385-390. [Dept. Phys. Cell. Res., Karolinska Inst., Stockholm 60.]

For part 10 see Abst. 2409, Vol. 25.

In bone tissue from a young dog, thin sections studied by microradiography showed narrow zones round Haversian canals which had very low X-ray absorption. These zones were shown histochemically to contain acid mucopolysaccharides and may represent an accumulation of chondroitin sulphate.—D. Duncan.

5135

CAGLIOTI, V., ASCENZI, A. and SCROCCO, M. **Le relazioni tra sostanza organica e inorganica**

nel tessuto osseo studiate mediante spettrofotometria nell'infrarosso. [The relations between organic and inorganic substances in bone tissue studied by infrared spectrophotometry.] *Arch. Sci. biol., Bologna*, 1955, **39**, 116-126. [Ist. Chim. Gen. (Centro del C.N.R.), Univ. Rome.]

Sections of compact bone were prepared from the femoral diaphysis of cattle. The sections of whole bone were about 10 μ . thick and 25 mm. in diameter; the technique of cutting and mounting in Canada balsam is described. The osseous sections were demineralised in 2 per cent. HNO_3 and those without organic matrix were obtained by boiling in 6 per cent. KOH. The latter were so fragile that the spectrographic study was made on powder instead of on true sections.

The infrared absorption spectra of the 3 types of preparation are shown. It is concluded that in whole bone there is a bond between the $-\text{SO}_2-$ group in the ossein and the $-(\text{PO}_4)^{3-}$ group in hydroxyapatite.—D. Duncan.

5136

BRUDEVOLD, F. and STEADMAN, L. T. **A study of copper in human enamel.** *J. Dent. Res.*, 1955, **34**, 209-216. [Eastman Dent. Dispensary, Univ. Rochester, N.Y.]

The range of Cu in 4 successive layers of the enamel of pooled fully erupted teeth was from 15 to 30 p.p.m., with an average of 20 p.p.m. The distribution in the layers was random and was unaffected by age. In impacted teeth the average value was about 7 p.p.m. and in fluorosed teeth the range was from 6 to 12 p.p.m. Individual teeth showed wide variation in Cu content of the enamel, but there was no correlation between Cu content and pigmentation or caries.—J. S. Thomson.

5137

SHAW, J. H., GUPTA, O. P. and MEYER, M. **Fluoride content of teeth of residents in Delhi, India.** *Federation Proc.*, 1955, **14**, 450. *Proc. [Harvard Univ. Sch. Dent. Med., Boston, Mass.]*

See also Abstracts. 4833, 5093, 5231, 5371, 5438, 5439.

DUCTLESS GLANDS AND HORMONES

5138

JONES, I. C. **Role of the adrenal cortex in reproduction.** *Brit. Med. Bull.*, 1955, **11**, 156-160. [Dept. Zool., Univ. Liverpool.]

5139

SWYER, G. I. M. **Hormones and human fertility.** *Brit. Med. Bull.*, 1955, **11**, 161-164; 165. [University Coll. Hosp. Med. Sch., London.]

N.A. and R., October 1955

5140

- HAMMOND, J. **Hormones in relation to fertility in farm animals.** *Brit. Med. Bull.*, 1955, **11**, 165-168. [Sch. Agric., Univ. Cambridge.]

5141

- FOLLEY, S. J. **Hormones in mammary growth and function.** *Brit. Med. Bull.*, 1955, **11**, 145-150. [Nat. Inst. Res. Dairying, Univ. Reading.]

5142

- MENDELSON, M. L. and PEARSON, O. H. **Alterations in water and salt metabolism after bilateral adrenalectomy in man.** *J. Clin. Endocrinol.*, 1955, **15**, 409-423. [Div. Clin. Invest., Sloan-Kettering Inst., New York.]

5143

- ASCHKENASY, A. (with NEVEU, C.) **Effets de la surrenalectomie sur les poids relatifs de divers organes et tissus. Rôle du facteur temps et influence de la richesse du régime en protéines.** [Effect of adrenalectomy on the relative weights of different organs and tissues. Role of time factor and effect of richness of the diet in protein.] *J. Physiol., Paris*, 1955, **47**, 75-78.

5144

- NOBLE, N. L. and PAPAGEORGE, E. **Adrenal glycogen in the guinea pig and in the white rat.** *J. Nutrition*, 1955, **56**, 15-24. [Dept. Biochem., Emory University, Ga.]

Adrenal glycogen was estimated in fasted and non-fasted guineapigs with or without ascorbic acid depletion and in fasted and non-fasted white rats. In the guineapig adrenal glycogen concentration was not appreciably influenced by any of the treatments, but the concentration in the rat was 4 to 5 times that in the guineapig and fasting doubled it.—J. V. EVANS.

5145

- NICHOLLS, D. and ROSSITER, R. J. **Effect of cold stress on the phosphorus metabolism of the adrenal gland.** *Canad. J. Biochem. Physiol.*, 1955, **33**, 233-247. [Dept. Biochem., Univ. W. Ontario, London.]

Cold and its effect on concentration of phosphorus and the incorporation of labelled inorganic phosphate into the inorganic P of the plasma and the adrenal inorganic P, 20-min. hydrolysable P, and total acid-soluble P were studied in rats.

Short periods of cold, up to 24 hr., increased the relative specific activity of each of the adrenal fractions, but not that of the inorganic P of the plasma. Longer periods of cold, up to 16 days, increased adrenal weight and also the relative

specific activity of each of the 3 acid-soluble P fractions of the adrenal. Increased specific activity was not due to decreased concentration of P in any of the fractions.

Evidence is given for the view that an increased rate of passage of ^{32}P across the cell membrane accounts for this change and that adrenocorticotrophic hormone is responsible for the more rapid changes. It is suggested that changes after longer exposures may be related to thyroid function.

J. V. EVANS.

5146

- NICHOLLS, D. and ROSSITER, R. J. **The role of the pituitary and thyroid glands in the phosphorus metabolism of the adrenal gland during cold stress.** *Endocrinology*, 1955, **56**, 547-559. [Dept. Biochem., Univ. W. Ontario, London.]

5147

- GIACALONE, O. **Azione del timo, della corteccia surrenale e della ipofisi anteriore sui limiti di resistenza alla ipoalimentazione e sulla perdita percentuale giornaliera del peso corporeo.** [Effect of thymus, adrenal cortex and anterior pituitary on the limits of resistance to under-nutrition and on the daily percentage loss of bodyweight.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1769-1771. [Ist. Fisiol., Univ. Palermo.]

In continuation of previous studies (Abst. 4493, Vol. 23), 4 groups of 5 rats weighing about 200 g. were subjected to partial starvation, being given daily 0.17 or 0.18 Cal. per g. bodyweight of a complete diet. The groups were given on alternate days saline or an extract of thymus or of adrenal or of anterior pituitary. All the groups except those given thymus died after mean times of from 61.2 to 64.6 days, with percentage weight losses of from 50.6 to 51.3. For those given thymus the mean values were 56.8 days and 53.0 per cent.

E. M. HUME.

5148

- GOREBMAN, A. **Some aspects of the comparative biochemistry of iodine utilization and the evolution of thyroidal function.** *Physiol. Rev.*, 1955, **35**, 336-346. [Barnard Coll., Columbia Univ., New York.]

5149

- HODGES, R. E., EVANS, T. C., BRADBURY, J. T. and KEITTEL, W. C. **The accumulation of radioactive iodine by human fetal thyroids.** *J. Clin. Endocrinol.*, 1955, **15**, 661-667. [Dept. Int. Med., State Univ. Iowa, Iowa City.]

The human foetal thyroid begins to accumulate ^{131}I at about the twelfth week of gestation. Foetuses from 9 pregnancies, ranging from 6½ to 15 weeks, were studied after 500 μC . of ^{131}I had been given about a day before surgery. Maternal thyroid uptake was then studied and the thyroids

of the foetuses were examined by histology and by radio-autography. There was ^{131}I in all but 3 of the 9 foetuses. Doses of stable I had been administered previously to the mothers of 2 of these 3, and it is presumed that this prevented the accumulation of ^{131}I by the maternal and foetal thyroids. The third foetus was only 6½ weeks of age and the thyroid was in its primitive form. These 9 patients were euthyroid, but 1 thyrotoxic patient who had been pregnant 19 weeks received 6100 μC . of ^{131}I . She retained 69 per cent. of the dose at the end of 24 hr. A normal child was born which, 1 year later, was normal in height and weight and in good health. In thyrotoxicosis the maternal thyroid collects more I than is normal and this probably reduced the amount available to the foetus.—B. W. Simpson.

5150

BISHOPRIC, G. A., GARRETT, N. H. and NICHOLSON, W. M. The thyroidal uptake of radioactive iodine as modified by an iodine-restricted diet. *J. Clin. Endocrinol.*, 1955, 15, 592-597. [Dept. Med., Sch. Med., Duke Univ., Durham, N.C.]

Twenty patients who were being treated with the Kempner rice diet and 125 patients not receiving this diet were given a tracer dose of 20 μC . of ^{131}I . After 24 hr. the percentage of the dose present in the thyroid was estimated by scintillation counter.

The normal range of uptake of ^{131}I was taken as 15 to 45 per cent. of the dose. Of the patients not receiving rice diet 92 per cent. had normal I uptakes, 6.4 per cent. had less, 1.6 per cent. had more. Of the 20 patients on the rice diet half had uptakes of 46 per cent. or more. Twelve of these patients had been on the rice diet for 2 or more years; of these 8 had uptakes of 46 per cent. or more. Of 8 patients on the rice diet for 3 months or less only 1 had a thyroid ^{131}I uptake greater than 45 per cent. It is suggested that the avidity of the thyroid for I in many patients who had been on a rice diet for a long time was a deficiency phenomenon, though no enlargement of the thyroid was associated with it.—B. W. Simpson.

5151

LAAKE, H. Osteoporosis in association with thyrotoxicosis. *Acta med. scand.*, 1955, 151, 229-235. [Dept. B., Med. Univ. Clin., Rikshosp., Oslo.]

Osteoporosis was found in 7 out of 17 thyrotoxic patients, but there was no correlation between the degree and duration of the thyrotoxicosis and the skeletal changes. The Ca and P contents of the serum were normal and in only 1 patient was there a high phosphatase level.

Under treatment with Tapazole (1-methyl-2-mercaptoimidazol) the phosphatase became normal and the osteoporosis improved. Ca and N balances in 5 patients were positive, and in the 7 patients with negative balances 5 improved under Tapazole treatment.

In thyrotoxicosis the increased N breakdown may prevent normal formation of bone matrix, but it is suggested that there may be a combination of thyrotoxicosis and post-climacteric conditions which induce osteoporosis, as most patients were over 50.—B. W. Simpson.

5152

HULL, O. H. Critical analysis of two hundred twenty-one thyroid glands: study of thyroid glands obtained at necropsy in Colorado. *Arch. Pathol.*, 1955, 59, 291-311. [Dept. Pathol., Univ. Colorado Sch. Med., Denver.]

During 1952 and 1953, 221 thyroid glands from necropsies in the Colorado General Hospital were examined from settlers who had dwelt for some time in the Rocky Mountain area, a high, fresh-water, potentially goitrous region. Normal thyroids weighed on the average 19.3 g. in the males and 17.7 g. in the females and were 35.7 per cent. of the total. The incidence of nodules was 62.2 per cent. in males and 67.0 per cent. in females. Nodules were infrequent at younger ages, but common in the older people. Three primary carcinomas were found, all in multi-nodular glands. Cancers metastatic to the thyroid were found in 16.9 per cent. of the patients who had died of cancer. Pyramidal or third lobes were found in 48.9 per cent. In 5.9 per cent., parathyroids were found buried within the thyroid tissue.

B. W. Simpson.

5153

STRISOWER, B., GOFMAN, J. W., GALIONI, E., RUBINGER, J. H., O'BRIEN, G. W. and SIMON, A. Effect of long-term administration of desiccated thyroid on serum lipoprotein and cholesterol levels. *J. Clin. Endocrinol.*, 1955, 15, 73-80. [Donner Lab., Div. Med. Physics, Univ. California, Berkeley.]

The serum lipoproteins of low density, S_f 0-12 and 12-20, from 50 otherwise healthy schizophrenic patients were significantly reduced after 3 weeks when 3 grains of thyroid were given daily. The higher the initial value, the greater the fall. Lipoproteins S_f 0-12 then rose steadily to about the initial value after 24 weeks and were little changed after 33 weeks. Serum cholesterol showed a similar trend. Lipoproteins S_f 12-20 rose slightly but were well below the initial value after 33 weeks. Lipoproteins S_f 20-100 and S_f 100-400 were not significantly altered by the administration of thyroid for 33 weeks.—A. Hepburn.

N.A. and R., October 1955

5154

HENNEMAN, H. A., REINEKE, E. P. and GRIFFIN, S. A. The thyroid secretion rate of sheep as affected by season, age, breed, pregnancy and lactation. *J. Animal Sci.*, 1955, 14, 419-434. [Michigan State Coll.]

5155

SELENKOW, H. A. and ASPER, S. P. (Jr.) Biological activity of compounds structurally related to thyroxine. *Physiol. Rev.*, 1955, 35, 426-474. [Dept. Med., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

5156

AXELRAD, A. A., LEBLOND, C. P. and ISLER, H. Role of iodine deficiency in the production of goiter by the Remington diet. *Endocrinology*, 1955, 56, 387-403. [Dept. Anat., McGill Univ., Montreal.]

Components of the Remington low-iodine diet (Abst. 645, Vol. 7) were tested to see if the goitrogenic effect could be attributed to one ingredient. It was shown that the goitre-producing action was due to the low I content, 4.1 μ g. per 100 g., aggravated by inclusion of NaCl. The average weight of the left lobe of the thyroid of mice on the diet without NaCl was 2.3 mg., that of mice receiving 1 per cent. NaCl was 12.0 mg., but body-weights were equal. Mice can survive on as little as 60 μ g. NaCl daily. The concentration of radio-active I in the thyroids was assessed with a Geiger counter in mice given 2 μ C. radio-active I subcutaneously and killed 2½ hr. later. It was higher in mice given NaCl.

In another experiment 109 male mice were divided into 4 groups. One group was given a diet of glucose, wheat gluten, yeast and CaCO₃, containing 4.1 μ g. I per 100 g. diet, and the other 3 groups received added KI to raise the I content to 12.2, 32 and 100 μ g. per 100 g. Each group was divided into 4 sub-groups which received 0, 0.1, 1.0 or 3.0 g. NaCl per 100 g. diet. The mice were injected with radio-active I and killed on the 68th and 69th days. The mice on the lowest I intake had the largest thyroids and the highest concentration of radio-active I. The size of the glands and the concentration of radio-active I increased with increasing NaCl in the diet. In the groups getting KI, the thyroids were small. Although the concentrations of radio-active I were inversely related to the amounts of added KI, the concentrations increased with increasing percentages of NaCl, and examination of the right lobes showed increase of activity with increasing amounts of NaCl.

The goitrogenic effect of NaCl was basically different from that of antithyroid substances, which generally prevent the formation of thyroid

hormone. The presence of NaCl maintained or enhanced the function of the thyroid and thereby increased the I required for the production of hormone.—B. W. Simpson.

See also Absts. 4644, 4785, 5127, 5306, 5388, 5402, 5579, 5814, 5953.

5157

CROSS, B. A. The posterior pituitary gland in relation to reproduction and lactation. *Brit. Med. Bull.*, 1955, 11, 151-155. [Dept. Zool., Univ. Cambridge.]

See also Abst. 5009.

5158

GÓTH, A., LENGYEL, L., BENCZE, E., SÁVELY, C. and MAJSAJ, A. The role of amino-acids in inducing hormone secretion. *Experientia*, 1955, 11, 27-29. [Margit Hosp., Budapest.]

Low eosinophil counts occurred 4 hr. after the taking of egg white or amino-acids in healthy men but not in those with Addison's disease. In normal rats leucine, methionine, valine, phenylalanine and tryptophan, but not glycine, histidine or isoleucine, produced low eosinophil counts not found in adrenalectomised rats. Serum taken from normal men and patients with anterior pituitary deficiency 4 hr. after they had eaten egg white was injected into normal and adrenalectomised rats. Only the normal serum increased the blood sugar in normal rats and reduced the eosinophil count in those adrenalectomised.

Injection of valine or leucine into rats caused loss of ascorbic acid from the adrenals, attributed to mobilisation of the rats' own adrenocorticotrophic hormone from the pituitary. Daily injection for 10 days of 0.02 g. valine, leucine, tyrosine or methionine, but not of glycine, into immature female rats resulted in increased weight of the ovaries and uterus, and bleeding follicles of the ovaries and oedematous swelling of the uterus.

It is suggested that the specific dynamic action of foods may be explained by an acute stimulating effect on the pituitary.—C. Warner.

5159

FÖRSTER, W., HERRMANN, C., SCHARF, J. H. and EHRENBREND, F. Korrelationen zwischen Stoffwechsel-, Schilddrüsen- und Hypophysenveränderungen bei Ratten nach chronischer Verabreichung von NaI, BAL und Methionin. [Relations between changes in metabolic rate, thyroid and pituitary in the rat after prolonged administration of NaI, BAL and methionine.] *Arch. exp. Pathol. Pharmacol.*, 1955, 225, 195-209. [Pharmakol. Inst., Univ. Mainz.]

Groups of young rats weighing about 100 g. received for 46 days a stock diet, and in addition

daily, in mg. per kg. bodyweight, NaI 250 or 1000 or methionine 3000 or both, by stomach tube, or BAL 15 by intramuscular injection in olive oil, or NaI and BAL. Controls received saline. Six rats of each group were used for B.M.R. estimations twice weekly. One from each group was killed after 4, 7, 11, 13, 18 and 35 days for histological study of thyroid and pituitary.

B.M.R. in the control group varied very little in the course of the experiment. With NaI there was a sharp fall, a rise to well above normal, a second fall equal to the first and a final rise. With NaI and methionine the changes were similar but occurred somewhat later, and with NaI and BAL they were yet further delayed and of smaller magnitude.

The thyroid showed no significant change in weight in any group, but histologically showed increased activity when B.M.R. was low and low activity when B.M.R. was high. The proliferation of the thyroid was accompanied by increases of the beta cells in the pituitary and vacuolisation. Increased B.M.R. was accompanied by an increase in colloid and in beta cells with dense beta granulation.

The mechanisms concerned are discussed.

D. Duncan.

5160

GREENBERG, S. M. and ATERMAN, K. **Thyroid-cortisone "antagonism" in rats as measured by growth, organ weights and food utilization.** *Metabolism*, 1955, 4, 264-274. [Dept. Pharmacol., Med. Sch., Univ. Birmingham.]

The effects of the prolonged administration of cortisone and of thyroid hormone, singly and together, on growth, food intake, food utilisation and organ weights were studied. Doses of 1.5 or 1.25 mg. cortisone were injected subcutaneously 6 days a week. Dried thyroid formed 0.05, 0.10, 0.20 or 0.40 per cent. of the diets. Male rats of weight 45 to 55 g. were used and the tests lasted 4 or 5 weeks. Organ weights were recorded at the end.

When cortisone alone was given, growth was retarded and food intake as well as efficiency of utilisation of food were reduced. Dried thyroid also reduced growth except when the fat content of the diet was high, 10 per cent., and the level of dried thyroid in the diet was as low as 0.10 per cent.; 0.4 per cent. dried thyroid with 10 per cent. fat retarded growth. The rats receiving thyroid ate as much as or more than their controls, but efficiency of utilisation fell as the level of thyroid rose. When cortisone and thyroid were given together, the growth-inhibiting property of the cortisone was reduced and there was an increase of food consumption and an increased efficiency of food utilisation except at the highest level of thyroid, 0.4 per cent., in which group mortality was very high. Adrenals did not atrophy and there was no involution of thymus or spleen, but heart and kidney weights increased, the effects of the 2 substances being additive.

B. W. Simpson.

ENERGY EXCHANGE AND SPECIFIC DYNAMIC ACTION

5161

BROZEK, J. and GRANDE, F. **Body composition and basal metabolism in man: correlation analysis versus physiological approach.** *Human Biol.*, 1955, 27, 22-31. [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]

The physiological approach to the relation between body composition and B.M.R. has been made by direct measurement of oxygen uptake of different organs *in vivo* and evaluation of their share in the basal oxygen consumption of the whole body. The method of using correlation analysis to estimate the B.M.R. from body measurements is discussed and it is found that partition of the B.M.R. between tissues as estimated on the basis of direct measurements is different from that inferred from correlation analysis. For instance, "active tissue mass" as estimated from body-weight minus the weights of fat, bone mineral and extracellular fluid is sometimes a useful concept, but it cannot be identified with the muscle mass,

and the share of the skeletal muscle in the total oxygen consumption is probably not much more than 25 per cent. Moreover, despite the highly significant correlation between extracellular fluid and B.M.R. which indicates that the fluid compartment "accounts" for 64 per cent. of the variation in B.M.R., the actual participation of the fluid in total oxygen consumption must be negligible.

D. Duncan.

5162

EDHOLM, O. G. and FLETCHER, J. G. **Daily energy expenditure patterns in young men.** *J. Physiol.*, 1955, 128, 18P-19P. [Div. Human Physiol., Nat. Inst. Med. Res., London.]

5163

EDHOLM, O. G., FLETCHER, J. G., MCCANCE, R. A. and WIDDOWSON, E. M. **Comparison between daily energy expenditure and dietary intake in man.** *J. Physiol.*, 1955, 128, 19P. [Div. Human Physiol., Nat. Inst. Med. Res., London.]

N.A. and E., October 1955

5164

DOLE, V. P., SCHWARTZ, I. L., THORN, N. A. and SILVER, L. The caloric value of labile body tissue in obese subjects. *J. Clin. Invest.*, 1955, 34, 590-594. [Hosp. Rockefeller Inst. Med. Res., New York.]

Five obese women were given a diet of evaporated milk, maize oil, glucose and water. For the first 2 to 3 weeks of the study the amount was adjusted approximately to maintenance value for each patient.

There followed 4 periods of 8 days in each of which 55 g. (485 Cal.) was subtracted from the daily maintenance amount during half of the period and was added to the maintenance amount during the other half. Bodyweights were recorded daily. From statistical analysis of the data it was computed that the average energy equivalent of weight lost or gained was 2.5 Cal. per g. and the average daily energy expenditure 20.2 to 24.4 Cal. per kg.

F. C. Aitken.

5165

MANN, G. V. Importance of caloric disposition in cholesterol and lipoprotein metabolism of human subjects. *Federation Proc.*, 1955, 14, 442. *Proc.* [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

5166

MORRISON, W. D., HAMILTON, T. S. and SCOTT, H. M. Basal metabolism of chicks as affected by antibiotics. *Poultry Sci.*, 1955, 34, 78-81. [Illinois Agric. Exp. Stat., Urbana.]

Aureomycin at 15 mg. per kg. of a diet consisting mainly of yellow maize and soya bean meal had no effect on the basal metabolism of chicks aged 17 and 31 days.—D. Duncan.

5167

BUSKIRK, E., BROŽEK, J., GRANDE, F., ANDERSON, J. T. and TAYLOR, H. L. Semistarvation and performance capacity. *Federation Proc.*, 1955, 14, 24. *Proc.* [Lab. Physiol. Hyg., Univ. Minnesota, Minneapolis.]
Experiments on man.

5168

LÖVEI, E. Die physiologische Basis der spezifisch-dynamischen Wirkung der Eiweisse. [The physiological basis for the specific dynamic action of proteins.] *Ztschr. ges. inn. Med.*, 1954, 9, 1147-1151. [2. Med. Klin., Univ. Budapest.]

The physiological basis for specific dynamic action is discussed and experiments are cited in illustration. The basal metabolism was estimated before and hourly for 4 hr. after consumption of 150 g. skimmed milk cheese. In 14 men aged from 42 to 67 years and 1 woman aged 53, all

suffering from cirrhosis of the liver, significant S.D.A. of protein could not be demonstrated. In subjects with endocrine disorders, such as obesity and Addison's disease, no S.D.A. of protein could be demonstrated until after intravenous injection of 10 mg. Percortene Hydrosoluble or intramuscular injection of 5 ml. adrenal cortex extract, when the response appeared.—E. M. Hume.

5169

DAUM, K., TUTTLE, W. W., LARSEN, R., ROLOFF, L. and SALZANO, J. Physiologic response of boys 12 to 14 years old to different breakfasts. *J. Amer. Dietetic Assoc.*, 1955, 31, 359-362. [Dept. Nutrit., State Univ. Iowa, Iowa City.]

For previous work see Absts. 2144, Vol. 21; 4521, Vol. 23.

No significant difference in maximum work rate, maximum work output, neuromuscular tremor or choice reaction time in the late morning hours was found in a cross-over experiment in which 8 schoolboys aged between 12 and 14 had a basic breakfast of cereals and milk, an isocaloric one of bacon and egg, or a mixture of these, or a mixed heavy breakfast supplying 60 per cent. more energy than the basic cereal and milk breakfast.

W. M. Deans.

5170

DURNIN, J. V. G. A. The oxygen consumption, energy expenditure, and efficiency of climbing with loads at low altitudes. *J. Physiol.*, 1955, 123, 294-309. [Inst. Physiol., Univ. Glasgow.]

The subjects were 2 men in good physical condition, 32 and 22 years old, 173 and 178 cm. in height, weighing 81 and 86 kg. and with B.M.R. of 1.10 and 1.41 Cal. per min. They climbed on 2 slopes of Ben Lomond which had mean gradients of 1 in 5.7 and 1 in 4.7, at controlled rates of vertical climb of 600 and 630 metres per hr. and rates of linear climb of 2.1 and 1.8 m.p.h. Loads carried were 5, 10, 15 and 20 kg., the smallest load representing the Max Planck respirometer and a frame. The experiment was planned as an 8 × 8 Latin square: the variables were days, loads, gradients, subjects and the sequence in which loads were carried.

Mean oxygen consumption with different loads and gradients varied from 2.22 to 2.60 litres per min. in the older and from 2.09 to 2.69 in the younger subject, with a significant difference between subjects and a highly significant difference between loads and also between days. Mean energy expenditure was from 11.09 to 13.25 and from 10.42 to 13.45 Cal. per min. in the 2 subjects. Mean pulmonary ventilation was from 49.32 to 68.01 and from 50.85 to 62.18 litres per min., and mean oxygen extraction from 5.37 to 4.64 and from 4.94 to 5.18 per cent. There was a negative correlation between oxygen extraction and

ventilation, although the mean oxygen extraction of the second subject showed an almost steady increase as the load became greater.

The efficiency of climbing, measured as the gross weight \times vertical height climbed, in kg. m. per min., \times the correction factor, divided by the difference between energy expenditure in climbing and the B.M.R., differed little with load. When basal metabolism was deducted the greatest efficiency reached by the older subject was on the lower gradient with the greatest load and was 23 per cent.; by the younger subject it was on the same gradient with a load of 5 kg., and was 26 per cent. When the metabolism of horizontal walking was deducted the greatest mean efficiencies were 32 and 36 per cent.

The subjective feelings of the subject often did not agree with the physiological findings.

D. Duncan.

5171

MÜLLER, E. A. Wirkungsgrad und Leistungsfähigkeit bei Arbeit mit den Wadenmuskeln. [Effort and work capacity with the calf muscles]. *Internat. Ztschr. angew. Physiol. Arbeitsphysiol.*, 1955, 16, 25-34. [Max Planck Inst. Arbeitsphysiol., Dortmund.]

A foot ergometer is described which measures work of the extensor muscles, the axis of which passes through the ankle. Only the calf muscles are used. Work can be kept up for as much as 8 hr. by a man of medium strength without much affecting the pulse frequency. A bicycle based on the same principle required about as much energy to cover a given distance as an ordinary bicycle and much less energy than walking, and for a given expenditure of energy its velocity was between those of walking and the ordinary bicycle.

D. Duncan.

5172

NUKADA, A. and MÜLLER, E. A. Hauttemperatur und Leistungsfähigkeit in Extremitäten bei dynamischer Arbeit. [Skin temperature and work capacity in the limbs during active work.] *[Internat. Ztschr. angew. Physiol. Arbeitsphysiol.]*, 1955, 16, 61-73. [Max Planck Inst. Arbeitsphysiol., Dortmund.]

With the ergometer described in the preceding Abst. it was shown that the colder the skin of the leg, the longer is the maximum working time of the calf muscles at constant output and the lower the pulse rate during work and recovery. The difference in work capacity was inversely related to blood flow in the superficial vessels.

D. Duncan.

5173

NUKADA, A. Die Muskelleistungsfähigkeit bei reaktiver Hyperämie der Muskeln. [Work capacity during reflex hyperaemia of the muscles.] *Internat. Ztschr. angew. Physiol.*

Arbeitsphysiol., 1955, 16, 81-82. [Max Planck Inst. Arbeitsphysiol., Dortmund.]

In 2 men the capacity for severe work on the foot ergometer was increased during the period of reactive hyperaemia after the leg had been constricted to reduce circulation.—D. Duncan.

5174

NUKADA, A. Hauttemperatur und Leistungsfähigkeit in Extremitäten bei statischer Haltearbeit. [Skin temperature and work capacity in the limbs during static postural work.] *Internat. Ztschr. angew. Physiol. Arbeitsphysiol.*, 1955, 16, 74-80. [Max Planck Inst. Arbeitsphysiol., Dortmund.]

The work capacity was estimated from the ability of the subject to keep his arm bent at a right angle while a weight was hung from the wrist. Warming the arm by diathermy or in a water-bath before work reduced the time for which loads could be supported, and cooling the arm increased it. The effect was not closely related to the muscle temperature, but appeared to depend on the circulation, which was greater in the muscle when driven away from the skin and vice versa.—D. Duncan.

5175

LEROY, A. M. Utilisation de l'énergie des aliments par les animaux. [Utilisation of feed energy by animals.] *Ann. Zootech.*, 1954, 3, 337-372. [Dept. Zootech., Inst. Nat. Agronom., Paris.]

Data from 337 experiments on energy metabolism for 6 species were obtained from work published by 12 groups of authors. The heat loss in 24 hr. by a normally fed animal in conditions of equilibrium is equal to the maintenance expenditure plus K times the energy of the absorbed food in terms of dry matter. The coefficient K measures the specific dynamic action of the food and in all the species considered it is about 1 Cal. per g. dry matter. In cattle and pigs there is a positive correlation between the value of K and the ratio of total net energy expenditure to maintenance expenditure. There is considerable individual variation in K, which indicates that within a species there are animals which utilise food well or badly. K tends to be less when the animal consumes its ration quickly.—D. Duncan.

5176

LEROY, A. M. and ZELTER, S. Z. Contribution à l'étude des échanges énergétiques du mouton. [Study of the energy exchange of sheep.] *Ann. Zootech.*, 1954, 3, 373-385. [Lab. Recherches Zootech., Inst. Nat. Agronom., Paris.]

Respiratory exchange and N balance were studied in sheep of different ages, in relation to the time of feeding.

The energy lost during consumption and digestion of feeds, as shown in the previous Abst., is approximately equal to 1 Cal. per g. dry matter ingested. When an animal is in energy equilibrium,

Metabolisable energy = $E + P + Ms \times 1 \text{ Cal.}$,

where E is maintenance energy, P is productive energy and Ms the dry matter of the ration. Practical application of the findings is discussed.

D. Duncan.

5177

MILOSAVLJEVIĆ, S. and ŠEKOVIĆ, N. Prilog poznavanju radne sposobnosti brdskog konja sa Peštera. [Working capacity of the Pešter mountain horse.] *Acta vet., Belgrade*, 1954, 4, No. 4, 83-87. [Inst. Biol. Gajenja, Vet. Fak., Belgrade.] German summary.

The horses studied were 13 geldings and 7 mares aged from 4 to 22 years, and about 131.5 to 135.6 cm. [51 to 53 in.] high at the shoulder. [They were not weighed.] The work consisted in carrying a load of 100 kg. on a pack saddle weighing another 15 kg. for 10,000 m., which took 2 hr.

The average length of step was 144 cm. in the first 100 m. and 142 in the last, and the times taken for each step were 1.03 and 1.05 sec. The pulse rate was 43.55 per min. before and 48.05 after work and 46.25 after a 20-min. rest. Respiration rates at the same times were 20.8, 34.8 and 22.8. There was no change of temperature. Hb increased during work by 10.9 per cent., red cell count by 11.6 per cent. and white cell count by 10 per cent. The seven oldest horses, over 12 years old, took slightly longer to cover the distance and showed greater changes in pulse rate and blood picture than the younger ones.—D. Duncan.

5178

MORRISON, S. D. The total energy metabolism of non-pregnant rats. *J. Physiol.*, 1955, 127, 479-497. [Inst. Physiol., Univ. Glasgow.]

A closed-circuit respiration calorimeter, which is described, was used to study the metabolism of adult female rats in periods of 2 to 5 days, the latter covering the complete oestrus cycle. The rats weighed 100 to 250 g. and were fed to appetite on the Bruce and Parkes diet 41 (Abst. 5251, Vol. 19). Energy expenditure was calculated from oxygen consumption, CO_2 production and urinary N output, and water exchange was measured.

The total energy expenditure varied linearly with bodyweight and net energy intake. It was estimated to be 153 per cent. of the B.M.R. The mean non-protein R.Q. was 0.97, closely corresponding to the value of 0.955 expected from the composition of the diet. R.Q. varied linearly with the ratio of ingested energy to energy expenditure and the ratio of absorbed energy to energy expenditure. There was usually, but not invariably,

a diurnal variation in total energy expenditure, which on the average was highly significant, with maximum oxygen consumption between 10 p.m. and 6 a.m. and minimum from 2 to 6 p.m. The total mean variation was 10.5 per cent. Considerable activity with much eating occurred during the night and again between 10 a.m. and 2 p.m. In rats studied for 5 days there was a tendency to higher energy expenditure in pro-oestrus and late di-oestrus, but the differences were not significant.

The total evaporated water showed a large variation from day to day, apparently independently, for any rat or period, of other metabolic measurement such as total energy expenditure. There was no significant variation with bodyweight. The mean water evaporation was estimated to be 13.6 g. daily with a coefficient of variation of 11 per cent. From the ventilation rate and other factors it was calculated that of the total evaporation 17 per cent. was of pulmonary origin in rats weighing 100 g., and 32 per cent. in rats weighing 250 g. If the latent heat of evaporation from the rat under the given conditions were 0.58 Cal. per g., the mean total evaporative heat loss was 7.9 Cal daily, and for rats of 100 and 250 g., 32 and 18.6 per cent. of the total daily energy expenditure.—D. Duncan.

5179

GLEISS, J. and WEBER, H. G. Beiträge zum Frühgeborenenproblem der Gegenwart. 8. Die Entwicklung der Wärmeregulation von Frühgeborenen im Vergleich zu Neugeborenen. [The problem of the premature baby. 8. The development of heat regulation in premature as compared with [term] newborn infants.] *Ztschr. Kinderheilk.*, 1955, 76, 138-147. [Kinderklin., Med. Akad., Düsseldorf.]

For Nos. 7, 9 and 10 in this series see Absts. 5494, 5495, Vol. 25.

Thermo-electric measurements of skin and rectal temperatures in 14 premature infants, birthweights 1120 to 2070 g., and 14 infants of birthweight 2640 to 4100 g., showed that the premature are to some extent poikilothermic. The development of heat regulation is gradual and independent of birthweight and weight gain. Prematures require a higher environmental temperature to maintain the same rectal temperature as term infants, but the relation of rectal to bed temperatures is similar. From this the conclusion is drawn that it is chiefly the regulation by control of peripheral circulation that is defective in the premature infant.—I. Leitch.

5180

MEEHAN, J. P. Body heat production and surface temperatures in response to a cold stimulus.

J. Appl. Physiol., 1955, **7**, 537-541. [Arctic Aeromed. Lab., Ladd Air Force Base, Alaska.]

The subjects were 9 Alaskan natives aged from 17 to 26 years and 8 Caucasian subjects aged from 21 to 26 who had spent at least a year in Alaska. All were fed for at least 2 days before the experiment on standard mess rations.

The B.M.R. of all the subjects was normal. In a cold room at 6° to 7° C. the native subjects increased their metabolic rate in 90 min. much more than the Caucasians; the increases were 142 ± 22 and 77 ± 11 per cent. This was ascribed to greater shivering on the part of the natives. They kept their hands and feet warmer, but mean body and trunk temperatures did not differ significantly from those of the Caucasians. At the end the native subjects showed a fall in rectal temperature and the Caucasians a rise.

D. Duncan.

5181

BRODY, S. **Average critical temperatures in cattle and man.** *Federation Proc.*, 1955, **14**, 19-20. *Proc.* [Dept. Dairy Husb., Univ. Missouri, Columbia.]

5182

BEAKLEY, W. R. and FINDLAY, J. D. **The effect of environmental temperature and humidity on the respiration rate of Ayrshire calves. The effect of environmental temperature and humidity on the frequency of the heart beat of Ayrshire calves.** *J. Agric. Sci.*, 1955, **45**, 452-460; 461-468. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

The respiration rates of 3 pairs of 4-month-old Ayrshire bull calves were measured in a holding room; 1 animal of each pair was then transferred to a hot room and exposed for 6 hr. on different days to 15°, 20°, 25°, 30°, 35° and 40° C. dry bulb temperature at 17 mg. per litre absolute humidity and to temperatures of 30°, 35° and 40° C. at 7 mg. per litre saturation deficit.

Respiration rates increased with increasing environmental temperature and humidity. Changes in respiratory rate at high and low humidities followed the same pattern, but the values obtained at high humidity were higher and suggested that temperatures of 30° and 35° C. at high humidity had the same effect on respiration rate as temperatures of 33° and 46° C. at low humidity. At high temperature and humidity respiration rate reached a maximum and then fell. The decline coincided with an increase in the amplitude of flank movements. It was suggested that the fall in respiration rate with time of exposure was associated with a decline in the CO₂-combining capacity of the blood.

Heart rates increased with increasing environmental temperature above 20° C. and with increas-

ing humidity above 30° C. High humidity at 40° C. increased the heart rate by 48, 108 and 136 beats per min. in the 3 calves. There was a decline in heart rate with increasing exposure to temperatures above 25° C. The heart rates of the control calves reached a maximum 2 hr. after feeding and then declined. It was concluded that heart rate is an unreliable index of heat tolerance in young cattle.—J. N. Aitken.

5183

KLEMM, G. H. and ROBINSON, K. W. **The heat tolerance of two breeds of calves from 1 to 12 months of age.** *Austral. J. Agric. Res.*, 1955, **6**, 350-364. [Sir William Macgregor Sch. Physiol., Univ. Queensland, Brisbane.]

Rectal temperature, pulse rate, respiratory rate, evaporative heat loss, skin temperature and behaviour of 2 Illawarra Shorthorn and 2 Zebu × Hereford calves were studied at 1 to 3, 6 to 8 and 12 to 13 months of age. At each age the calves were exposed for 7 hr. to temperatures from 86° to 108° F. and humidities of 6.5 to 16.6 g. moisture per c. ft.

Above 95° F. rectal temperature rose more and took longer to reach equilibrium in Shorthorns than in Zebu crosses. At the temperatures studied increased humidity caused greater stress than increased temperature. Pulse rate was not changed by temperature or humidity but in all atmospheric conditions and in both breeds the rate was lower in the older calves. The rate of panting was also lower in older calves in any combination of temperature and humidity. Evaporative heat loss increased with rising temperature, but increased humidity depressed this tendency. The evaporative loss increased regularly from 1 to 12 months in the Zebu × Herefords, but in the Shorthorns at 1 to 3 months it was negligible, and though it increased from 6 to 12 months of age it never attained the same level as in the crossbred calves. At 96° F. the Zebu × Herefords began to sweat, and skin temperatures fell. The results are compared with published data for Jersey calves. It was thought that the greater heat tolerance of Zebu cattle is at least partly due to better sweating mechanism and lower heat production.

T. D. Bell.

5184

CARTWRIGHT, T. C. **Responses of beef cattle to high ambient temperatures.** *J. Animal Sci.*, 1955, **14**, 350-362. [Texas Agric. Exp. Stat., Bluebonnet Farm, McGregor.]

Physiological reactions of Brahman, Hereford and F₁ Brahman × Herefords were recorded when they were kept for 8 hr. at 105° F. and relative humidity 50 per cent. in a heat chamber, and on summer pasture without shade. Respiration and pulse rate and rectal temperature were taken every

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hour in the heat chamber, and in the field respiration rate was counted hourly and weight gain during the summer was recorded. A total of 366 sets of observations were made; animals tested in the field were tested also at least twice in the heat chamber.

In the heat chamber respiration rates and rectal temperatures rose; the increase was greatest in the Herefords, and the crossbreeds were intermediate, but nearer the Brahmans. A similar increase of respiration rate was found in the hot climate of the summer pasture. Brahman \times Herefords gained most weight, followed by Brahmans and then Herefords. Only summer gain was sufficiently heritable to be used in selection for heat tolerance.—T. D. Bell.

5185

BRODY, S., RAGSDALE, A. C., THOMPSON, H. J. and WORSTELL, D. M. **Environmental physiology and shelter engineering with special reference to domestic animals.** 28. The thermal effects of radiation intensity (light) on milk production, feed and water consumption, and body weight in Holstein, Jersey and Brahman cows at air temperatures 45°, 70° and 80° F.

STEWART, R. E. and BRODY, S. 29. Effect of radiation intensity on hair and skin temperatures and on respiration rates of Holstein, Jersey, and Brahman cattle at air temperatures 45°, 70° and 80° F.

DALE, H. E. and BRODY, S. 30. Thermal stress and acid-base balance in dairy cattle. *Missouri Agric. Exp. Stat. Res. Bull.* No. 556, July 1954, pp. 20; No. 561, September 1954, pp. 36; No. 562, September 1954, pp. 27. [Columbia, Mo.]

For previous parts see Abst. 2498, Vol. 24.

28. Lactating Holstein and Jersey and dry Brahman cows were exposed for periods of 7 days to radiation intensities of 5, 40, 90, 130 and 180 B.t.u. per c. ft. per hr., supplied by combinations of incandescent and fluorescent lamps. Sometimes the radiation was continuous throughout the period, and sometimes varied to simulate natural daily changes. At each radiation intensity 3 temperatures, 45°, 70° and 80° F., were allowed. The effects on milk production, feed and water intakes and bodyweight were studied. At 45° an increase in radiation intensity did not affect any of these characteristics. The lactating cows were affected at the higher temperatures. Milk yield declined at 70° F. and still more at 80° F. The decline was even greater at higher intensities of radiation, but decline was less in Jerseys than in Holsteins. Butterfat percentage showed a slight increase related to the decrease in milk yield. The consumption of total digestible nutrients declined in these 2 breeds parallel to the fall in milk yield.

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Water intake increased slightly in all breeds with increasing temperature and radiation intensity, and Jerseys and Holsteins lost weight slightly. Greater heat tolerance was aided by large surface area per unit bodyweight, by light, glossy, short hair and lower heat production. Greater age, advanced gestation and lactation and greater size tended to reduce heat tolerance.

29. Hair and skin temperatures and respiration rate of the cows were also studied. The absorption of radiation by the coat was first measured. It was least in the Brahmans and greatest in the Holsteins. As air temperature increased absorption decreased. Hair and skin temperatures increased with increasing radiation, and were highest in the Holsteins, which showed distinct signs of discomfort at the higher radiation intensities. Brahmans were least affected. Respiration rate was unaffected by radiation intensity, and in the Holsteins there was no difference between the predominantly black and the predominantly white animals. The complicated interactions of hair colour and structure and surface area are discussed.

30. The same cows were used, and in addition some were exposed to higher environmental temperature and greater radiation intensity for a short period, and some were starved for 5 days. The CO₂-combining capacity of plasma, CO₂ content of plasma and "arterialised" plasma, pH of blood, and ketone bodies in blood and urine were estimated. CO₂ capacity decreased with increasing thermal stress, and the decrease was greater in large lactating animals than in small non-lactating. The difference between breeds diminished at higher radiation intensities. At the same time there was a rise in pH of the blood, the condition being described as respiratory alkalosis. During the longer periods of exposure there was a tendency for the change in pH to correct itself: this did not appear in the short intensive periods of heat stress. Plasma was "arterialised" by saturation with normal human alveolar air. Plasma of blood taken under thermal stress lost CO₂ during arterialisation, because the CO₂ in the venous plasma had been reduced by panting. The analysis for CO₂-combining capacity was complicated by the effect of laboratory temperature: at high temperatures there was a loss of CO₂ from plasma during saturation. Ketone bodies in blood and urine were not affected by heat stress, even in the animals in which feed intake was slightly reduced, but during starvation for 5 days they increased and total organic acids in the urine decreased.

T. D. Bell.

5186

SCHMIDT-NIELSEN, K., SCHMIDT-NIELSEN, B., HOUPT, T. R. and JARNUM, S. A. **Body temperature of the camel.** *Federation Proc.*, 1955,

14, 133. *Proc. [Centre Recherches Sahariennes, Beni Abbes, Algeria.]*

5187

HART, J. S. and HEROUX, O. Exercise and temperature regulation in lemmings and rabbits. *Canad. J. Biochem. Physiol.*, 1955, **33**, 428-435. [Div. Appl. Biol., Nat. Res. Labs., Ottawa.]

Lemmings (*Dicrostonyx groenlandicus groenlandicus*) and rabbits were fed on mixed grain, fresh vegetables and water and were acclimatised for several weeks at $20 \pm 1^\circ \text{C}$. Oxygen consumption and colonic temperature were then studied during rest and work on a treadmill at different environmental temperatures. The index of body insulation was calculated from the ratio

Body temperature — Air temperature

Oxygen consumption

Of 16 lemmings, 8 died, apparently of heat stroke. In both species the increases in oxygen consumption during work were independent of and additive to those accompanying falls in environmental temperature. Work produced higher body temperatures in a warm environment and lower body temperatures in cold; the cross-over occurred in lemmings at -4°C . and in rabbits at -20°C . The insulation index in both species increased with falling environmental temperature and fell with work.—D. Duncan.

5188

HILLERMAN, J. P. and WILSON, W. O. Acclimation of adult chickens to environmental tem-

perature changes. *Amer. J. Physiol.*, 1955, **180**, 591-595. [Dept. Poultry Husb., Univ. California, Davis.]

Light and heavy breeds of domestic fowl and Jungle Fowl were used to study the effects of sudden changes from high to low temperature and vice versa, and acclimatisation to high or low temperature, 95° and 60°F . Comparisons between breeds and between layers and non-layers were made.

Body temperature regulation was most highly developed in the Jungle Fowl and least in the heavy domestic breeds. The birds all became acclimatised in body temperature after 3 to 5 days at high or low temperature, and this acclimatisation was important in modifying the effects of environmental temperature. Water consumption was also important in heat tolerance. Respiration rate took longer, 8 to 10 days, than temperature to settle after a change in environmental temperature. Layers had higher body temperatures and respiration rates and consumed more water than non-layers at high temperatures. The respiration of Jungle Fowl was slower than that of domestic breeds.—T. D. Bell.

5189

LYMAN, C. P. and CHATFIELD, P. O. Physiology of hibernation in mammals. *Physiol. Rev.*, 1955, **35**, 403-425. [Dept. Anat., Harvard Med. Sch., Boston, Mass.]

See also Absts. 4863, 5326, 5341, 5374, 5377, 5443, 5482, 5577, 5901, 5932.

CARBOHYDRATES

5190

HUGGETT, A. St. G. Growth, pregnancy, and carbohydrate metabolism. *Amer. J. Obstet. Gynecol.*, 1955, **69**, 1103-1126. [Dept. Physiol., St. Mary's Hosp. Med. Sch., Univ. London.]
A lecture report, with references.

5191

FRYER, J. H., MOORE, N. S., WILLIAMS, H. H. and YOUNG, C. M. A study of the interrelationship of the energy-yielding nutrients, blood glucose levels, and subjective appetite in man. *J. Lab. Clin. Med.*, 1955, **45**, 684-696. [Sch. Nutrit., Coll. Agric., Cornell Univ., Ithaca, N.Y.]

Twelve overweight men were given for 9 weeks diets supplying 1800 Cal. daily per head. In the three 3-week phases of the experiment the diets were, successively, low-carbohydrate, low-fat and low- or moderate-protein. At the end of each

phase samples of capillary and venous blood were taken before breakfast and at intervals during the day. Sampling times bore the same relation to meal times throughout. Satiety value of diets was assessed from records kept by the subjects. No correlation was found between the satiety values of the diets and capillary or venous levels of glucose or the difference between them.

In another group of 12 overweight men given a diet with 3000 Cal. for 1 week, fasting levels of glucose in capillary blood were of the same order as in the first group, but the rise of capillary blood glucose after both breakfast and lunch was more prolonged in those with the higher energy intakes.

F. C. Aitken.

5192

FABRYKANT, M. (with ALLEN, J. F.) Clinical versus laboratory hypoglycemia. An analysis of 81 oral glucose tolerance tests with arterial and venous blood glucose measurements.

N.A. and R., October 1955

Metabolism, 1955, 4, 153-159. [Dept. Med., Post-Grad. Med. Sch., Univ. New York.]

Oral glucose tolerance tests with 100 g. glucose were made in 76 patients; venous and capillary blood samples were used.

In nearly all tests when the lowest blood sugar level fell below 60 mg. per 100 ml., clinical symptoms of hypoglycaemia occurred, but 7 patients showed no clinical disturbance when the arterial blood sugar was 44 to 62 mg. per 100 ml. In the other subjects the commonest symptoms were weakness and hunger, and their onset usually occurred before the lowest blood sugar levels, at values from 40 to 135 mg. per 100 ml. in capillary and 39 to 135 mg. in venous blood. The occurrence of symptoms in the tests was not related to their spontaneous occurrence, an indication of the diagnostic limitations of the test. There was no uniform behaviour of the arteriovenous glucose difference except that it was usually eliminated or even reversed at the lowest blood sugar levels.

D. Duncan.

5193

HOWARD, J. M. Studies of the absorption and metabolism of glucose following injury. The systemic response to injury. *Ann. Surg.*, 1955, 141, 321-326. [Army Med. Serv. Grad. Sch., U.S. Army.]

The subjects for oral glucose tolerance tests were 4 casualties with minor soft tissue wounds, 10 with major injuries and 6 healthy soldiers, all between 18 and 30 years old. The casualties were studied in the week after they were injured. The numbers in the same 3 categories given insulin tolerance tests were 4, 6 and 3.

Mean values for the 3 groups still in the same order were: fasting blood sugar 95, 119, and 85 mg. per 100 ml., peak blood sugar 165, 202 and 134 mg. per 100 ml., reached 45, 60 and 30 min. after intake of glucose and declining after 240 min. to 109, 130 and 84 mg. After injection of 0.1 unit crystalline insulin per kg. bodyweight the fasting blood sugar of 94, 113 and 83 mg. per 100 ml. fell to 56, 78 and 40 mg. after 30 min. Only in the severely injured group was the fasting level not regained within 120 min. The most pronounced impairment of glucose tolerance was in a burned patient on the day of injury, but by the fourth day after injury nearly normal tolerance had been regained.

The mechanism of the effect is not known.

D. Duncan.

5194

HENNEMAN, D. H., ALTSCHULE, M. D., GONZ, R. M. and DAVIS, P. Carbohydrate metabolism in brain disease. 5. Effect of epinephrine on intermediary carbohydrate metabolism in schizophrenic and manic-depressive psychoses. *Arch. Int. Med.*, 1955, 95, 594-

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600. [Lab. Clin. Physiol., McLean Hosp., Waverley, Mass.]

For previous parts see Absts. 2202, 3765, Vol. 25.

5195

FOURNIER, P. Relation entre l'utilisation des glucides de structure et l'ossification. [Relation between utilisation of structural sugars and ossification.] *C.R. Acad. Sci.*, 1955, 240, 1364-1366.

The method was that described in Abst. 745, Vol. 25. The diets of young rats contained, per cent., at the expense of starch, lyxose 3.5, mannose 10, galactose 4, lactose 7.6, melibiose 7.6 or raffinose 11.2; the last 4 provided the same proportion of galactose. Controls received starch as the only carbohydrate.

All the sugars except galactose gave much better retention of Ca than starch alone. Lactose, melibiose and raffinose were similar in effect, though the galactose they contain is in different forms.

It is suggested that all sugars which are not "energetic" may be "structural" (see Abst. 2213, Vol. 25). The extreme diversity of structure of sugars so far shown to affect calcification suggests that they have a simple action, otherwise many different transpositions and inversions of radicals would be involved. Unlike energy-giving carbohydrates, the structural ones may be metabolised through two-carbon steps. The hypothesis is expressed that they may be precursors of glycine. Ossein contains 25 per cent. of this amino-acid; most other animal proteins contain about 1 per cent. Reversible reactions between glycine and lactose might explain both the effects of lactose on calcium metabolism and the resorption of bone tissue in lactating females when lactose is being formed.—D. Duncan.

5196

LODDING, C. Galactosemia. *Acta paediat.*, 1954, 43, 569-574. [Univ. Paediat. Clin., Rikshosp., Oslo.] French, German and Spanish summaries.

Galactose tolerance curves are presented from an infant with galactosaemia, an infant with atresia of the bile ducts, an infant with signs of liver damage and a child with severe liver damage. Only in the first and the last were the curves abnormal. It is suggested that galactosaemia is not a secondary sign of congenital liver disease, but an independent primary disease.

F. C. Aitken.

5197

CARLETON, F. J., MISLER, S. and ROBERTS, H. R. Comparison of the metabolism of C¹⁴-labeled lactose, glucose, and galactose in rats. *J. Biol. Chem.*, 1955, 214, 427-440. [Nat. Dairy Res. Labs., Inc., Oakdale, N.Y.]

Forty rats weighing from 180 to 200 g. were maintained on a sugar-free diet containing, per cent., casein 24, salt mixture 4, butterfat 6, cod liver oil 2, liver concentrate 2 and maize starch 62, with vitamins E, K and those of the B complex. Sixteen of the rats were given by intravenous injection 4 to 6 mg. D-glucose-U- ^{14}C (i.e., labelled in all C atoms), D-glucose-1- ^{14}C , D-galactose-1- ^{14}C or D-lactose-1- ^{14}C , and the rest received similar quantities by stomach tube, with or without 100 to 250 mg. carrier sugar, after being starved for 18 hr. Expired CO_2 , urine and faeces were collected and at the end carcasses were examined for distribution of ^{14}C .

Oxidation of glucose and galactose given by vein was rapid and 64 per cent. of the radio-activity of glucose was recovered as $^{14}\text{CO}_2$ in a few hours, with another 16 per cent. within 4 days. The yields of $^{14}\text{CO}_2$ from glucose-U- ^{14}C were slightly greater than those from glucose-1- ^{14}C . With galactose 61 per cent. of the activity was recovered as $^{14}\text{CO}_2$ in 24 hr., and with lactose only 7 per cent. in 48 hr. This suggests the presence of some lactase activity outside the digestive tract. The percentages of radio-activity recovered in the urine were from galactose 10, from glucose 5 and from lactose 83. The urine after lactose contained much unchanged lactose and 3 unidentified labelled components. Recoveries from faeces were so small as to suggest that they came from contamination with urine. The carcasses contained from 7 to 21 per cent. of the activity from glucose, 8 per cent. from galactose and 10 per cent. from lactose.

When the sugars were given by mouth glucose-U- ^{14}C was broken down to CO_2 to a greater extent than the other sugars. With lactose most of the $^{14}\text{CO}_2$ appeared in the first few hours and the metabolic picture was almost identical with that of glucose-1- ^{14}C , suggesting that most of the lactose was hydrolysed in the intestine. Glucose and galactose given together were better utilised than either sugar alone, but the respiratory ^{14}C was less. The peak of $^{14}\text{CO}_2$ activity was reached within 2 hr. with glucose, galactose or both, 2 to 4 hr. later with lactose. About 4-5 per cent. of the lactose activity was recovered in the faeces, partly as lactose and partly as unidentified substances. Recoveries from the carcasses were 35 to 42 per cent. after lactose or glucose, only 17 to 21 per cent. after the mixture of glucose and galactose.

D. Duncan.

5198

SCHREIER, K. Über den Einfluss von Monosacchariden auf das Wachstum junger Ratten. [Effect of monosaccharides on the growth of young rats.] *Klin. Wochenschr.*, 1955, **33**, 188. [Dept. Exp. Radiol., Univ. Rochester, N.Y.]

Three groups of young rats of initial weight about 50 g. were given purified diets containing 56 per cent. glucose, fructose or galactose, and weight changes and urine output were measured for 10 days. Those having galactose showed no increase of weight and excreted very large volumes of urine. The other 2 groups gained weight normally and the urine volume was small. The polyuria of galactose-fed rats was associated with excretion of large amounts of amino-acids. More amino-acids were excreted by the groups having glucose or fructose than by comparable rats given starch as carbohydrate.—A. M. Copping.

5199

TERLIZZI, L. Accrescimento ponderale di ratti femmine giovani tenuti a diete sintetiche a vario tenore di glucosio. [Weight increase of young female rats maintained on synthetic diets with different amounts of glucose.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1607-1609. [Ist. Fisiol., Univ. Bari.]

See also Title 3287, Vol. 24.

5200

PERKOFF, G. T. and ROSECAN, M. Relationship of dietary carbohydrate and fat to ketonuria in diabetic and nondiabetic subjects. *Metabolism*, 1955, **4**, 214-226. [Nat. Inst. Arthritis Metabol. Dis., Nat. Inst. Health, Bethesda, Md.]

The effect on ketone excretion of a change from customary diet to isocaloric diets high in fat and low in carbohydrate and then low in fat and high in carbohydrate was studied in 6 diabetic and 3 nondiabetic subjects. Ketone excretion was within normal limits in all subjects given their customary diets. Change to high-fat, low-carbohydrate diets caused small increases in ketone excretion in 3 well regulated diabetics and large increases in the other diabetics and in one nondiabetic. Change to low-fat, high-carbohydrate diets induced sharp reductions in ketonuria in 5 diabetic and 2 non-diabetic subjects. The disappearance rate of intravenously administered β -hydroxybutyric acid was studied in 2 diabetic subjects during high-fat and high-carbohydrate diet periods. The results suggested that changes in ketonuria were due to changes in rate of ketone production rather than in utilisation.

F. C. Aitken.

5201

FALK, W. Beiträge zum Fruktose-Stoffwechsel bei Kindern. [Fructose metabolism in children.] *Ann. paediat.*, 1955, **184**, 319-351. [Kinderklin., Univ. Graz.] English and French summaries.

Tolerance tests with intravenous loads of fructose were made in 14 infants, 25 toddlers and 42

children of school age. In 20 healthy children there was a slight initial depression of blood glucose after the injection; the fructose disappeared within 2 hr. and there was no hypoglycaemic reaction. In the 5 children studied for this there was no fructose or glucose in the urine. In 7 healthy infants the fructose peak was higher than that of older children and clearance was slightly slower.

In 19 diabetic children given no insulin for at least 12 hr. before the test there was no important difference in fructose tolerance, though 8 of them had prolonged clearance times. Sometimes the blood glucose was considerably reduced. Three children with diabetic coma tolerated fructose well and in 2 there were falls in blood glucose and total reducing sugar.

Obese children had reduced fructose tolerance, and so had 5 out of 7 children with hepatitis, but in children with coeliac disease fructose metabolism was not impaired. In 7 infants with eczema fructose tolerance was high.

In double fructose tolerance tests on 5 healthy children the second fructose peak was only slightly higher than the first, but the total sugar peak was higher because of a rise in blood glucose. In 4 infants with coeliac disease this Staub effect was missing. Deoxycorticosterone reduced the tolerance for fructose and increased the drop in glucose level after the injection of fructose. Cocarboxylase did not affect the fructose curve, but increased the drop in glucose.

In healthy children there was a rise in blood pyruvic acid after fructose, but this was not seen in diabetics and was not affected by cocarboxylase. D. Duncan.

5202

JARRETT, I. G. and POTTER, B. J. **The effect of glucose on blood pyruvate in sheep.** *Austral. J. Exp. Biol. Med. Sci.*, 1954, **32**, 757-762. [Div. Biochem. Gen. Nutrit., C.S.I.R.O., Univ. Adelaide.]

Five adult ewes were fed on wheat hay and lucerne chaff and fasted overnight before each experiment. A polythene tube was inserted into the jugular vein and filled with heparin in saline so that blood samples could be obtained without disturbing the sheep. After an initial sample was taken, 100 ml. solution containing 1 g. glucose per kg. bodyweight was injected during 5 min. Blood samples were taken 30, 60 and 90 min. later for estimation of pyruvate. Similar experiments were made on 7 lambs aged 3 to 4 weeks and removed from their dams 2 to 3 hr. before receiving glucose at the same rate, and on 4 rabbits. Control experiments were either with saline replacing glucose or with sheep anaesthetised with Nembutal.

In rabbits the mean initial blood pyruvate level was 1.36 mg. per 100 ml., and after glucose the

level rose at 30 min. to 0.78 mg. above that attained after saline. The normal level was regained within 90 min. In young lambs the increase after glucose was less, but still significant; pyruvate was highest at 30 min. and usually below the initial level at 90 min. In adult sheep the pyruvate rose steadily after glucose and was still high after 90 min. In adult sheep there was no effect of anaesthesia, but in lambs the pyruvate fell after either glucose or saline in anaesthesia.

D. Duncan.

5203

ALBANESE, A. A., ORTO, L., ROSSY, J., DiLALLO, R. and BELMONT, A. **Effect of carbohydrates on blood amino nitrogen.** *Metabolism*, 1955, **4**, 160-165. [Nutrit. Res. Lab., St. Luke's Hosp., New York.]

Fructose given to human subjects after a 12-hr. fast at 1 g. per kg. bodyweight produced after 1 hr. about the same increase in blood amino-N as 0.3 g. protein per kg. bodyweight. Sucrose produced a smaller increase and glucose and a maltose-dextrin product had no significant effect. The increase of amino-N was inversely related to the total blood sugar. A protein-sparing activity of fructose is suggested, possibly due to readier production from glucose than from fructose of carbon structures which can be converted to amino-acids by transamination.—A. Hepburn.

5204

GEIGER, E. and PINSKY, J. J. **Utilization and nitrogen-sparing effect of fructose in alloxan diabetic rats.** *Metabolism*, 1955, **4**, 166-173. [Dept. Pharmacol., Univ. S. California Med. Sch., Los Angeles.]

Synthetic diets were used. For one group of rats the diet was free from protein and the utilisation of fructose, glucose and sucrose was compared. In another group under better conditions protein at the rate of 1 g. daily per rat and a vitamin and mineral supplement were given and utilisation of the same sugars and of a mixture of glucose and fructose was studied. Fructose, sucrose and the mixture were utilised better than glucose and the difference in favour of fructose persisted for up to 25 days. The effect of giving protein separately from the sugars was examined in normal and diabetic rats. In normal animals fructose, like glucose, had a greater N-sparing effect when given with the protein than when sugar and protein were separated by 5 hr. In the diabetic rats the N-sparing effect of glucose disappeared or was much reduced, but that of fructose was maintained.

D. Harvey.

5205

PATTERSON, J. W. **Effect of blood supply on the development of cataracts.** *Amer. J. Physiol.*

1955, 180, 495-497. [Dept. Anat., Sch. Med., W. Res. Univ., Cleveland, Ohio.]

In 25 rats on a diet containing galactose, the first cataract was slightly more often in the left eye. In 16 rats weighing from 75 to 145 g. the common carotid was ligated and cut, in 8 on the right side and 8 on the left. Sixteen other rats had sham operations. A week after operation all the rats were given a chow diet with 35 per cent. galactose added. When one carotid was cut, cataract appeared first in the opposite eye in 14 out of 16 rats, but after the sham operation it appeared in either eye.

In 36 rats made diabetic with alloxan or dehydroascorbic acid, cataracts first appeared in either eye or both with similar frequency. In 15 rats with a ligated carotid artery, given alloxan a week after operation, there was no preferential development of cataract on the unoperated side.

In 7 rats kept on normal diet for 40 days after carotid ligation and then given the galactose diet, all the cataracts appeared in the contralateral eyes.

It is concluded that galactose produces cataract by local action on the eye and that a good blood supply therefore favours galactose cataract, and that diabetic cataract does not result from local action of glucose on the eye, but possibly from lack of insulin.—D. Duncan.

5206

FISCHER, J. E. **Small intestine growth-stimulatory effect of lactose in synthetic diets for rats.** *Federation Proc.*, 1955, 14, 433. *Proc.* [Dept. Home Econ., Ohio Agric. Exp. Stat., Columbus.]

5207

SCHULMAN, J. L. and SATUREN, P. **Glycogen storage disease of the liver. 1. Clinical studies during the early neonatal period.**

CORI, G. T. and SCHULMAN, J. L. **2. Enzymic studies.** *Pediatrics*, 1954, 14, 632-645; 646-650. [Dept. Paediat., Jewish Hosp., Brooklyn, N.Y.] Spanish summary.

1. Glycogen storage disease is described in 3 infants in the first few days of life. The results of estimations of liver glycogen and glucose-6-phosphatase and of glucagon tolerance tests are reported for 2 of the infants. Electroencephalograms were normal while blood sugar was low.

2. Glucose-6-phosphatase and phosphoglucomutase were estimated in livers of 6 infants, 2 of them with von Gierke's disease (glycogen storage disease) and in the liver of a 4-months foetus. Cell counts were made in 6 of the 7 livers. In livers of

infants with glycogen storage disease glucose-6-phosphatase activity was low and phosphoglucomutase activity normal compared with controls, whether activity was based on tissue weight or cell count. In the foetal liver, cell count was high and both enzyme activities, expressed on a cell count basis, were low; on a tissue weight basis, glucose-6-phosphatase activity was 9 times that of liver in von Gierke's disease and phosphoglucomutase activity was within the normal range for infant liver.—F. C. Aitken.

5208

LEPKOVSKY, S., CHARI-BITRON, A. and MATZUSAKI, H. **Glycogen synthesis in various tissues as affected by ingestion of water and a high carbohydrate diet.** *Federation Proc.*, 1955, 14, 440. *Proc.* [Dept. Poultry Husb., Univ. California, Berkeley.]

A study with rats.

5209

TODD, C. M. **The antiketogenic action of sorbitol in rats.** *Austral. J. Exp. Biol. Med. Sci.*, 1954, 32, 827-833. [Dept. Biochem., Med. Sch., Univ. Otago.]

Rats fed on stock diet were anaesthetised with sodium amytal. Some were previously made diabetic with alloxan and maintained with insulin until they were required for experiment, when ketosis was induced in some by withdrawal of the insulin. In other rats ketosis was produced with phloridzin. Blood samples were taken for estimation of acetone bodies, reducing sugar and fructose.

In ketosis produced by phloridzin, 0.18 g. sorbitol, but not mannitol, given by vein increased the blood sugar and reduced the concentration of ketone bodies. In starved diabetic rats with low ketone body levels, sorbitol and fructose reduced them further. A similar effect was obtained in fat rats which had 8 to 15 mg. acetone per 100 ml. after 48 hr. without food. Glycerol also reduced the blood ketone level, but duleitol did not.

Pronounced ketosis was produced in diabetic rats given excess butter for a week, and in these rats the blood ketones were only slightly and briefly reduced by sorbitol or fructose. In alloxan-diabetic rats severely ketotic and semi-comatose after withdrawal of insulin there was some drop in ketones, but not in fructose, after injection of sorbitol.

Sorbitol might be used as an adjunct to insulin in human diabetic ketosis.—D. Duncan.

See also Absts. 4818, 4820, 4901, 4902, 4998, 5144, 5217, 5288, 5341, 5433, 5618, 5681.

PROTEINS AND PROTEIN DERIVATIVES

- 5210
FENTON, P. F. Inherited patterns of nitrogen metabolism. *Federation Proc.*, 1955, 14, 432. *Proc.* [Brown Univ., Providence, R.I.]
- 5211
DINKHAUSER, G. Studio sulle variazioni dell'N amino del sangue dopo ingestione di proteine in bambini in condizioni normali e patologiche. [Variations in amino-N in the blood after ingestion of protein in children in normal and pathological conditions.] *Arch. ital. Pediat. Puericolt.*, 1955, 17, 91-124. [Clin. Paediat., Univ. Rome.] French, English and German summaries.
- A test meal of caseinate sweetened with saccharine was given to infants and children fasted for 8 or 9 hr. Blood amino-acids were estimated before and $\frac{1}{2}$, 1, 2, 3, 4 and 5 hr. after the meal. After preliminary trials with different preparations Plasmon, a sodium caseinate with 76 per cent. casein, was selected.
- In 8 normal children the blood amino-N was highest $1\frac{1}{2}$ hr. after the meal, and reached fasting level usually in about 5 hr. In 3 infants and a 7-year-old child the peak value was between 3.38 and 3.78 mg. per cent. after a meal of 1.32 g. casein per kg. Two children showed secondary peaks in blood amino-N, 3 and 4 hr. after the meal, respectively. The peak values, between 2.9 and 3.8 mg. per cent., are taken as characteristic for normal children.
- In 5 dystrophic children the peaks were low, from 1.99 to 2.89 mg. per cent., and in 1 the peak was not reached until 2 hr. after the meal. In a sixth child, with starch dystrophy, the peak value was 3.39 mg. and the curve declined very rapidly. In an infant with hepatic insufficiency the peak value was 3.85 mg., but by the end of the second hour the level was little above the fasting value, and there was another slight rise after 5 hr. Five infants with alimentary intoxication and acetonaemia had very irregular responses, showing the important effects of dehydration. Two infants with cystic fibrosis of the pancreas showed small peaks, slowly attained. It is suggested that a secondary peak in one of these infants was attributable to protein breakdown by the intestinal flora.—D. Duncan.
- 5212
NATELSON, S., PENNIAL, R., CRAWFORD, W. L. and MUNSEY, F. A. Effect of albumin to casein ratio of feeding formulas on blood component levels. *Federation Proc.*, 1955, 14, 259. *Proc.* [Rockford Mem. Hosp.] A study with infants.
- 5213
COX, W. M. (JR.), MUELLER, A. J. and ELLINGSON, R. C. Influence of protein level and infant formula preparations on growth and reproduction in rats. *Federation Proc.*, 1955, 14, 198. *Proc.* [Mead Johnson Res. Labs., Evansville, Ind.]
- 5214
NIZET, A. Erythropoïèse et métabolisme protéique. [Erythropoiesis and protein metabolism.] *J. Physiol., Paris*, 1955, 47, 7-60. [Inst. Clin. Policlin. Méd., Liège.] A review.
- 5215
COLE, W. H., SCHNEEWIND, J. H. and CANHAM, R. The role of protein metabolism in surgery. *Surgery*, 1955, 37, 683-690. [Dept. Surg., Univ. Illinois Coll. Med., Chicago.]
- 5216
BEAL, J. M., CORNELL, G. N. and GILDER, H. Factors influencing nitrogen metabolism in surgical patients. *Surgery*, 1954, 36, 468-484 (with discussion 484-486). [Dept. Surg., New York Hosp.-Cornell Med. Centre.]
- Balances of N, Na and K were measured in 2 groups each of 4 patients who had undergone cholecystectomy or sub-total gastrectomy and who were given glucose, alcohol, protein hydrolysate and KCl by vein. The average intakes for the periods 1 to 5 and 1 to 8 days after operation for the respective groups are tabulated; the greatest amounts given were 53.3 Cal., 0.49 g. N and 2.5 m. equiv. K per kg. bodyweight in 24 hr. The change in lean tissue (g. N balance \times 30) is shown graphically for each patient.
- The results, regarded as only preliminary, appear to indicate that the loss of lean tissue after operations can be diminished by giving intravenously large amounts of these nutrients.
- D. Harvey.
- 5217
KRIEGER, H., ABBOTT, W. E., LEVEY, S., BABE, L. I. and HOLDEN, W. D. Metabolic alterations in surgical patients. 3. The influence of peritonitis on nitrogen, carbohydrate, electrolyte, and water balance. *Surgery*, 1954, 36, 580-597 (with discussion 597-598). [Dept. Surg., Western Reserve Univ., Cleveland, Ohio.]

For part 1 see Abst. 4884, Vol. 24.

Individual balance data are presented for 15 patients. The metabolic alterations which occur in peritonitis largely depend on the severity and duration of the disease and the type of replacement therapy. Adynamic ileus and accumulation of water, electrolytes and protein in the peritoneal cavity are the most important conditions influencing the metabolic alterations.—F. C. Aitken.

5218

RUTHERFORD, E. B. and CRAMPTON, E. W. **Effect of fiber on utilization of dietary protein.** *Federation Proc.*, 1955, **14**, 448. *Proc.* [Dept. Nutrit., Macdonald Coll., McGill Univ., Que.] A study with rats.

5219

RUMSFELD, H. W. (Jr.) **Role of dietary protein in normal rat proteinuria.** *Federation Proc.*, 1955, **14**, 274. *Proc.* [Dept. Biochem., Univ. Texas Southwestern Med. Sch., Dallas.]

5220

SHEFFNER, A. L., ECKFELDT, G. and SPECTOR, H. **Release of amino acids during peptic digestion as a determining factor in the biological value of proteins.** *Federation Proc.*, 1955, **14**, 279. *Proc.* [Quartermaster Food and Container Inst. Armed Forces, Chicago, Ill.]

5221

MITCHELL, H. H. **The dependence of the biological value of food proteins upon their content of essential amino acids.** *Wiss. Abh. Deutsch. Akad. Landwirtsch. Berlin*, 1954, **5**, 279–325. [Div. Animal Nutrit., Univ. Illinois, Urbana.] German summary.

A critical review, with 262 references. It includes tables, based mostly on published results, which give for some 30 animal and vegetable proteins the amino-acid composition compared with that of whole egg, the limiting amino-acid, the chemical score and essential amino-acid index as computed by the author, and the biological value by the author's method and the protein efficiency ratio for the growing rat, with some values for the pig and the dog. There are also 5 graphs showing the correlations between the results of different methods of chemical and biological evaluation. From these it is concluded that the essential amino-acid index is a satisfactory means, better than the chemical score, of predicting from chemical data the biological value of a protein or a mixture of proteins for the growing rat and, so far as data go, for the growing pig and dog. Whether this applies also to children is not yet certain. Next, supplementation of proteins is discussed. Damage of proteins by heating is

briefly referred to, with a warning that prediction of biological value from chemical data may then be hazardous. The special needs of growing poultry are reviewed, with a table of essential amino-acid requirements for the chicken and the turkey poult in comparison with those for the growing rat and pig and the child. Here prediction of biological value is difficult for want of a satisfactory reference protein. A section on the requirements of mature animals, including man, has a table comparing the biological values of several proteins for the growing rat with those for the adult rat, dog and man. The high correlation between the values for adult man and the growing rat ($r = +0.915$) suggests that the biological value of proteins for adult man may be satisfactorily predicted from the essential amino-acid indices. In conclusion, the special case of the ruminant is discussed. Here chemical data are no guide to biological value, because of the intervention of the micro-organisms in the rumen.

W. M. Deans.

5222

FORBES, R. M. and YOHE, M. **Net protein value of blood fibrin for the albino rat: evaluation of nitrogen balance and carcass analysis methods.** *J. Nutrition*, 1955, **55**, 493–498. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Ten rats were each given 6 g. daily of a diet containing 10 per cent. protein as commercial blood fibrin for 2 weeks, then for 2 weeks a standardising diet with 4 per cent. whole egg protein; N balances were estimated during the last 7 days of each period and the biological value, true digestibility and net protein value were estimated. Thirty weanling male rats were used for estimation of net protein value from carcass analysis; for 7 days 10 received 28 per cent. protein in stock diet, 10 received 10 per cent. whole egg protein and 10 received 4 per cent. whole egg protein. Food intake was again 6 g. daily. Five rats from each group were then given the diet with 10 per cent. blood fibrin protein while the other 5 received an N-free diet. After 10 days all were killed and the carcasses were analysed for total N and water. Bender and Miller (Title 2726, Vol. 23) proposed that a predetermined ratio of N to water in the carcasses be used in order to eliminate the necessity of estimating carcass N. The reliability of this technique was investigated in this study.

The ratio 100 N : H₂O was 4.81, S.D. ± 0.114 . The standard error in estimating N content from water content was 0.08 per cent., and since this would cause an error of 20 per cent. in estimation of net protein content under the conditions of the experiment, it is considered safer to estimate N directly.

The net protein value of the blood fibrin, per cent., was 76.6 ± 1.57 and 77.2 ± 1.83 by the 2

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direct methods and 80.8 ± 2.88 by calculation from water content.—G. F. Garton.

5223

FORBES, R. M. and YOHE, M. **Effect of energy intake on the biological value of protein fed to rats.** *J. Nutrition*, 1955, **55**, 499-506. [Div. Animal Nutrit., Univ. Illinois, Urbana.]

Six groups of 5 weanling rats were given 4, 6 or 8 g. daily for 3 periods of 14 days, of diets containing 4 per cent. minerals, 2 per cent. fibre and 10 per cent. ether extract with 10 per cent. protein supplied by soya bean meal, whole egg or blood fibrin plus methionine; 3 of the groups received the proteins in the above order, for the other 3 the order was reversed. The 2 test diets contained 1.6 per cent. N, the whole egg protein diet 0.67 per cent. Biological values were estimated by the N balance method; the last 7 days of each test were the collection period.

At food intake of 4 g. the biological values of the soya bean protein and the methionine-supplemented fibrin were 59.1 and 74.3. At 6 and 8 g. intake the values did not differ significantly with intake and the averages were 71.0 and 96.8.

G. F. Garton.

5224

BEHM, G. **Über den Einfluss der Futtermenge auf die Menge des Darmverlust-Stickstoffs. [The effect of food intake on the amount of faecal nitrogen.]** *Arch. Tierernährung*, 1955, **5**, 52-60. [Inst. Tierernährung, Humboldt Univ., Berlin.]

The N-free diet contained, per cent., sugar 8, olive oil 7, minerals 4, potato starch 80 and filter paper 1. When it was given to appetite for 6 days 6 rats weighing from 61 to 69 g. ate on the average 8.78 g. dry food daily and excreted 14.5 mg. N in the faeces. When the same rats, now weighing 82 to 93 g., were restricted to about 4.68 g. daily the faecal N fell to 9.08 mg. In two more studies the rats weighed about 100 and 110 g. and were allowed 7.69 and 2.95 g. food, when they lost 16.74 and 7.72 mg. faecal N.

With 6 heavier rats, weighing in 4 successive experiments about 170, 185, 200 and 208 g., food intakes of 12.75, 9.38, 14.66 and 5.9 g. led to faecal N losses of 31.96, 21.49, 31.49 and 17.11 mg.

It is concluded that the food intake has an important influence on the output of endogenous faecal N, as suggested by Columbus (Abst. 3287, Vol. 25).—D. Duncan.

5225

RIGGS, L. K., BEATY, A. and MALLON, B. **Nutritive value of whey powder protein.** *J. Agric. Food Chem.*, 1955, **3**, 333-337. [Nat. Dairy Res. Labs., Oakdale, N.Y.]

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Spray-dried or roller-dried whey and lactalbumin were compared in rat growth experiments. The crude protein ($N \times 6.25$) of spray-dried whey was superior to that of roller-dried, with higher digestibility and nutritive value. Supplements of lysine partly corrected the deficiency of the latter. Lactalbumin promoted better growth and efficiency than either of the whey proteins. Protein concentrates prepared by heat coagulation of ethanol extracts of spray-dried whey powder were equal to lactalbumin, but those from roller-dried were inferior.—T. D. Bell.

5226

CAHN, A. J. **Commercial dried egg albumen as a protein source for the growing rat.** *Austral. J. Exp. Biol. Med. Sci.*, 1954, **32**, 819-825. [Dept. Biochem., Univ. Melbourne.]

Male weanling rats were fed for 15 to 16 weeks on diets containing as source of N 15 per cent. dried egg albumin, or 15 per cent. casein supplemented with methionine and cystine to levels comparable with egg albumin, or 7.5 per cent. of each.

There was no difference between groups in weight gain or food intake. About a third of the animals given egg albumin developed fatty infiltration of the liver, with high total fat and cholesterol concentrations. Signs of biotin deficiency, curable by biotin, developed in the animals given egg white, but the presence or absence of added biotin in the diet had no effect on the proportion of animals developing liver abnormalities; many of the animals on albumin developed mild diarrhoea.—C. Warner.

5227

YANG, S. P., SWANSON, P., CAEDO, M. and FOX, H. **Nutritive value of proteins in teosinte grain.** *Federation Proc.*, 1955, **14**, 455. *Proc. [Nutrit. Lab., Home Econ. Res., Iowa State Coll., Ames.]*

5228

EVERSON, T. C. (with HOPPE, E. and POULOS, A.) **Experimental comparison of protein and fat assimilation after Billroth II, Billroth I, and segmental types of subtotal gastrectomy.** *Surgery*, 1954, **36**, 525-535 (with discussion 535-537). [Dept. Surg., Univ. Illinois Coll. Med., Chicago.]

There were 10 dogs in each operation group. Two to 6 months after operation, protein and fat intakes and excretions were studied in four 7-day metabolic periods. The percentage of ingested N and fat excreted in the faeces increased in the following order: control, segmental gastrectomy, Billroth I and Billroth II groups.

After the metabolic studies the dogs were allowed food to appetite. Most of those in Billroth II group lost weight; most of those in the other experimental groups gained or maintained weight.

In the discussion some relevant observations on human subjects are cited.—F. C. Aitken.

5229

CALLOWAY, D. H., GROSSMAN, M. I., BOWMAN, J. and CALHOUN, W. K. The effect of previous level of protein feeding on wound healing and on metabolic response to injury. *Surgery*, 1955, **37**, 935-946. [Quartermaster Food and Container Inst. Armed Forces, Chicago, Ill.]

Groups of rats were given a stock diet and when bodyweight was between 250 and 300 g. were divided into 3 groups. For a standardisation period of 2 weeks they received 1, 2 or 3 times the minimum N requirement in the form of purified diet supplying 48 Cal. daily. At the end of that time balances of N were measured and some of the animals were killed. The remaining rats were subjected to surgical injury and to burns by water at 90°C. During recovery they were given the same purified diets and analyses of urine for N were made at 2-day intervals. At 4, 7 or 10 days after injury the rats were killed. Wounds were examined histologically and their tensile strength was measured; livers were analysed and weight of adrenals was recorded.

Variation in intake of N before injury was reflected only in N content of liver at the end of the standardisation period and in the amount of N excreted in urine on the day of injury and the day following it. During recovery the retention of N and the N content of the liver were greater with the high than with the low level of feeding.

It was concluded that for wound healing the maintenance of a high level of nutrition had no advantage over minimum adequate feeding.

D. Harvey.

5230

WHITE, J., BURR, B. E., COOL, H. T., DAVID, P. W. and ALLY, M. S. Level of protein intake and nitrogen excretion in rats following total-body X irradiation. *J. Nat. Cancer Inst.*, 1955, **15**, 1145-1154. [Nat. Cancer Inst., Nats. Insts. Health, Bethesda, Md.]

Rats fed on diets containing 6, 15 or 20 per cent. casein excreted more N, mainly as urea, after from 450 to 500 r of total body exposure to X rays. The lowest protein intake produced the greatest excretion. Food intake was reduced during the first 3 or 4 days after exposure. The group with the lowest protein intake was partly protected against N loss when the spleen was shielded.

A. Hepburn.

5231

HARKNESS, M. L. R., HARKNESS, R. D. and JAMES, D. W. Effect of protein-free diet on total body collagen. *J. Physiol.*, 1955, **128**, 15P-16P. [Dept. Physiol., University Coll., London.] Experiments with mice.

5232

SERENI, F., McNAMARA, H., SHIBUYA, M., KRETCHMER, N. and BARNETT, H. L. Concentration in plasma and rate of urinary excretion of amino-acids in premature infants. *Pediatrics*, 1955, **15**, 575-585. [Dept. Paediat., New York Hosp.—Cornell Med. Centre.] Spanish summary.

Clearances of total amino-acids, individual amino-acids and endogenous creatinine were measured in 4 groups of healthy fasting subjects, namely: 5 premature infants under 17 days; 7 premature infants between 28 and 51 days; 7 full-term infants between 9 days and 17 months; 4 children between 4 and 10 years and 5 adults between 21 and 40 years. Blood and urine were analysed. The results are tabulated for individuals, with means for the 4 groups.

The concentration of total amino-acids in the plasma was higher in the premature infants than in full-term infants, children or adults, owing mainly to higher concentrations of glycine, serine, threonine, glutamine, tyrosine and phenylalanine. The clearances and rates of excretion, relative to surface area, of total amino-acids and of most individual amino-acids were highest in the group of older premature infants. The results indicated that the high rate of excretion of total amino-acids compared with that of children or adults was due not to the higher concentration in plasma, but to a lower rate of re-absorption by the renal tubules. The younger premature infants, in addition, had a low rate of glomerular filtration, which caused their rate of excretion to resemble that of children and adults.—W. M. Deans.

5233

CLEMETSON, C. A. B. and CHURCHMAN, J. Plasma amino-acid levels following protein ingestion by pregnant and non-pregnant subjects. *J. Obstet. Gynaecol. Brit. Empire*, 1955, **62**, 390-394. [University Coll. Hosp., London.]

Random samples of plasma from 5 men and 5 non-pregnant women contained similar amounts of amino-acids with mean values of 4.90 and 4.89 mg. per 100 ml.; the mean value for 10 pregnant women was 3.30. The values in 4 normal men, 4 pregnant women and 4 women *post partum* rose to a maximum about 3 hr. after ingestion of 100 g. calcium caseinate and slowly fell to the original level after 12 hr. Amino-acid curves obtained

from the pregnant women were similar to the others but did not reach such a high peak. One patient with severe pre-eclampsia had a delayed peak.

A. Hepburn.

5234

KÖEL, F. Sur quelques modifications des aminoacides et leur rôle potential. [Some modifications of amino-acids and their potential function.] *Gaz. chim. ital.*, 1954, **84**, 1223-1234. [Univ. Utréant.]

A lecture.

5235

WALSHE, J. M. Disturbances of aminoacid metabolism following liver injury: a study by means of paper chromatography. *Quart. J. Med.*, 1953, **22**, 483-505. [Med. Unit, University Coll. Hosp. Med. Sch., London.]

Amino-acid patterns were examined in blood and urine from normal subjects and 119 patients with acute or chronic liver injury. Urine from patients with massive hepatic necrosis contained 30 different amino-acids. The large excretion of amino-acids usually heralded death. Changes in the plasma amino-acids were less striking. Urine amino-acids sometimes increased in severe acute hepatitis, but many were normal. An increase in cystine excretion was considered a sensitive index of impaired amino-acid metabolism.

A few patients with chronic hepatitis and cirrhosis of the liver had a high excretion, particularly of 2 or 3 amino-acids. Occasionally the increase disappeared, and this was associated with clinical remission. Patients with obstructive jaundice or focal lesions of the liver had normal amino-acid metabolism.—A. Hepburn.

5236

KALANT, H. and DUCCI, H. The influence of diet on urinary amino nitrogen levels. *J. Clin. Endocrinol.*, 1955, **15**, 481-486. [Serv. A. Med., Hosp. del Salvador, Santiago, Chile.]

Amino-N excretion in the urine of normal and pathological subjects without cancer varied with the amount of protein in the diet.—A. Hepburn.

5237

CHEUNG, M. W., FOWLER, D. I., NORTON, P. and PRATT, E. L. Ninhydrin-reacting constituents of human urine in relation to age and diet. *Federation Proc.*, 1955, **14**, 192. *Proc. [Dept. Paediat., Coll. Med., Univ. New York.]*

5238

WESTALL, R. G. The amino acids and other ampholytes of urine. 3. Unidentified substances excreted in normal human urine. *Biochem. J.*, 1955, **60**, 247-255. [Med. Unit, University Coll. Hosp. Med. Sch., London, W.C.1.]

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For parts 1 and 2 see Abst. 1227, Vol. 23 and Title 744, Vol. 24.

Fractionation of 100 litres of urine from a normal adult on ion-exchange columns, followed by chemical and paper chromatographic techniques, allowed 27 common urinary constituents which reacted with ninhydrin to be identified. In addition to these, 38 unidentified substances which reacted with ninhydrin, 5 after hydrolysis, were found. Of these, 10 were stable to acid hydrolysis, the rest mostly yielding amino-acids.—A. Hepburn.

5239

SUTTON, H. E. and CLARK, P. J. A biochemical study of Chinese and Caucasoids. *Amer. J. Phys. Anthropol.*, 1955, **13**, 53-65. [Inst. Human Biol., Univ. Michigan, Ann Arbor.]

The Chinese subjects were 10 men and 8 women living under western conditions in the United States for 2 years or more; the Caucasoids were 16 men and 13 women, mostly of western European origin. Analysis of urine showed that the Chinese excreted significantly more alanine, β -aminoisobutyric acid, histidine, leucine, lysine, tyrosine and uric acid. How far these differences are racial is not clear, but the fact that the Chinese group included several married couples of whom one excreted β -aminoisobutyric acid and the other did not suggests that the excretion of this substance does not depend on diet.—W. M. Deans.

5240

SHREEVE, W. W., HUTCHIN, M. E., HARPER, H. A., MILLER, C. D. and DOOLAN, P. D. Excretion of amino acids in nephrosis. *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 510-514. [Metabol. Res. Facility, U.S. Naval Hosp., Oakland, Calif.]

A man with nephrosis associated with glomerulonephritis had far more than the normal amounts of amino-acids, notably the essential ones, in the urine. A woman with nephrosis had also aminoaciduria when fasting, but it was less severe. Both tended to have low amounts of several amino-acids in the blood. Infusion of an amino-acid mixture to raise the blood concentration and inulin clearance tests showed that the percentage of filtered amino-acids excreted in normal and nephrotic subjects was increased. Intravenous administration of adrenocorticotrophic hormone for 9 to 10 days produced a fall in excretion of amino-acids in one nephrotic subject, but had no definite effect on 2 normal subjects.

A. Hepburn.

5241

ALBANESE, A. A., HIGGONS, R. A., HYDE, G. M. and ORTO, L. Biochemical and nutritional effects of lysine-reinforced diets. *Amer. J. Clin. Nutr.*, 1955, **3**, 121-128. [Nutrit. Res. Lab., St. Luke's Hosp., New York.]

Fifteen infants aged from 1 to 27 months were studied for from 9 to 21 weeks to find the effects of lysine supplements on anthropometric and body-weight changes, N balance, Hb, total plasma protein and blood lysine. The lysine-supplemented diets were given for from 3 to 4 weeks, preceded and followed by control periods of equal duration during which the infants received standard mixtures of fresh or evaporated milk, the vitamin and mineral content of which was as high as, or higher than, the recommended levels. The supplements were given as L-lysine hydrochloride at the rate of 100 mg. per kg. bodyweight daily. Controls were 9 infants aged 2 to 18 months who received no lysine supplement.

The bodyweights and N balances of 5 of the 15 infants were much better with the lysine supplements. In 6 infants weight gains were not affected, but more N was retained when the lysine supplements were given. Blood protein also rose during supplementation. The other 4 infants showed no improvement when lysine was added to the diet, but their growth rate was already well above average, so the lysine supplements were effective only with children who were not getting adequate nourishment. It is concluded, therefore, that the nutritive value of many infant foods, including cow's milk, can be substantially improved by small supplements of lysine.

G. F. Garton.

5242

ALBANESE, A. A. and ORTO, L. **Human utilization of L-lysine.** *Federation Proc.*, 1955, **14**, 171-172. *Proc.* [Nutrit. Res. Lab., St. Luke's Hosp., New York.]

5243

ROSE, W. C., LEACH, B. E., COON, M. J. and LAMBERT, G. F. **The amino acid requirements of man. 9. The phenylalanine requirement.** *J. Biol. Chem.*, 1955, **213**, 913-922. [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

This paper continues the detailed presentation of results discussed in Abst. 3891, Vol. 19, using the general technique described in Abst. 3803, Vol. 25.

Six men were kept in slightly positive N balance by 0.8 to 1.1 g. L-phenylalanine daily and consequently about 2.2 g. L-phenylalanine daily is suggested as a safe intake. In 3 subjects an amount of DL-phenylalanine equal to or slightly in excess of their minimum L-phenylalanine requirement could maintain positive N balance, but D-phenylalanine alone in amounts up to 2.2 g. daily gave strongly negative N balances, suggesting that up to about 0.5 g. D-phenylalanine daily, but no more, could be inverted.—C. Warner.

5244

LANGNEER, R. R. and VOLKMAN, C. M. **The fate of ingested acetyl-L- and D-tryptophan in the human subject.** *J. Biol. Chem.*, 1955, **213**, 433-437. [Dept. Biochem., Univ. Texas Dent. Branch, Houston.]

After ingestion of 2.46 g. acetyl-D-tryptophan, 3 adult subjects excreted 211 to 670 mg. in the urine and 1254 (incomplete) to 1811 mg. in the faeces. After ingestion of 2.46 g. of acetyl-L-tryptophan, one subject excreted 100 mg. in the urine and 166 mg. in the faeces. No free tryptophan was excreted.

It is suggested that the transport of acetyl-L-tryptophan across the intestinal mucosa is by enzyme action, not by simple diffusion.

C. Warner.

5245

CASTRO, V. and MONACO, P. **Comportamento di alcuni aminoacidi liberi durante il decorso del digiuno. [Behaviour of some free amino-acids during fasting.]** *Arch. Fisiol.*, 1954, **54**, 170-183. [Ist. Fisiol., Univ. Palermo.] English summary.

Thirty-seven rats, weighing from 130 to 170 g., were maintained on a normal diet. Groups of 5 or 7 were killed after having fasted for 6, 12, 16, 39, 72, 96 or 120 hr., and 5 free amino-acids were estimated chromatographically in the liver, heart muscle and skeletal muscle.

In the liver the concentration of aspartic acid, glutamic acid and glycine fell slightly in the first 12 hr., and then rose, reaching the highest value after 39 hr. Alanine and threonine rose steeply, the highest value here also being after 39 hr. The values for all 5 then fell steeply to below the initial value, except that for glycine, which did not vary greatly with lapse of time. The value for threonine did not rise again. The values for alanine, glutamic acid and aspartic acid rose again after 96 hr. and had passed the initial values after 120 hr.

Aspartic acid and threonine could not be measured in heart and skeletal muscle. In skeletal muscle, alanine, glutamic acid and glycine rose at first, alanine beginning to fall after 39 hr., and glutamic acid and glycine after 72; they were still falling after 120 hr. In heart muscle the changes in concentration were less; glycine remained nearly constant, and glutamic acid and alanine began to fall after 39 hr., alanine having first risen somewhat; they were still falling slightly after 120 hr.—E. M. Hume.

5246

GAVRILOVA, K. I. and KONIKOVA, A. S. **Issledovanie metodom mechenykh atomov pre-vrashahenii v organizme parenteral'no vvoden-nykh belkov syvorotki pochek i pecheni. [Investigation by means of labelled isotopes of**

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the transformation in the organism of parenterally injected protein of serum, kidney and liver.] *Biokhimiya*, 1954, **19**, 414-421. [Inst. Khirurg., Akad. Med. Nauk SSSR, Moscow.]

Proteins of serum, liver and kidney containing labelled methionine were injected into rats and rabbits in an attempt to elucidate the process of incorporation into the tissues. Full experimental details are given, including preparation of labelled serum protein and liver and kidney homogenates and separation of liver cell nuclei. Both homologous and heterologous serum proteins injected parenterally were used in the formation of the protein of liver cell nucleus and cytoplasm in rats, without preliminary splitting. Injection of homologous and heterologous serum protein into both rats and rabbits led to increased radio-activity of the plasma fibrinogen, the relative specific activity of which was appreciably higher than that of the liver proteins. Intra-abdominal injection of proteins of serum and of liver and kidney homogenates was followed by their incorporation into tissue protein, as was injection directly into the bloodstream, without breakdown into amino-acids.

D. W. Taylor.

5247

KONIKOVA, A. S., KRITZMAN, M. G. and SAMARINA, O. P. Issledovanie uslovii vliyeniya aminokislot v "individualnye" belki i belkovye komplekxy. [Investigation of the conditions for incorporating amino-acids and "individual" proteins into protein complexes.] *Biokhimiya*, 1954, **19**, 440-448. [Inst. Khirurg. A. V. Vechnevskogo, Akad. Med. Nauk SSSR, Moscow.]

The uptake of labelled amino-acids by such proteins and protein complexes as rabbit liver homogenate, rabbit blood plasma and serum, rabbit liver globulin and pentose nucleoproteins of rabbit and rat liver was studied with different incubation temperatures and times and in environments altered by the addition of enzyme inhibitors or of different amino-acids. The results are tabulated in full. The value of such experiments *in vitro* in the investigation of protein formation and breakdown in living systems is discussed.

D. W. Taylor.

5248

BECK, L. V., HARTMAN, S. and MARRACCINI, A. Effect of variation in sulfur amino acid content of diets on mouse tissue NPSH values. *Federation Proc.*, 1955, **14**, 10. *Proc.* [Dept. Physiol., Sch. Med., Univ. Pittsburgh, Pa.]

5249

AWAPARA, J. Taurine content of some animal organs. *Federation Proc.*, 1955, **14**, 175. *Proc.* [M. D. Anderson Hosp., Univ. Texas, Houston.]

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5250

PORTMAN, O. W. and MANN, G. V. The disposition of taurine- S^{35} and taurocholate- S^{35} in the rat: dietary influences. *J. Biol. Chem.*, 1955, **213**, 733-743. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Rats were fed for 45 to 60 days on diets varying in content of organic S, fat and cholesterol and then the bile duct was cannulated and taurine- S^{35} was given through the cannula into the duodenum. Animals fed on a stock diet excreted about 63 per cent. of the injected S^{35} in 24 hr., about 17 per cent. in the bile as taurine conjugated with bile acids, 45 per cent. in the urine as neutral S and 1 per cent. in the faeces. Animals fed on a diet low in organic S and high in cholesterol and fat excreted very little S^{35} in the urine, excretion in the bile being normal. Moderate reduction of the fat and cholesterol content of the diet allowed somewhat increased urinary excretion of S^{35} ; addition of methionine or high levels of casein gave normal urinary and reduced bile S^{35} excretion. An important cause of these differences appeared to be a low intrinsic taurine content of the bile when the diet was low in organic S. A considerable amount of S^{35} remained in the tissues, about half in the skeletal muscles. The animals fed on purified diets excreted much less total bile acid, particularly cholic acid, than did those on the stock diet.

When sodium taurocholate labelled with S^{35} was injected into the duodenum, most was absorbed from the intestine and excreted unchanged in the bile; only small amounts were excreted in the faeces or hydrolysed and excreted in the urine. No radio-activity was found in lymph from the thoracic duct. The findings are consistent with the classical hypothesis of Schiff, that there is an entero-hepatic circulation of conjugated bile acids.

C. Warner.

5251

TABACHNICK, M. and TARVER, H. The conversion of methionine- S^{35} to cystathionine- S^{35} and taurine- S^{35} in the rat. *Arch. Biochem. Biophys.*, 1955, **56**, 115-122. [Dept. Physiol. Chem., Sch. Med., Univ. California, Berkeley.]

S^{35} -methionine with unlabelled serine and cystathionine was injected into rats; the animals were killed from 35 to 65 min. later and trichloroacetic acid extracts of the internal organs were hydrolysed and fractionated on ion-exchange resins. Radio-activity was found in cystathionine, more in pooled non-hepatic internal organs than in liver; in taurine, cysteic acid and glutathione, more in liver than in other internal organs.—C. Warner.

5252

EDWARDS, C. H. and CARTER, L. P. Utilization of radioactive methionine in hemoglobin

formation. *Federation Proc.*, 1955, 14, 431.
Proc. [Carver Found., Tuskegee Inst., Ala.]

5253

WU, C. Effect of ethionine on the urinary nitrogenous constituents of adult rats. *Arch. Biochem. Biophys.*, 1955, 56, 230-234. [Sect. Biochem., Mayo Clin., Rochester, Minn.]

Groups of 5 rats of both sexes were fasted for 18 hr. before intraperitoneal injection of ethionine, methionine or other amino-acids. Some of the rats were spayed or castrated. Ethionine produced an increase in the urinary excretion of ammonia, urea, uric acid, creatinine and non-ethionine α -amino-N. The excretion of both ethionine and non-ethionine α -amino-N was increased by castration and reduced either by simultaneous injection of methionine or cysteine or by treatment with testosterone.—G. F. Garton.

5254

POPPER, H., CLEARKIN, K., KENT, G., PARTHASARATHY, M. and BRUCE, C. Coarse nodular cirrhosis produced by ethionine. *Amer. J. Pathol.*, 1955, 31, 594-595. *Proc.* [Hektoen Inst. Med. Res., Cook County Hosp., Chicago, Ill.]

5255

MAHADEVAN, V. Cyst(e)ine in health and disease. *Antiseptic*, 1955, 52, 373-381. [Dept. Animal Nutrit., Madras Vet. Coll.]

5256

KOCH, R. Strahlenschutzwirkung des Cysteins. [Protective action of cysteine against radiation.] *Arch. exp. Pathol. Pharmacol.*, 1955, 225, 179-182. *Proc.* [Freiburg i. B.]

5257

ARMSTRONG, M. D. The phenylalanine and tyrosine requirements of the rat. *J. Biol. Chem.*, 1955, 213, 409-414. [Lab. Study Hereditary Metabol. Disorders, Coll. Med., Univ. Utah, Salt Lake City.]

After 2 days of depletion, rats were given diets containing an amino-acid mixture. The effect on growth of different amounts of phenylalanine in the absence of tyrosine and in the presence of excess (1 per cent.) tyrosine, and of different amounts of tyrosine in the presence of 0.6 per cent. phenylalanine was measured.

Requirements for optimum growth were 1.2 per cent. phenylalanine alone or 0.6 per cent. phenylalanine plus 0.3 to 0.4 per cent. tyrosine. It is suggested that the route of metabolism of phenylalanine is not directly through tyrosine, but to some derivative which can be either converted to tyrosine or metabolised further.—C. Warner.

5258

SAUBERLICH, H. E. and SALMON, W. D. Amino acid imbalance as related to tryptophan requirement of the rat. *J. Biol. Chem.*, 1955, 214, 463-473. [Dept. Animal Husband., Agric. Exp. Stat., Alabama Polytech. Inst., Auburn.]

Addition of gelatine or oxidised casein, both devoid of tryptophan, to a diet containing 7 to 10 per cent. casein and adequate nicotinic acid depressed growth. Digestion and absorption of protein appeared to be normal, but plasma tryptophan was low and urinary tryptophan high; addition of tryptophan to the diet abolished these effects.—C. Warner.

5259

WIXOM, R. L., PIPKIN, G. E. and DAY, P. L. Interrelationship of serine and glycine for chick growth. *Federation Proc.*, 1955, 14, 454-455. *Proc.* [Dept. Biochem., Univ. Arkansas Sch. Med., Little Rock.]

5260

SHAW, K. N. F. and ARMSTRONG, M. D. Rat growth experiments with β -phenylserine diastereoisomers. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 673-675. [Lab. Study Hereditary Metabol. Disorders, Coll. Med., Univ. Utah, Salt Lake City.]

5261

ROTHSTEIN, M. and MILLER, L. L. The metabolism of δ -aminovaleric acid- δ -C¹⁴. *Arch. Biochem. Biophys.*, 1955, 54, 1-5. [Dept. Radiation Biol., Sch. Med. Dent., Univ. Rochester, N.Y.]

δ -Aminovaleric acid- δ -¹⁴C, either alone or with a suspected metabolite, glutarate, formate or ornithine, was injected intraperitoneally into male rats. Urine was collected for 18 hr. and the radio-activity of suspected metabolites was estimated. In another experiment the aminovaleric acid was injected into 2 rats and the radio-activity of the respired CO₂ was measured; glutamic acid, aspartic acid and arginine were isolated from the proteins of the abdominal organs of these animals and tested for ¹⁴C activity.

The injected δ -aminovaleric acid was rapidly oxidised to CO₂; glutaric acid appeared to be an important product of its intermediary metabolism. No radio-activity was detected in formate or ornithine in the urine. It is suggested that glutaric acid may be a common metabolite of δ -aminovaleric acid and lysine.—G. A. Garton.

5262

JAFFÉ, W. G. and BUDOWSKI, P. Influencia de la dieta sobre la concentración del glutatión en ratones. [Effect of diet on the concentration

N.A. and R., October 1955

of glutathione in mice.] *Acta cientif. venezol.*, 1954, 5, 131-134. [Inst. Nac. Nutric.] English summary.

Three experimental diets were used; diet 1 consisted mainly of soya and maize, with 24 per cent. protein and reinforced with minerals and vitamins but deficient in vitamin B₁₂. The other diets were based on cooked black beans (*Phaseolus vulgaris*) and raw pigeon peas, respectively, and contained 10 per cent. crude protein deficient in methionine or methionine and tryptophan. All the mice received diet 1 to begin with. Different groups of from 3 to 10 mice received for a month before they were killed one of the above diets with or without supplements of vitamin B₁₂, methionine and tryptophan singly or together. At the end, blood and liver glutathione were estimated.

There was no significant effect of any diet on the concentration of glutathione in the red cells. The concentration in the liver was reduced when methionine was deficient; the lowest values were obtained on the diets low in methionine when these were supplemented with vitamin B₁₂. In mice deficient in vitamin B₁₂ there was no significant fall in liver glutathione except when they were starved for 24 hr. before death. Deficiency of tryptophan had no apparent effect.—D. Duncan.

5263

RIDDELL, A. G., KOPPLE, P. N. and McDERMOTT, W. V. The etiology of "meat intoxication" in the Eck fistula dog. *Surgery*, 1954, 36, 675-684 (with discussion 684). [Dept. Surg., Harvard Med. Sch., Boston, Mass.]

Eleven of 19 dogs which underwent the operation survived and in them 20 attacks of "meat intoxication" were studied. It was found that signs appeared only when ammonia in blood was raised to a high level and sustained there for several hours. The increase was produced by giving meat or urea; ammonium salts were less effective because of the frequency of vomiting. Urease by vein also brought about attacks. The implications for human surgical treatment are discussed.

D. Harvey.

5264

KIERSZ, J. Über den Einfluss von Nierengewebsentfernung und Diät auf den Harnstoffspiegel im Blut. [The effect of removal of kidney tissue and of diet on blood urea.] *Arch. inter. nat. Pharmacodyn.*, 1955, 101, 237-246. [Physiol. Inst., Med. Akad., Białystok, Poland.]

Ten young adult dogs weighing from 7.3 to 17.4 kg. were kept on stock diet and blood urea was estimated. In 5 dogs one kidney was removed and 10 days later also three-quarters of the other kidney. In the other 5 the operations were reversed. The dogs then received a carbohydrate diet with little fat, plant protein and minerals, and blood urea was studied for 3 weeks, after which they received a diet rich in protein.

There was no great difference between the 2 groups. The greatest change in blood urea was a sharp rise in the first few days after the second operation, when urine output was low; but the level reached was never very high. The mean difference from pre-operative blood urea values was only 22 mg. per cent. As urine output increased the blood urea declined to about 70 mg. per cent. When the high-protein diet was introduced the blood urea rose to an average of more than 280 mg. per cent. in 12 days, signs of toxicity developed and the dogs died, except 3 which were returned to the low-protein diet.

In dogs examined after death there was some hypertrophy of the remaining kidney cortical tissue.—D. Duncan.

5265

DEKKER, E. E. Urea as a source of nitrogen for biosynthesis of amino acids. *Federation Proc.*, 1955, 14, 201. *Proc.* [Div. Biochem., Noyes Lab. Chem., Univ. Illinois, Urbana.]

A study with rats.

See also Absts. 4727, 4971, 4982, 4996, 5088, 5158, 5168, 5203, 5204, 5277, 5301, 5405, 5406, 5425, 5438, 5579, 5580, 5587, 5641, 5734, 5735, 5901, 5983.

FATS AND OTHER LIPIDS

5266

SNYDERMAN, S. E., MORALES, S. and HOLT, L. E. (Jr.) The absorption of short-chain fats by premature infants. *Arch. Dis. Childhood*, 1955, 30, 83-84. [Dept. Paediat., Coll. Med., Univ. New York.]

Six premature infants, 5 to 43 days old and between 1350 and 2010 g. in weight, were the subjects of fat balance studies for 4-day periods.

Tributyrin and triacetin were almost completely

absorbed when substituted for butterfat and were better than infant oil in this respect. The weight gains of the infants on tributyrin and triacetin mixtures were always better than those on butterfat, but somewhat less than those on maize oil mixtures because of the higher energy value of the latter.

It is suggested that the portal mechanism, by which the short-chain fats are absorbed, is unimpaired and that the lacteal mechanism alone

is affected. The substitution of the short-chain fats for butter appears to have little or no advantage for supplying energy, since shortening the fatty acid chain brings a corresponding loss in energy yield.—F. E. Hytten.

5267

HANSEN, A. E., WIESE, H. F., LAWLIS, M., ADAM, D. J. D. and BAUGHAN, M. A. Effect of dietary fat on unsaturated fatty acids of serum of infants. *Federation Proc.*, 1955, **14**, 436. *Proc. [Dept. Paediat., Univ. Texas Med. Branch, Galveston.]*

5268

GARCIA, P., RODERUCK, C. and SWANSON, P. The relation of age to fat absorption in adult women together with observations on concentration of serum cholesterol. *J. Nutrition*, 1955, **55**, 601-609. [Dept. Home Econ. Res., Iowa Agric. Exp. Stat., Ames.]

The subjects were 58 apparently normal women aged from 30 to 90 years; at least 10 were from each decade of age, except that only 3 were aged 80 to 90. The women were given a standard test meal containing 0.5 g. oleomargarine per kg. body-weight. Blood samples were taken before the test meal and subsequently hourly for 7 hr. Fat absorption was studied by estimation of chylomicron concentrations; serum cholesterol was also estimated.

With advancing age the maximum number of chylomicrons appearing in the blood after the test meal rose, as did the time interval before the maximum count was obtained. Serum cholesterol values rose with age up to the seventh decade and then fell; thus, serum cholesterol values may not be related to the pattern of fat absorption.

G. A. Garton.

5269

HOLASEK, A. Über den Ursprung des Kotfettes. 2. Versuche an Ratten mit Gallengangverschluss. [Origin of faecal fat. 2. Experiments on rats with ligated bile duct.] 3. Versuche an Menschen. [3. Experiments on man.] *Hoppe-Seyler's Ztschr.*, 1954, **298**, 219-223; 224-229. [Med. Chem. Inst., Univ. Graz.] For part 1 see Abst. 2274, Vol. 25.

2. After a control study on fat-free diet, the bile duct in adult rats was ligated in 2 places and cut. Rats which survived for a week then received the fat-free diet for 3 to 5 weeks; those with poor appetite were not used.

After operation the content of higher fatty acids in the faeces was double or treble that before operation, but it fell to normal when the rats were given agar and terramycin. The faecal flora was mostly Gram-negative. It is concluded that the

increase in fat excretion after operation was due to increased bacterial growth in the intestine.

3. The 5 subjects received the same diets, but ate different amounts. The diet was high in vegetable products and only plant fat was used.

The amounts of higher fatty acids in the faeces were reduced to about 20 per cent. of their normal when the subjects took by mouth terramycin and chloramphenicol or terramycin and streptomycin.

It is concluded that in man also, much of that faecal fat which is not of dietary origin is bacterial.

D. Duncan.

5270

TASKER, R. R. Neutral fat absorption in the rat. The alleged effect of choline and the changes in the intestinal lymph. *Canad. J. Biochem. Physiol.*, 1955, **33**, 361-367. [Banting and Best Dept. Med. Res., Univ. Toronto, Ont.]

The intestinal lymph ducts of rats were cannulated. The rats were then starved for 24 or 48 hr., and each received by stomach tube 1 ml. olive oil; 10 received also 1 ml. of 1 per cent. choline chloride solution, 5 received 1 ml. distilled water and 7 received 1 ml. saline isotonic with the choline solution. Lymph was collected before and for 48 hr. after the test meal for estimation of total lipids and phospholipins.

The effect of choline in increasing the rate of fat absorption was small and probably not significant, and there was no effect on absorption of phospholipins.

The effect of the fat meal was an increase in the hourly lymph output, with a peak in 2 to 3 hr. and no change in fat-free dry matter content. The total fat and phospholipin contents reached their peaks in 4 or 5 hr. Total lipids rose and fell more rapidly than phospholipins.

The results are at variance with those of Frazer (Abst. 746, Vol. 16).—D. Duncan.

5271

FISCHER, W. and KIMBEL, K. H. Untersuchungen über enterale Antibiose bei der Ratte. 6. Wirkung auf die Fettersorption. [Studies on intestinal antibiotics in the rat. 6. Effect on fat absorption.] *Ztschr. ges. exp. Med.*, 1954-1955, **125**, 437-444. [Med. Klin., Univ. Erlangen.] For earlier parts see Absts. 4382, Vol. 24; 2215, Vol. 25.

The adult rats received a low-fat basal diet of defatted casein, glucose, the known vitamins and salt mixture. After 19 days they were given an olive oil supplement. After 17 weeks they were divided into 2 groups and given 25 mg. terramycin or aureomycin daily for another 9 weeks; the fat was then withdrawn for the last 15 days. Faecal fat and free fatty acids were estimated.

The output of neutral fat fluctuated little throughout the experiment. During the pre-

liminary period on fat-free diet the free fatty acid output was about 22.5 mg. daily, but when olive oil was given it rose sharply and remained at about 180 mg. daily for the next 17 weeks. When terramycin was given there was first a sharp drop in fatty acid excretion, but after a week it had risen again to about 149 mg., where it remained fairly steady as long as olive oil was given. With aureomycin the initial sharp fall also occurred, followed by a rise, but a week later the output became stabilised at the lower level of 90 mg. When the olive oil was withdrawn the fatty acid output in both groups fell to 21 mg. daily, nearly the same as in the preliminary period.

The antibiotics had no effect on faecal neutral fat, which was independent also of diet. The effect of aureomycin on the free fatty acid was significant, that of terramycin was not significant in individual animals.—D. Duncan.

5272

MANN, G. V. **Lack of effect of a high fat intake on serum lipid levels.** *Amer. J. Clin. Nutrit.*, 1955, **3**, 230-233. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

No significant increase in serum cholesterol or serum lipoprotein was found in 2 young men who, for 15 days, were given a diet in which 57 per cent. of the energy was provided by the fat of pemmican.

G. A. Garton.

5273

LABECKI, T. D., BRIGHT, I. B., LAKE, W. W. and THOMPSON, C. C. **Effect of a therapeutic regime on hyperchylomicronemia and hypercholesterolemia.** *Amer. J. Clin. Nutrit.*, 1955, **3**, 141-147. [Heart Dis. Control Unit, Mississippi State Board Health.]

A commercial mixture of lipotropic substances, "Methischol" was given to 11 patients with myocardial infarction and to 24 normal white women of average age 77 years for 9 or 12 weeks. The average daily intake of lipotropic substances was choline dihydrogen citrate 2 g., methionine 800 mg. and inositol > 600 mg. Total and ester serum cholesterol were estimated and chylomicron counts were made at intervals.

After 9 weeks the total serum cholesterol of the patients with myocardial infarction showed a decrease of "borderline" statistical significance; this decrease was not observed in the (presumably) non-atherosclerotic women.

All subjects given the lipotropic mixture showed a statistically significant depression of chylomicron levels.—G. A. Garton.

5274

LABECKI, T. D. **Hyperchylomicronemia and hypercholesterolemia: their correlation with clinical atherosclerosis.** *Amer. J. Clin. Nutrit.*, 1955,

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3, 132-140. [Heart Dis. Control Unit, Mississippi State Board Health.]

5275

MORRIS, B. **The interrelationships of the plasma and lymph lipid fractions before and during fat absorption.** *Austral. J. Exp. Biol. Med. Sci.*, 1954, **32**, 763-782. [Kanematsu Mem. Inst. Pathol., Sydney Hosp.]

Cats, rabbits and rats were used in a study of lipid fractions of lymph and plasma. In the post-absorptive state, the concentration of lipids in the circulating plasma of cats was greater than that in the thoracic duct lymph. The concentration gradient between the lipids of plasma and lymph was similar to that of the plasma and lymph globulins.

The total fatty acids, phospholipins and cholesterol in lymph increased during fat absorption. The fat recovered from the lymph of unanaesthetised rats during 10 hr. after ingestion of 1 ml. olive oil accounted for 41 to 79 per cent. of the amount given. In similar experiments only 6 to 21 per cent. was recovered from cat lymph in 10 hr. after intake of 3 ml. olive oil per kg. bodyweight, and 0.5 to 2 per cent. in 10 hr. from rabbits.

The phospholipins recovered from thoracic duct lymph during 10 hr. were estimated to be up to 10 times the total amount of circulating plasma phospholipins in the rat and about 50 per cent. of that in the cat and the rabbit. The possible significance of intestinal mucosa as a source of plasma phospholipins is discussed.—G. A. Garton.

5276

MORRIS, B. and COURTICE, F. C. **Lipid exchange between plasma and lymph in experimental lipaemia.** *Quart. J. Exp. Physiol.*, 1955, **40**, 149-160. [Kanematsu Mem. Inst. Pathol., Sydney Hosp.]

High blood fat levels were produced in 2 groups of rabbits, one group given cholesterol 2 g. in the diet on 3 days weekly for 12 to 14 weeks, the other group repeated intravenous injections of 2.5 ml. per kg. of 20 per cent. Tween 80 in saline. Subsequently blood samples were taken from the femoral vein and lymph was collected from a cannula in the thoracic duct. Plasma and lymph were examined by zone electrophoresis and analysed for total cholesterol, lipid P and total esterified fatty acid.

In animals given cholesterol, plasma cholesterol increased 11-fold, but phospholipins and total esterified fatty acids only doubled; the concentrations of these lipids increased in thoracic duct lymph, but relatively less than in plasma. The phospholipin: cholesterol ratio fell from 2.2 to 0.4 in plasma and from 2.4 to 0.7 in lymph. The injection of Tween 80 caused a 5- to 6-fold increase

in all the plasma lipid fractions; lymph lipids increased 2 or 3 times. No significant change occurred in the phospholipin: cholesterol ratio in plasma or lymph.

The animals given cholesterol had high plasma concentrations of cholesterol-containing lipoprotein which migrated electrophoretically behind and with the β -globulin; similarly increased amounts of large-molecular lipoproteins were found also in plasma of the animals treated with Tween 80. The amount of lipoproteins and particulate lipids in lymph was much less than in the plasma in both groups.—G. A. Garton.

5277

TEPPERMAN, H. M. and TEPPERMAN, J. (with DEWITT, J. M.) Ketogenesis in rats on high carbohydrate and high fat diets. *Amer. J. Physiol.*, 1955, 180, 511-518. [Dept. Pharmacol., State Univ. New York.]

Adult rats were given to appetite for 4 to 6 weeks high-carbohydrate or high-fat diets of similar energy value. The diets (Abst. 5210, Vol. 19) were modified to include casein instead of lactalbumin and gelatine as protein source; about 20 per cent. of the energy was contributed by protein and most of the rest by fat or carbohydrate; lard was used instead of maize oil in the high-fat diets. After 4 to 6 weeks the animals were killed and liver slices were prepared for the study of oxygen consumption and ketone body production.

The blood ketone content of rats given the high-fat diet was significantly higher than that of rats given the high-carbohydrate diet, but when the animals were fasted for 24 hr. the reverse was true. Surviving liver slices from fat-fed rats produced more ketone bodies than did comparable slices from the carbohydrate-fed rats; after a 24-hr. fast, the reverse was true. The addition of octanoate did not affect the capacity of liver slices from fat-fed rats to oxidise octanoic acid. Washed liver particles from livers of fat-fed rats consistently showed a low capacity to oxidise octanoate, but no impairment of ketoglutarate oxidation. Fortified whole homogenates from the livers of the rats on either diet were differentiated by either an increased production of ketone bodies by homogenates from fat-fed rats or by a smaller increment in both oxygen consumption and ketone production on addition of octanoate to the same homogenates.

G. F. Garton.

5278

WIESE, H. F., BAUGHAN, M. A. and HANSEN, A. E. Influence of fat in diet on distribution of unsaturated fatty acids in serum of dogs. *Federation Proc.*, 1955, 14, 453-454. *Proc.* [Dept. Paediat., Univ. Texas Med. Branch, Galveston.]

5279

KAUNITZ, H., SLANETZ, C. A., JOHNSON, R. E., KNIGHT, H. B., SAUNDERS, D. H. and SWERN, D. Nutritional effects of fractions of heated and autoxidized lard and cottonseed oil. *Federation Proc.*, 1955, 14, 408. *Proc.* [Dept. Pathol., Columbia Univ., New York.]
A study with rats.

5280

REID, M. E. Effect of variations in dietary fat and linoleic acid on health and growth of the guinea pig. *Federation Proc.*, 1955, 14, 448. *Proc.* [Nat. Inst. Health, Bethesda, Md.]

5281

LIENER, I. E. and VISWANATHA, T. Reproductive performance of rats receiving corn oil or butter fat in presence of sulfathalidine. *Federation Proc.*, 1955, 14, 441. *Proc.* [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

5282

MATTSON, F. H., BAUR, F. J. and BECK, L. W. Nutritive value of acetin fats. *Federation Proc.*, 1955, 14, 443. *Proc.* [Res. Div., Procter and Gamble Co., Cincinnati, Ohio.]
A study with rats.

5283

MENG, H. C. and YOUNG, J. B. Utilization of a "synthetic" triglyceride preparation by weanling rats. *J. Nutrition*, 1955, 55, 527-541. [Dept. Physiol., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

Groups of weanling rats were fed for 13 weeks on diets containing 5 or 25 per cent. lard or a synthetic triglyceride composed of oleic acid 60-0, palmitic acid 30-0, stearic acid 7-4 and linoleic acid 2-6 per cent. Weights of animals were recorded weekly and water and N balances were studied; faecal fat was estimated.

The synthetic fat was utilised well for growth, especially at the 25 per cent. level. The average daily weight gains per rat for the groups fed on diets containing 5 per cent. lard, 25 per cent. lard, 5 per cent. synthetic fat and 25 per cent. synthetic fat were 3-18, 3-45, 2-91 and 3-27 g., respectively. From 94-6 to 98-6 of the synthetic fat eaten was absorbed.—G. A. Garton.

5284

SILBERBERG, R. and SILBERBERG, M. Life span of mice fed a high fat diet at various ages. *Canad. J. Biochem. Physiol.*, 1955, 33, 167-173. [Snodgrass Lab., St. Louis City Hosp. Div., Mo.]

Male mice of the C57 BL strain were studied. One group of 100 mice received a stock diet of

Purina Laboratory Chow throughout life and another group of 76 received from 1 month of age the diet with 29 per cent. fat, which was prepared by grinding the chow to a meal and adding 25 per cent. lard. Another 61 mice were given the high-fat diet from 6 months of age, and 39 from 12 months. Further groups of 65, 51 and 49 mice were given the high-fat diet for 5 months starting at ages one month, 7 months and 12 months, respectively. At all other times the mice were given the stock diet; both stock diet and high-fat diet were given to appetite, with water always available. Only 225 of the animals, which died or had to be killed because of sickness, are included in this study.

The most frequent cause of death was chronic kidney disease and anaemia. The high-fat diet given from 6 or 12 months shortened life, but less than when the diet was given from one month. Old mice were more susceptible to the adverse effect on life span than young adult mice. When the high-fat diet was given for 5 months to growing mice it had no effect on life span; given to young adults it had a beneficial effect, but in old animals it slightly shortened life.—G. F. Garton.

5285

FISCHER, W. and KIMBEL, K. H. Die Nahrungs-fettbilanz der Ratte. [Dietary fat balance in the rat.] *Ztschr. ges. exp. Med.*, 1954-55, 125, 426-436. [Med. Klin., Univ. Erlangen.]

Rats weighing 180 to 200 g. received for 48 hr. a low-fat basal diet, consisting of extracted casein with 0.3 per cent. fat, 2 g. daily, glucose 8 g., salt mixture 0.4 g., a vitamin mixture, and water as desired. The rats then received 2 g. olive oil by stomach tube and faeces were collected every 4 hr. for 48 hr. for estimation of free fatty acids and neutral fat.

The peak of excretion of free fatty acid and neutral fat occurred 24 hr. after the fat meal and was over within 40 to 44 hr. On the low-fat diet, which provided about 25 mg. fat daily, mean daily excretion was 81.5 mg., of which 20.5 mg. represented free fatty acids. In the 48 hr. after a meal of 2 g. olive oil the mean total fat excretion was 243.5 mg., 178 mg. of free fatty acid. After 4.5 g. olive oil the values were 481 and 397 mg. The mean absorption was 91 ± 4 per cent. Neutral fat excretion was constant within the limit of statistical variation, or only slightly increased with the highest fat intake.—D. Duncan.

5286

KAUNITZ, H., SLANETZ, C. A. and JOHNSON, R. E. Antagonism of fresh fat to the toxicity of heated and aerated cottonseed oil. *J. Nutrition*, 1955, 55, 577-587. [Dept. Pathol., Columbia Univ., New York.]

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Albino rats, 4 weeks old when the study began, were fed on a diet containing 15 to 20 per cent. of refined cottonseed oil which had been heated to 95° C. for 200 to 300 hr. The animals lost weight rapidly and death ensued within 3 weeks; the affected animals had diarrhoea, and post-mortem examination revealed large livers, kidneys and adrenals and small spleens and thymus glands. The only lesion apparent histologically was occasional intestinal oedema.

The administration of DL- α -tocopherol did not much alleviate the condition, but the toxicity of the heated oil was prevented by fresh cottonseed oil mixed in the diet, though the retardation of growth persisted. The protective effect of fresh oil was not as marked when it was given separately, not mixed with the rest of the diet, and so it is concluded that the protective effect is probably not due to an antimetabolite relationship, but perhaps to a change in the state of polymerisation of the heat-treated oil.—G. A. Garton.

5287

CHENG, A. L. S., GRAHAM, T. M., ALFIN-SLATER, R. B. and DEUEL, H. J. (Jr.) The effect of fat level of the diet on general nutrition. 15. Comparison of the protective effect of linoleic acid and linolenic acid against multiple sublethal doses of X-irradiation in the rat. *J. Nutrition*, 1955, 55, 647-653. [Dept. Biochem., Sch. Med., Univ. S. California, Los Angeles.]

Male rats were given a fat-free diet from weaning to 6 weeks of age. While continuing to receive the same diet, the animals were divided into groups of 13 or 14 and the diet was supplemented twice weekly for 19 weeks with ethyllaurate 0.25 ml., methyl linoleate 10, 20, 40 or 80 mg., ethyl linolenate 10, 20, 40 or 80 mg., or a mixture of methyl linoleate and ethyl linolenate 10 mg. each. Two weeks after the supplemented diets were withdrawn the rats were exposed to 200 r of X-rays weekly for 7 weeks, after which they were under observation for a further 10 weeks. Bodyweights were recorded regularly and the average survival time and percentage mortality in each group were noted.

Compared with the control group given ethyl laurate, the administration of methyl linoleate protected the rats against X-ray injury; the average survival time was almost twice that of the control group. Linolenate alone afforded only slight protection, but at the 10 mg. level with linoleate the protective action was such as to suggest that synergism exists and that linoleate may be required to initiate the action of linolenate.

G. A. Garton.

5288

LEPKOVSKY, S., LEMMON, R., CHARL-BRITON, A. and DIMICK, M. Lipogenesis of tissues as

affected by ingestion of food (high carbohydrate) and water. *Federation Proc.*, 1955, **14**, 243. *Proc.* [Dept. Poultry Husb., Univ. California, Berkeley.]

A study with rats.

5289

VAN BRUGGEN, J. T., COCKBURN, R. M. and WILLIAMS, W. R. Effects of feeding and of routes of tracer acetate administration upon lipogenesis. *Federation Proc.*, 1955, **14**, 295. *Proc.* [Dept. Biochem., Med. Sch., Univ. Oregon, Portland.]

5290

HOFUND, S., HOLMBERG, J. and SELLMANN, G. Investigation on fat digestion and fat metabolism in ruminants. 1. Feeding unsaturated fats to dairy cows; fat digestion in rumen. *Cornell Vet.*, 1955, **45**, 254-261. [Dept. Cattle and Sheep Dis., Royal Vet. Coll., Stockholm.]

A lactating cow was given linseed, 1 to 2 kg. daily for 2 periods of several weeks, sunflower seed, 1 kg. daily for 16 days, and cod liver oil, 100 ml. daily for 16 days; each experiment was followed by at least 3 weeks of normal feeding. Linseed, 1 kg. daily, was given to a pregnant cow for 17 days; it calved 6 days later. Rumen activity was studied by microscopic examination of microorganisms, fermentation and nitrate disappearance tests and cellulose digestion. Milk fat and colostrum were analysed for I value, saponification equivalent and polyethenoid fatty acids.

Administration of linseed, which is rich in linolenic acid, to the lactating animal resulted in a slight increase in the linolenic acid content of the milk fat, and a considerable increase in linoleic acid and conjugated dienoic acid; increased amounts of tetra- and pentaenoic acids were also found. It is considered that hydrogenation of linolenic acid takes place in the rumen.

Administration of sunflower seed, rich in linoleic acid, caused an increase only in the linoleic acid content of milk fat. When cod liver oil was given an increase of linoleic acid, tetraenes and pentaenes in milk fat was observed; there was no reduction in the amounts of short-chain acids.

Milk fat from the cow given linseed before calving contained tetraenoic and pentaenoic acids for up to 3 weeks after calving, indicating that dietary fat is stored in depots before being utilised for constituents of milk fat.—G. A. Garton.

5291

MELNICK, D. and DEUEL, H. J. (Jr.) Biological utilization of fatty acid isomers. *J. Amer. Oil Chem. Soc.*, 1954, **31**, 63-71. [The Best Foods, Inc., Bayonne, N.J.]

A review of the literature shows that during hydrogenation of vegetable oils both positional isomers and stereoisomers of unsaturated fatty acids, some of which are intermediates in the formation of the more saturated fatty acids, are produced in appreciable quantity. The unnatural *trans*-isomers, which are more resistant to oxidation and have higher melting-point than the *cis*-isomers, can be selectively produced, as is done in the manufacture of margarine.

Microbiological assays with *Lactobacillus arabinosus*, which can utilise oleic acid instead of biotin for growth, showed that oleic acid and 4 of its *cis*-isomers had about the same activity. Of 7 *trans*-isomers of oleic acid only elaidic acid, the stereoisomer, could effectively replace biotin.

Studies with rats showed that fatty acids with conjugated double bonds were not antimetabolites for the essential fatty acids, but were readily metabolised.

The essential fatty acids in vegetable oils decrease during hydrogenation, but the formation of linoleic acid isomers which have essential fatty acid activity makes hydrogenated fat compare favourably with a natural fat of comparable hardness.—A. Hepburn.

5292

BATES, M. W., NAUSS, S. F., HAGMAN, N. C. and MAYER, J. Fat metabolism in three forms of experimental obesity. Body composition.

BATES, M. W., MAYER, J. and NAUSS, S. F. Acetate incorporation. Fatty acid turnover. *Amer. J. Physiol.*, 1955, **180**, 301-303; 304-308; 309-312. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Total carcass fat was extracted from 2 groups of obese mice and 1 group of obese rats. The mice were of the genetically obese-hyperglycaemic strain or were rendered obese by injections of goldthiogluco-; rats were made obese by surgical lesions of the hypothalamus. Compared with appropriate control animals, more than 90 per cent. of the increased weight of obese animals in all 3 groups was accounted for as deposited fat. The fat accumulated in obesity was chemically similar to that found in non-obese animals. Obese animals did not show an increased total protein content.

Acetate labelled with ^{14}C was incorporated in the diet of groups of obese mice and rats similar to those used in the study reported above. The retention of ^{14}C in carcass and liver fat was studied in groups of underfed animals and in animals which were allowed to maintain weight. When losing weight, obese-hyperglycaemic mice and rats with lesions of the hypothalamus retained more ^{14}C in carcass lipids than did the corresponding control groups; the mice treated with goldthiogluco-

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retained the same amount of ^{14}C in carcass lipids as did their control animals. All obese animals, when maintaining weight, retained more ^{14}C in carcass lipids than did the corresponding control groups.

Palmitic acid labelled with ^{14}C in the carboxyl group was given to groups of obese mice. The decline in ^{14}C content of the carcass lipids when the animals were gaining weight was then studied. The 2 groups of obese mice mobilised half as much fat daily as did the controls. The hypothalamic rats showed a daily turnover of fat only 5 per cent. of that shown by control animals.

It is concluded that the different types of obesity are characterised by different patterns of lipid metabolism.—G. A. Garton.

5293

PARSON, W. and CRISPELL, K. R. (with VINECOUR, J.) Studies of acetate metabolism in the hereditary obesity-diabetes syndrome of mice utilizing C^{14} acetate. *Metabolism*, 1955, 4, 227-230. [Dept. Int. Med., Sch. Med., Univ. Virginia, Charlottesville.]

Seven genetically obese and diabetic mice and their 8 littermates, with average weights of 45 and 22 g., were studied. The mice were fasted for 16 hr. and then given intraperitoneally sodium acetate containing about 1 μC . of ^{14}C . Expired CO_2 was collected for 3 hr.

Obese mice excreted more CO_2 with a tendency to lower specific activity, but when bodyweight was considered the obese and control mice were found to utilise acetate equally well. The results fail to confirm those of Guggenheim and Mayer (*J. Biol. Chem.*, 1952, 198, 259) suggesting a block in utilisation of acetate in genetically obese mice.

D. Duncan.

5294

EMERSON, G. A. and DOOLEY, C. L. Dietary liver degeneration in rats. *Federation Proc.*, 1955, 14, 431. *Proc. [Merck Inst. Therap. Res., Rahway, N.J.]*

5295

GIACALONE, O. and RUBINO, F. Comportamento della steatosi epatica nei ratti alimentati con dieta steatogena contenente grasso di buco o grasso di maiale. [Fatty infiltration of the liver in rats fed on a diet to produce that condition, containing beef fat or pig fat.] *Arch. Fisiol.*, 1954, 54, 159-165. [Ist. Fisiol., Univ. Palermo.]

Fifty-two male rats were maintained on a diet of, per cent., sucrose 48, fat 40, casein 5, salt mixture 5 and sawdust 2, with adequate vitamins. For half the rats the fat was lard and for half beef fat. Animals were killed after 8, 16, 24, 32 and 42 days, and lipids, fatty acids and non-saponifi-

able material were estimated in the liver. The same estimations were made on 10 normal rats. All the values for the rats having the low-protein, high-fat diets were much higher than for the normal rats, and the values for those given beef fat were regularly somewhat higher than for those given lard.

The beef fat had a somewhat lower proportion of unsaturated fatty acids than the lard.

E. M. Hume.

5296

HEDIN, P. A. and SCHULTZE, M. O. Maternal diet and other factors affecting the lipid content of livers of very young rats. *J. Nutrition*, 1955, 56, 129-138. [Dept. Agric. Biochem., Univ. Minnesota, St. Paul.]

The young rats used in this study were the offspring of animals which had been fed from weaning on a diet deficient in vitamin B_{12} (see Abst. 849, Vol. 17), supplemented as required with vitamin B_{12} , choline or DL-methionine, a low-fat diet containing complete vitamin requirements (ration OC_1 of Schultze, Abst. 3982, Vol. 25) or a balanced stock ration. Towards the end of pregnancy the rats were individually housed and the young were removed soon after birth or up to 21 days later. Liver lipids of the young were estimated by solvent extraction of tissue dried at 70°C . for 48 hr.

An increase in the absolute amount and concentration of liver lipids was found within 6 hr. of birth; the increase continued until after about 40 hr. lipids accounted for about 40 per cent. of the dry weight of the tissue, compared with 15 per cent. at birth. The inclusion of vitamin B_{12} , and to a less extent of choline or methionine, caused a significantly smaller increase in the amount of liver lipids, but did not prevent it.—G. A. Garton.

5297

SCHLICHT, I. Experimentelle Untersuchungen über den Ablauf der Leberverfettung bei Hunger und Sauerstoffmangel. [Experimental studies on the development of fatty liver in starvation and oxygen lack.] *Virchows Arch.*, 1954-55, 326, 568-581. [Pathol. Inst., Humboldt Univ., Berlin.]

The fat deposition in the livers of mice was graded from I, slight, to 4, severe, on inspection of sections stained with Sudan III. In 20 control mice II had no visible fat, 7 had grade I and the others grade 2 deposition.

In starved mice fat deposition began in a few hours and reached a peak on the average in 22 to 24 hr. In the next 24 hr. the stainable fat declined almost to none, but in mice starved for 60 to 80 hr. there was a second increase, usually only slight to medium. A small number of mice at this time had fat-free livers, and these were usually animals which had died, often those with the

lowest initial bodyweight. The site of deposition of the fat was commonly peripheral or central and perivascular in the first place, later diffuse or in scattered cells. In advanced starvation necrosis occurred.

Mice kept short of oxygen also within a few hours began to deposit fat in the liver, but there was no fall and secondary rise. The fat might be central or peripheral or intermediate in position to begin with, but after 6 or 7 days of extreme oxygen lack it was always central.—D. Duncan.

5298

TREADWELL, C. R., FLICK, D. F. and VAHOUNY, G. V. **Effect of cold on fat fatty livers.** *Federation Proc.*, 1955, **14**, 452-453. *Proc.* [Sch. Med., George Washington Univ., Washington, D.C.]

5299

TREADWELL, C. R., VAHOUNY, G. V. and FLICK, D. F. **Effects of cold on cholesterol fatty livers.** *Federation Proc.*, 1955, **14**, 453. *Proc.* [Sch. Med., George Washington Univ., Washington, D.C.]

5300

GIDDEZ, L. I. **Liver lipide studies in normal and fat-deficient rats.** *Federation Proc.*, 1955, **14**, 218. *Proc.* [Dept. Med., Brookhaven Nat. Lab., Upton, N.Y.]

5301

OKBY, R. and LYMAN, M. M. **Relation of food intake to effectiveness of protein and methionine as lipotropic agents.** *Federation Proc.*, 1955, **14**, 447. *Proc.* [Dept. Home Econ., Univ. California, Berkeley.]

5302

MALLOV, S. **Effect of chronic ethanol intoxication on liver lipid content of rats.** *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 246-249. [Dept. Pharmacol., State Univ. New York, Upstate Med. Centre, Syracuse.]

Chronic alcohol intoxication was induced in rats given daily 1-52 g. or 1-90 g. ethanol for about 30 days. They then had about 36 per cent. more liver fat than animals which had received the same diet but no alcohol. Large supplements of vitamin B₁₂ or choline chloride prevented accumulation of liver fat in rats given alcohol.

G. A. Garton.

5303

MCGUIRE, J. S. (Jr.) and LIPSKY, S. R. **The effects of squalene on the incorporation of acetate into plasma cholesterol in man.** *J. Clin. Invest.*, 1955, **34**, 704-710. [Dept. Int. Med., Sch. Med., Yale Univ., New Haven, Conn.]

Eight subjects with limited expectancy of life were used in this study. All were given 200 μ C. of Na acetate-1-¹⁴C by mouth. The acetate was given to 3 of the subjects on the fourth day of a 5-day period during which 25 g. squalene was given daily by mouth; 3 other subjects were given 25 g. squalene daily by mouth for 5 days, beginning 72 hr. after the acetate had been given. Blood samples were taken at intervals beginning 1 hr. after the administration of acetate and continuing for up to 29 days; the specific activity of free and ester plasma cholesterol was measured.

When labelled acetate was given in the middle of the period during which squalene was administered, synthesis of ¹⁴C-labelled plasma cholesterol was reduced to between one-half and one-third. It is suggested that this effect was probably due to dilution of a pool of metabolic intermediates between acetate and cholesterol.—G. A. Garton.

5304

FRIEDMAN, M. and BYERS, S. O. (with GUNNING, B., OMOTO, C. and HAYASHI, W.) **Observations concerning the production and excretion of cholesterol in mammals. 14. The relationship of the hepatic reticulo-endothelial cell (Kupffer cell) to endogenously produced cholesterol.** *Circulation*, 1954, **10**, 491-500. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.] Spanish summary.

For earlier papers of the series see Absts. 4843, Vol. 24 and 2296, Vol. 25.

Injection of India ink, which accumulated in the reticulo-endothelial cells, did not affect the cholesterol content of the bile of rats.

Serum rich in cholesterol was obtained from rats with ligated bile ducts, given 200 mg. cholate daily with a sterol-free diet. The serum was centrifuged to remove chylomicrons and then injected into 10 rats which were killed 6 or 24 hr. later, 1 hr. after injection of India ink. Other rats were given cholesterol by mouth, and 3 controls were starved for 24 hr. and given no cholesterol. The cholesterol given in serum produced lipid accumulation within the liver parenchymal cells, but not between the cells or in the reticulo-endothelial cells; the cholesterol given by mouth produced lipid accumulation mainly between the parenchymal cells and in or around the reticulo-endothelial cells. In rats given India ink injections twice daily for 48 hr. there was no effect on deposition of cholesterol injected in serum, but deposition of cholesterol given by mouth was much reduced.

In rats similarly injected with India ink for 48 hr. cholesterol given by mouth produced high blood cholesterol, moderate turbidity and many chylomicrons, but cholesterol given as serum did not. The presence of chylomicrons in injected

serum also appeared to interfere with removal of dietary cholesterol by the liver, by blocking the reticulo-endothelial cells.

It is suggested that dietary cholesterol and that formed endogenously are removed from the blood in different ways and are in different physicochemical states.—D. Duncan.

5305

HOTTA, S. and CHAIKOFF, I. L. The role of the liver in the turnover of plasma cholesterol. *Arch. Biochem. Biophys.*, 1955, **56**, 28-37. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

Cholesterol-4-¹⁴C was injected intravenously into male rats and blood samples were withdrawn at intervals from 18 to 90 hr. after the injections; cholesterol was isolated from the plasma and its specific radio-activity was measured.

When plotted on semilogarithmic paper, the specific activity-time curves for total plasma cholesterol were straight lines, characteristic of a single homogeneous pool of cholesterol; the turnover time was about 60 hr.

Similar experiments were made on animals in which the hepatic artery had been severed; this resulted in an almost complete cessation of the decline in the specific activity-time curves, indicating that the liver is the main site of formation and destruction of cholesterol.—G. A. Garton.

5306

WEISS, S. B. and MARX, W. The fate of radio-active cholesterol in mice with modified thyroid activities. *J. Biol. Chem.*, 1955, **213**, 349-353. [Dept. Biochem. Nutrit., Sch. Med., Univ. S. California, Los Angeles.]

Groups of hyper- and hypothyroid mice received intravenous injections of 4-¹⁴C-cholesterol. The animals were then caged separately for 48 or 96 hr. and the excreta were collected. The mice were killed and total carcass cholesterol and saponifiable fractions were isolated and tested for ¹⁴C activity. It was concluded that thyroid can stimulate the conversion of cholesterol to acidic products as well as the excretion of the sterol and some of its acidic metabolites.—G. A. Garton.

5307

KANTIENGAR, N. L. and MORTON, R. A. Formation of cholesta-3:5-dien-7-one in rats. *Biochem. J.*, 1955, **60**, 28-29. [Dept. Biochem., Univ. Liverpool.]

Adult rats were fed for 60 days on a diet containing 2 per cent. cholesterol; controls received the same diet without cholesterol. The liver lipids were extracted and assayed for vitamin A; unsaponifiable matter was chromatographed on

alumina and the resulting fractions were examined spectrophotometrically.

Cholesterol reduced the liver store of vitamin A from 607 to 305 I.U. per g. Control animals showed only a trace, < 0.06 mg., of cholesta-3:5-dien-7-one in the liver; cholesterol-fed rats had 0.6 mg. 7-Dehydrocholesterol was present in greater amounts in the livers of the rats given cholesterol than in the controls.—G. A. Garton.

5308

KANTIENGAR, N. L. and MORTON, R. A. The administration to rats of cholesta-3:5-dien-7-one. *Biochem. J.*, 1955, **60**, 30-34. [Dept. Biochem., Univ. Liverpool.]

Adult rats were given from 25 to 100 mg. cholesta-3:5-dien-7-one daily either dissolved in arachis oil or mixed with the diet. Examination of liver, faecal and intestinal lipids showed that the sterol was slowly and incompletely absorbed. Most of that absorbed could not be accounted for, though some of it was probably isomerised to give cholesta-4:6-dien-3-one which was subsequently reduced to cholesta-4-en-3-one. Some was converted to digitonin-precipitable steroids and other constituents of faecal unsaponifiable matter. Small amounts of impure dienes were isolated from the liver.—G. A. Garton.

5309

KANTIENGAR, N. L., LOWE, J. S., MORTON, R. A. and PRY, G. A. J. The effects of administering cholesterol and cholesta-3:5-dien-7-one to cockerels. *Biochem. J.*, 1955, **60**, 34-39. [Dept. Biochem., Univ. Liverpool.]

Cockerels were given a diet containing either 2 g. cholesterol or 0.33 g. cholesta-3:5-dien-7-one daily from the 8th to the 16th week of age. Control birds received the same diet unsupplemented.

Blood cholesterol for control and diene-fed birds remained between 105 and 152 mg. per 100 ml.; those given cholesterol had values of 526 to 860 mg. per 100 ml.

Cholesta-3:5-dien-7-one was poorly absorbed and no effect on the unsaponifiable matter, cholesterol or vitamin A content of liver was found; the intestines were heavier than those of the controls and contained more unsaponifiable matter, including cholesterol.

Cholesterol feeding induced fatty livers with a tenfold increase in unsaponifiable matter. Much liver vitamin A was lost. Cholesta-3:5-dien-7-one was found in liver and intestinal unsaponifiable matter. The livers of all cockerels contained a substance showing λ_{max} 272 m μ . in light petroleum; an associated substance gave an absorption band near 315 m μ . in concentrated H₂SO₄.

G. A. Garton.

5310

SCHAEFER, A. E., KOWALD, J. W., WIND, S., NUMEROF, P., KESSLER, W. B. and MCCORMACK, R. W. Effect of dietary fat and plant sterol on cholesterol metabolism. *Federation Proc.*, 1955, 14, 449. *Proc.* [Squibb Inst. Med. Res., E. R. Squibb and Sons Div. Olin Mathieson Chem. Corp., New Brunswick, N.J.]

5311

GOULD, R. G., LOTZ, L. V. and LILLY, E. M. Absorption and metabolic effects of dihydrocholesterol and beta sitosterol. *Federation Proc.*, 1955, 14, 487. *Proc.* [Los Alamos Sci. Lab. Univ. California, Los Alamos, N. Mex.]

5312

FELLER, D. D., DOWLING, H. and HUFF, R. L. Effect of dietary cholesterol on arterial and hepatic lipogenesis. *Federation Proc.*, 1955, 14, 47. *Proc.* [Radioisotope Unit, Veterans Admin. Hosp., Sch. Med., Univ. Washington, Seattle.]

5313

FRIEDMAN, M., ROSENMAN, R. H. and BYERS, S. O. Deranged cholesterol metabolism and its possible relationship to human atherosclerosis. A review. *J. Gerontol.*, 1955, 10, 60-85. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

5314

HIRSCH, E. F. and NAILOR, R. Atherosclerosis. 3. Fractional distribution of the esterified fatty acids of the blood lipids of rabbits with cream and cholesterol diets. *Arch. Pathol.*, 1955, 59, 419-428. [Henry Baird Favill Lab., St. Luke's Hosp., Chicago, Ill.]

Rabbits receiving daily 15 to 50 ml. of cream containing 36 per cent. fatty acids in 7 to 10 days showed increases in the blood neutral fat, phospholipins and total cholesterol. When the total esterified fatty acids in the blood appreciably exceeded 20 to 30 m. equiv. per litre there was a steep rise in their ratio in the neutral fat, diarrhoea occurred with high blood sugar and N and the rabbits died. No deposit of lipids was found in the aorta, large arteries or other important viscera, except the liver after 40 to 180 days on cream. In sharp contrast to the results described in part 2 (Title 3508, Vol. 10), when cholesterol was given to rabbits a large increase occurred in the blood cholesterol, but only a small increase in the neutral fat, and lipid was deposited in the aorta, arteries and other tissues.—A. Hepburn.

5315

McMILLAN, G. C., HORLICK, L. and DUFF, G. L. Cholesterol content of aorta in relation to

severity of atherosclerosis : studies during progression and retrogression of experimental lesions. *Arch. Pathol.*, 1955, 59, 285-290. [Dept. Pathol., Pathol. Inst., McGill Univ., Montreal.]

Cholesterol was given to 101 rabbits on 6 days a week for 90 days ; each rabbit received daily 93 g. rabbit pellets coated with 6 g. maize oil and 1 g. cholesterol. After this time 39 rabbits were killed and the rest received pellets alone for from 2 weeks to 6 months ; groups of 4 to 6 were killed every 2 weeks. Another 17 rabbits had 0.5 cholesterol daily for 6 weeks, then 1 g. daily for 6 weeks, and were killed after 19 weeks on stock diet. Seven controls were killed after 2 months on the pellet diet. Aortas were examined visually for atherosclerotic lesions and their cholesterol content was estimated.

The cholesterol content of the aorta did not decrease even after 6 months on the cholesterol-free diet. Atherosclerotic lesions after 2 or 3 months or longer showed an apparent morphological regression with fibroblastic proliferation, but it is considered that there was no true regression. There was only crude and variable correlation between the visual grading of atherosclerotic lesions and the cholesterol content of the aorta. It is suggested that both methods of assessment are subject to large errors.—D. Duncan.

5316

STAMLER, J. and PICK, R. Inhibition of cholesterol-induced hypercholesterolemia and atherogenesis by fat-free diet in chicks. *Federation Proc.*, 1955, 14, 144. *Proc.* [Cardiovascular Dept., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

5317

GAMBASSI, G. and MAGGI, V. L'ATP fattore di protezione dall'ateromasi sperimentale colesterolica : il comportamento di alcune frazioni fosforate del sangue e dei tessuti. [Adenosine triphosphate as a protective factor in experimental cholesterol atheroma : behaviour of some phosphorylated fractions of the blood and tissues.] Il comportamento del glicogeno tissutale. [Behaviour of the tissue glycogen.] Il comportamento della colesteroloesterasi serica. [Behaviour of the serum cholesterol esterase.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1650-1652 ; 1653-1655 ; 1655-1658. [Ist. Patol., Univ. Bari.]

5318

BLOMSTRAND, R. and RUMPF, J. A. The conversion of [^{14}C] cetyl alcohol into palmitic acid in the intestinal mucosa of the rat. *Acta*

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physiol. scand., 1954, **32**, 374-383. [Dept. Physiol. Chem., Univ. Lund.]

[^{14}C] Cetyl alcohol was given by stomach tube to rats with thoracic duct cannulae and lymph was collected for 24 hr. The whole digestive tract was then removed and, together with faeces passed, was hydrolysed with KOH and the resulting fatty acids were extracted. Lymph lipids were fractionated on silicic acid.

From 63 to 96 per cent. of the ^{14}C given was absorbed; 31 to 64 per cent. of the activity absorbed was recovered from the thoracic lymph

lipids. About 80 per cent. of the lymph lipid activity was present as neutral fat fatty acids, mainly palmitic, and about 15 per cent. was recovered as unchanged cetyl alcohol.

It is concluded that oxidation of cetyl alcohol to palmitic acid took place during the passage of lipids through the intestinal mucosa.

G. A. Garton.

See also Absts. 4939, 4967, 5055, 5056, 5101, 5107, 5165, 5200, 5228, 5358, 5394, 5396, 5399, 5400, 5407, 5446, 5728, 6007.

MINERALS

GENERAL

5319

MYERS, G. B. and ISERI, L. T. **Abnormalities of body water, sodium, potassium, and magnesium. Pathogenesis, clinical manifestations, and treatment.** *Arch. Int. Med.*, 1955, **95**, 503-537. [Detroit.]

A review.

5320

BALLABRIGA, A. **Electrolytes in newborn infants.** *Helv. paediat. Acta*, 1955, **10**, 28. [Barcelona.]

5321

PASSARO, G. **L'équilibre électrolytique dans la néphrose lipofidique. [Electrolyte balance in lipid nephrosis.]** *Helv. paediat. Acta*, 1955, **10**, 225-230. [Clin. Paediat., Univ. Rome.]

5322

TEGELAERS, W. H. H. and TIDDENS, H. W. **Changes in electrolyte metabolism during remission of nephrosis.** *Helv. paediat. Acta*, 1955, **10**, 231-236. [Bindhoven.]

5323

CALLOWAY, D. H. and SPECTOR, H. **Effect of metallic salts on appetite.** *Federation Proc.*, 1955, **14**, 429. *Proc. [Quartermaster Food and Container Inst., Chicago, Ill.]*

5324

SOGNNAES, R. F., SHAW, J. H. and BOGOROCH, R. **Radiotracer studies on bone, cementum, dentin and enamel of rhesus monkeys.** *Amer. J. Physiol.*, 1955, **180**, 408-420. [Harvard Sch. Dent. Med., Boston, Mass.]

Three methods of exposure to ^{131}I , ^{42}K , ^{32}P , ^{24}Na and ^3H were studied in 26 monkeys kept under an anaesthetic for periods of from 5 min. to 5 hr. The isotope was (1) injected intravenously

and allowed to reach bones and teeth through both blood circulation and saliva, (2) injected intravenously while the molar crowns were surrounded by cups fitted as described by Sognnaes and Shaw (*J. Amer. Dent. Assoc.*, 1952, **44**, 489) and containing non-radioactive saliva, or (3) applied only externally by being added to saliva in such cups. Supplies of saliva were obtained by stimulation of other monkeys with pilocarpine. Radio-activity was measured in different bones and tissues and in cement, dentine and enamel of teeth.

With method 1 the order of functioning tissues with decreasing uptake of P was alveolar bone, calvarium, shaft of long bone, cement, internal dentine, external enamel, external dentine and internal enamel. In mesenchymal hard tissues activity was highest in layers with cellular and vascular environments. In unerupted teeth uptake of P was high and comparable with that of long bones. For I no similar gradient in uptake by hard tissues was found.

With method 2 gradients within dentine and enamel were studied in comparison with data from method 1. The uptake of P by enamel in the first was 5 times that in the second method, but uptake by dentine did not differ with the 2 methods. The distribution of I was fairly uniform in both enamel and dentine. For Na and K the secretion in saliva influenced uptake by enamel, but not that by dentine.

For a comparison of the second and third methods the isotope chosen was ^{131}I . With method 3 uptake by the external layer of enamel was high; it was progressively lower towards internal layers. Uptake by dentine was less than by enamel, with only a minor gradient in its layers. With method 2 the distribution was the opposite, with only low activity in the enamel and a slight decrease towards its outer surface.

The findings are discussed with suggestions for further studies.—D. Harvey.

See also Absts. 4824, 5217, 5966, 6006.

CALCIUM AND PHOSPHORUS

5325

BRONNER, F., MOOR, J. R., HARRIS, R. S. and BENDA, C. E. Calcium metabolism. 5. Differential absorbability of calcium salts by children.

BRONNER, F., MOOR, J. R., HARRIS, R. S., KREPLICH, J. and BENDA, C. E. 6. Radiocalcium⁴⁵ metabolism in a moribund boy with gargoylism. *Federation Proc.*, 1955, 14, 428-429; 429. *Proc.* [Dept. Food Technol., Massachusetts Inst. Technol., Cambridge.]

5326

PATTON, M. B. Further experiments on the utilization of calcium from salts by college women. *J. Nutrition*, 1955, 55, 519-526. [Dept. Home Econ., Ohio Agric. Exp. Stat., Columbus.]

The subjects were 9 college women and the basal diet was similar to that used earlier (Abst. 3248, Vol. 23), except that the Ca content was reduced to 300 mg. daily. The Ca supplements for the 3 groups were milk, calcium gluconate and calcium carbonate, supplying 305, 208 and 208 mg. Ca daily.

The study lasted 8 weeks, but the first week was the adjustment period and the second the basal period.

There was no significant difference in utilisation of Ca between the 3 groups, but balances differed significantly from week to week, though not so much in the last 2 weeks. B.M.R. was inversely related to retention of Ca, in contradiction of the earlier experiment.

In all subjects but one the B.M.R. was lower at the end than at the beginning of the experiment, and in 7 subjects the Ca retention was highest in the last 2 weeks.—D. Duncan.

5327

STALDER, G. Phosphat-Clearance im Kindesalter. [Phosphate clearance in childhood.] *Ann. paediat.*, 1955, 184, 191-205. [Kinderspital, Basle.] English and French summaries.

The subjects were 5 infants aged 8 days to 3½ months, including 2 prematures, fed on breast milk; 5 infants aged 3 weeks to 11 months, including 2 prematures, fed on cow's milk; 4 children 4½ to 14 years old; and 5 sick children. Inulin clearance and inorganic P concentrations of the plasma and urine were studied before and after injection of parathyroid extract.

P excretion and endogenous P clearance were low in breast-fed and high in bottle-fed infants, and somewhat lower in older children than in bottle-fed infants.

The mean percentage re-absorption of filtered P in these 3 groups was 97, 78 and 90. After

injection of parathyroid hormone there was increased loss of P, increased P clearance and reduced tubular re-absorption, but no characteristic change in plasma P. The maximum re-absorption of P (Im_p) was high in 2 infants with high serum phosphate, suggesting impaired parathyroid function. It was very low in an 18-year-old girl with vitamin-D-resistant rickets and low serum P.—D. Duncan.

5328

FANOONI, G. Disturbances in calcium and phosphorus metabolism: with special emphasis on disturbances of the renal excretion of phosphates. *Metabolism*, 1955, 4, 95-106. [Dept. Paediat., Fac. Med., Univ. Zürich.] A review.

5329

CAUSERET, J. and HUGOT, D. Utilisation physiologique comparée du phosphore et du calcium du lait et du yoghourt. [Comparative physiological utilisation of phosphorus and calcium of milk and yoghurt.] *Lait*, 1955, 35, 129-132. [Lab. Physiol., Inst. Nat. Recherche Agronom.]

Groups of from 3 to 6 rats of bodyweight 60 to 80 g. received for 10 days either pasteurised whole milk or yoghurt prepared from the same milk, with the addition of 20 g. sucrose per 100 g. milk or yoghurt. Calcium and phosphorus balances were studied.

In each of 3 experiments the net utilisation of both Ca and P was significantly less from yoghurt than from milk, but the extent of the difference varied. Still, yoghurt is probably better than cheese as a source of both elements.—D. Duncan.

5330

HOUSE, W. B. and HOGAN, A. G. Injury to guinea pigs that follows a high intake of phosphates. The modifying effect of magnesium and potassium. *J. Nutrition*, 1955, 55, 507-517. [Dept. Agric. Chem., Coll. Agric., Univ. Missouri, Columbia.]

In 3 series of experiments 6, 4 and 4 groups of male and female guineapigs were given different diets, all of which contained casein 30 g., soya bean oil 4 g., magnesium oxide 0.55 g. and potassium acetate 2.74 g., with vitamins A, D, C, E and those of the B group. In the first series the 6 diets all contained gum arabic as bulk and varied in their Ca and P content. There was no death and weight gains were similar in all groups. When the diets contained small amounts of Ca and P the appearance of wrist stiffness was delayed until about 23 weeks; when the diets contained less than one part of Ca to one of P stiffness developed quickly and when large amounts of Ca

and P were present and the Ca : P ratio was high the stiffness developed more slowly than when the diets contained an excess of P.

In the second and third series gum arabic and cellu flour were compared as sources of bulk and the effects of adding Mg and K were studied; the Ca : P ratios in the 2 series were 1 : 1 and 0.5 : 1. When the ratio was 1 : 1, but not otherwise, gum arabic gave better growth than cellu flour and prevented deposition of calcium phosphate. With both Ca : P ratios the addition of Mg and K improved growth and prevented deposition of calcium phosphate.—G. F. Garton.

5331

COMAR, C. L., WHITNEY, I. B. and LENGEMANN, F. W. **Comparative utilization of dietary Sr^{90} and calcium by developing rat fetus and growing rat.** *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 232–236. [Univ. Tennessee—Atomic Energy Commission Agric. Res. Programme, Oak Ridge.]

Rockland rat diet containing 1.9 per cent. Ca was labelled with carrier-free ^{90}Sr at the rate of about 200 μC . per 500 g. diet. Young female rats were given this diet throughout pregnancy; some of their young were analysed at birth and others were reared on the same diet. Some were analysed at different stages of growth and the remaining females were divided into 3 diet groups and mated. The 3 diets were a normal stock diet, the ^{90}Sr diet and a low-Ca diet. The newborn young of the second generation were analysed.

In the rats reared on the experimental diet the utilisation of Ca was selective, and the bones of animals weighing from 70 to 400 g. showed a preferential deposition of Ca over Sr in the ratio of 3.6 : 1.

In newborn rats from females reared on the ^{90}Sr diet and therefore having uniform skeletal labelling, but fed on a normal or low-Ca diet during pregnancy, the ^{90}Sr in the body was derived from the maternal skeleton. On the normal diet it was calculated that 28.6 per cent. of the foetal Ca was derived from the maternal skeleton. Results on the low-Ca diet were less reliable because only 2 litters were obtained, but in these nearly all the skeletal Ca was of maternal origin and the ratio of 3.6 parts of Ca utilised for 1 of ^{90}Sr appeared to be valid here also. In young from dams given the ^{90}Sr diet for different periods before parturition, the preferential utilisation of dietary Ca over ^{90}Sr in foetal bone formation was in the ratio of 5.1 : 1.

D. Duncan.

5332

COMAR, C. L., WHITNEY, I. B. and LENGEMANN, F. W. **Comparative utilization of dietary Sr^{90} and calcium by developing rat fetus and growing rat.** *Federation Proc.*, 1955, **14**, 430.

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Proc. [Univ. Tennessee—Atomic Energy Commission Agric. Res. Programme, Oak Ridge.]

5333

ANTONI, R. and CREMER, H. D. **Ernährungsfaktoren bei Zahn- und Knochenbildung. 4. Aufnahme und Verbleiben von Ca^{45} im Organismus. [Diet components in the formation of teeth and bones. 4. Uptake and retention of ^{45}Ca in the organism.] *Biochem. Ztschr.*, 1955, **326**, 311–316. [Anorg. Chem. Inst., Johannes Gutenberg Univ., Mainz.]**

The methods were as previously described (Abst. 899, Vol. 22) except that the labelled Ca salts, in this study tertiary citrate and secondary phosphate ($\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$) and 14 : 1 and 1 : 1 mixtures of these, were given to the rats in 1 g. food after an 8-hr. fast instead of by stomach tube; almost complete recovery of ^{45}Ca was thereby achieved.

Uptake of Ca in teeth and bones from citrate was less than that previously found for lactate and chloride but was improved by a vitamin D supplement [details not given]. Mixtures of citrate and phosphate were less effective than citrate; the effect of vitamin D in conjunction with them remains to be tested.

Pairs of rats were killed from 1 to 65 days after supply of ^{45}C ceased. A gradual decline of activity in the tibia and molars set in almost at once, but in the incisors the maximum activity was reached only in the third week, no doubt owing to uptake from the blood of ^{45}Ca released by other organs.—W. M. Deans.

5334

TOMLIN, D. H., HENRY, K. M. and KON, S. K. **The interstitial metabolism of calcium in the bones and teeth of rats.** *Brit. J. Nutrition*, 1955, **9**, 144–156. [Dept. Phys., Univ. Reading.]

Twenty weanling rats in 3 groups were given a basal diet low in Ca. ^{45}Ca was added for the first group of 2 at weaning and given for 14 weeks, for the second group of 8 at 15 weeks and given for 4 weeks and for the third group of 10 at 15 weeks for 2 weeks. Rats in the first group were killed at the end of the period of feeding, those in the second in pairs after 4, 7, 14 and 28 days while the isotope was included and those in the third, also in pairs, 4, 7, 14, 28 and 70 days after it had been withheld. The method of preparation of sections of long bones and of teeth and of their autoradiographs were slight modifications of those already reported in Abst. 814, Vol. 24.

After the isotope was added equilibrium between levels of Ca in diet and serum was soon reached and was maintained so long as the isotope was

given. Quantitative measurement of the percentage uptake of interstitial Ca showed it to be at the rate of about 1 per cent. of the total cortical bone Ca per week (*cf.* earlier work, *Abst.* 2856, Vol. 23); the exchangeable fraction was small and near the limit of detection. In dentine of incisors the total interstitial uptake of ^{45}Ca was very much less than in bone. The predominant effect at the age at which observations were made is concluded to be mainly of interstitial accretion with only slight reversible exchange of Ca.—D. Harvey.

5335

DALLEMAGNE, M. J., FARRY, C. and BODSON, P. **Exchange of bone calcium with Ca^{45} .** *Experientia*, 1955, **11**, 142-143. [*Inst. Exp. Therap.*, Univ. Liège.]

Bone ashed with glycol and KOH was exposed for a month to $^{45}\text{CaCl}_2$ and fractions of the resulting active material were exposed to different concentrations of HCl. The mineral contained 3 types of Ca ions, *i.e.*, for each 9 ions stoichiometrically bound to phosphate groups there were $1\frac{1}{2}$ ions in excess, and thirdly about 0.2 mg. per cent. of physically adsorbed Ca. Only the $1\frac{1}{2}$ excess ions and those physically adsorbed were found to be exchangeable with ^{45}Ca , and quantitatively this agreed well with the 15 per cent. exchangeability of total bone Ca reported in the literature.

D. Duncan.

5336

DE LANCE, M. F. **Bone healing in rats using radioactive calcium.** *Federation Proc.*, 1955, **14**, 201. *Proc.* [Dept. Biochem., Univ. California, Berkeley.]

5337

MYERS, H. M. **The correlation of gain in body weight and mineral ash content of teeth and bones of rats recovering from phosphorus deficiency.** *J. Dent. Res.*, 1955, **34**, 230-238. [*Coll. Dent.*, Univ. California, San Francisco.]

Three groups of young rats were fed for 47 days on a low-P diet, an equal quantity of normal diet, or normal diet to appetite. After this the rats on the low-P diet were given the normal diet and during the next 14 days animals from each group were killed.

During recovery from P deficiency the ash weight of the femur increased more rapidly, but that of incisors less rapidly, than bodyweight. In pair-fed control rats there was no steady change in the ratio of bodyweight to femur ash weight during recovery, but the relation between incisor ash weight and bodyweight in these animals was similar to that of rats recovering from P deficiency.

R. Hill.

5338

MYERS, H. M. **The comparative turnover rate of P^{32} in normal and deficient rats' teeth and bones during recovery from phosphorus deficiency.** *J. Dent. Res.*, 1955, **34**, 225-229. [*Sch. Dent.*, Univ. California, San Francisco.]

Rats of the experiment described in the previous *Abst.* were given an injection of ^{32}P before they were killed, and the amounts retained in femur, incisors and molars were estimated.

The femurs of P-deficient rats retained 10.8 times as much ^{32}P as those of controls fed to appetite and 4.1 times as much as those of pair-fed controls. The incisors and molars of P-deficient rats retained not more than twice as much ^{32}P as those of either group of controls.—R. Hill.

5339

YENDT, E. R. and HOWARD, J. R. **Studies on the mode of action of citrate therapy in rickets.** *Bull. Johns Hopkins Hosp.*, 1955, **96**, 101-115. [*Dept. Med.*, *Sch. Med.*, Johns Hopkins Univ., Baltimore, Md.]

Male Wistar rats, weighing from 40 to 55 g., were given a rachitogenic diet high in Ca and low in P for from 20 to 30 days. Some of them were then given in the diet citric acid and Na citrate to provide from 400 to 600 mg. of each. They were killed from 8 to 17 hr. later. Longitudinal slices were taken from the epiphyseal cartilage of the upper end of the tibia, and were incubated in a salt solution containing Na, K, Mg, Cl, bicarbonate and sulphate in concentrations like those in normal human serum; the concentration of inorganic P was 5 mg. per 100 ml., and that of Ca was 3.5, 4.0, 4.5, 5.0, 5.5 or 6.0 mg. per 100 ml., or higher for rats not given citrate. The slices, with some untreated slices, were stained with silver nitrate and the degree of calcification was read on an arbitrary scale with 4 degrees.

Of 24 rats not given citrate, the slices from 2 failed to calcify in any solution, and from 5 others the slices calcified in every solution. In the remaining 17 the lowest product of Ca and P at which the cartilage calcified lay between 22.5 and 37.5, most values being over 25.0.

In 8 rats given citrate in the diet, calcification occurred in solutions having a product less than 22.5. When citrate and citric acid were injected subcutaneously the immediate toxic effects prevented satisfactory study but, as far as they went, the results suggested that citrate did not exercise an antirachitic action unless it was administered through the gut.

When citrate was added to the pooled serum of infants, or to inorganic solutions shown to be capable of promoting calcification of rachitic rat's cartilage, the power to calcify was progressively

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less as the concentration of citrate was increased, until it was lost altogether.

Thirteen rachitic rats were injected intraperitoneally with an isotonic solution of sodium acid phosphate and disodium phosphate in differing amounts, and the rats were killed from 1½ to 29 hr. later. Some rats were rejected as showing healing *in vivo*. Cartilage slices from the remainder calcified in solutions with products of Ca and P ranging from 15.0 to 22.5.

Estimation of serum P in rachitic rats within from 6 to 48 hr. after administration of citrate and citric acid in the diet revealed a rise sufficient to initiate the healing process.

It is suggested as a possible explanation that the action of the citrate given in the diet was to "complex" most of the dietary Ca, so that the phosphate was left free to be absorbed instead of being precipitated as Ca phosphate. Once the healing process of calcification has been initiated, it is suggested that it can continue with a product of Ca and P lower than that with which it could start.—E. M. Hume.

5340

VAN KESSEL, H. I. A. M. Over de vernieuwings-snelheid van het anorganische fosfaat en de phospholipiden in de lever van de rat. [On the rate of turnover of inorganic phosphate and phospholipids in the liver of the rat.] *Thesis, Univ. Utrecht*, 1953, pp. 66. English summary.

In addition to the problem named in the title of this thesis, the effects on turnover of vitamin D₂ and of the intensity of combustion of fat in the body were studied. The technique for estimation of turnover by the use of ³²P and the validity of the assumption that plasma inorganic P is the precursor of liver inorganic P are discussed. Positive and negative effects of vitamin D₂ have been claimed.

Methods are described in detail. Results showed that there is no non-dialysable fraction of inorganic P in serum and that the whole of the inorganic P estimated by common methods may be considered the precursor of liver inorganic P. Short experiments lasting for from 20 to 30 min. are sufficient, with injections of ³²P, for the construction of curves of specific activity of serum and liver and the calculation of turnover.

In normal rats the rate of turnover, so measured, in liver cells is from 1.5 to 3 mg. P per hr. A 24-hr. fast approximately doubles it. Assuming the inorganic P of the liver cell to be the immediate precursor of lipid P, the rate of incorporation was about 0.2 mg. P per hr., equivalent to about 5 mg. phospholipid. A 24-hr. fast had no effect. Vitamin D₂, as 2 mg. calciferol, gave a 50 per cent. increase. These conclusions may be invalidated

when more is known of the normal variance between animals and of the intermediates formed. I. Leitch.

See also Absts. 4806, 5145, 5151, 5195, 5574, 5580, 5589, 5698, 5915, 5983.

MAGNESIUM

5341

BLAXTER, K. L. and ROOK, J. A. F. Energy and carbohydrate metabolism in magnesium-deficient calves. *Brit. J. Nutrition*, 1955, 9, 121-132. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Mg deficiency was produced in 4 calves with a synthetic diet (see Abst. 4877, Vol. 24). The diet was modified to cause vitamin B₁ deficiency in 2 calves, and 2 others were studied as controls.

In Mg deficiency, serum Mg fell, and heat production rose and energy retention fell in relation to the fall in serum Mg. Temporary relief was obtained by injection of MgSO₄. The increased heat production was due to increased muscle activity during tetany. Mg deficiency did not affect blood sugar, glucose tolerance, or serum phosphatase, but there were increases in blood pyruvic and lactic acid and in urine pyruvic acid.

In vitamin B₁ deficiency there was a greater increase in blood pyruvic acid. One of the calves had to be killed when the signs of vitamin B₁ deficiency became extreme, but the other improved in condition, and there was evidence of vitamin B₁ synthesis in the alimentary tract.

Exercise raised blood pyruvic and lactic acid levels of control calves to that found in Mg-deficient calves during milk tetany. This indicated that the abnormalities of energy and carbohydrate metabolism in the Mg-deficient calves were due to the increased muscular work in tetany, and not to a reduced supply of Mg to enzyme systems.

T. D. Bell.

See also Abst. 5330.

SODIUM, POTASSIUM, AND SODIUM CHLORIDE

5342

WOMERSLEY, R. A. and DARRAGH, J. H. Potassium and sodium restriction in the normal human. *J. Clin. Invest.*, 1955, 34, 456-461. [Dept. Med., Sch. Med., Yale Univ., New Haven, Conn.]

The effects on serum and urine composition of depletion of K alone or with Na were studied in 2 normal men. External balances of water and electrolytes were studied and internal balances of Na, K and water were calculated.

In all studies K depletion caused a reduction of serum K; urinary excretion of K decreased when K intake was restricted and decreased further when intakes of both K and Na were restricted.

During depletion the urine became more alkaline and the output of bicarbonate tended to rise. Balances of K were negative and when Na intake was unrestricted K depletion resulted in retention of Na and water in the extracellular space.

F. C. Aitken.

5343

FOURMAN, P. and HERVEY, G. R. **An experimental study of oedema in potassium deficiency.** *Clin. Sci.*, 1955, **14**, 75-79. [Med. Res. Coun. Dept. Exp. Med., Univ. Cambridge.]

When NaCl was added to the diet of a man already depleted of K, Na and Cl were retained, there was a gain in weight and, after 3 days, oedema was detected clinically. After 6 days the volume of blood and of extracellular fluids had expanded by about 15 and 18 parts per 100, respectively. A control experiment was made by adding NaCl to the diet when the man had not been depleted of K.—F. C. Aitken.

5344

KESSELMAN, R. H. **The formation of edema and the effect of sodium on colloid osmotic pressure.** *Amer. Heart J.*, 1955, **49**, 517-520. [Dept. Med., Women's Med. Coll. Pennsylvania, Philadelphia.] Interlingua summary.

From physico-chemical considerations an equation was derived for the relation of the colloid osmotic pressure of plasma to the concentration of Na⁺ in plasma. Over the wide range from 80 to 180 millimoles Na per litre plasma a fall in concentration was associated with a rise in pressure. From this association oedema formation should be favoured by an increase and reabsorption by a decrease in Na⁺ in plasma, a conclusion which is supported by clinical observations.—D. Harvey.

5345

GREEN, D. M. and ELLIS, E. J. **Sodium output—blood pressure relationships and their modification by treatment.** *Circulation*, 1954, **10**, 538-543. [Sch. Med., Univ. S. California, Los Angeles.] Spanish summary.

See also Abst. 3392, Vol. 24.

The 25 subjects with normal and 50 with high blood pressure were on self-selected diets. Water and Na output in urine were estimated for 24 hr. Basal urine output was estimated in the morning after food and water had been withheld since midnight; the subject recorded the time which elapsed between the first morning urination and the second, and the volume and Na concentration of the second were estimated.

There were positive correlations between the basal and 24-hr. outputs of Na and of water; the rates of output did not differ significantly. The average 24-hr. Na secretion of 34 patients with high blood pressure was 35 per cent. higher than

that of the 25 with normal blood pressure, a significant difference. The rate of Na output after a 5 per cent. salt load was also significantly correlated with blood pressure, both before and after treatment.

Since diets were not controlled and bodyweights were stable, it is inferred that the patients with high blood pressure had an increased appetite for salt.—D. Duncan.

5346

DAHL, L. K., STALL, B. G. (III) and COTZIAS, G. C. **Metabolic effects of marked sodium restriction in hypertensive patients. Skin electrolyte losses.** *J. Clin. Invest.*, 1955, **34**, 462-470. [Med. Dept., Brookhaven Nat. Lab., Upton, Long Island, N.Y.]

5347

RUNDO, J. and SAGILD, U. **Total and 'exchangeable' potassium in humans.** *Nature*, 1955, **175**, 774. [Finsen Lab., Copenhagen Ø.]

Total body K was estimated with a γ -monitor in 10 young adults of both sexes, and exchangeable K by an isotope dilution method with ⁴²K. The exchangeable K was in 9 of the subjects less than the total K by 7 to 25 per cent., mean 15.2; the experimental error in estimation of total K was so large as to swamp any possible biological variation in exchangeable K.

In one patient with typical hereditary periodic paralysis there was a much larger difference, the estimated values being 158 ± 20 g. total and 85 g. exchangeable K in the body.—D. Duncan.

5348

LESTRADET, H. **Rapport entre l'absorption du potassium, son élimination rénale et le taux des 17-céostéroïdes chez le sujet normal. [Relation between absorption of potassium, its excretion by the kidney and the level of 17-ketosteroids in the normal subject.]** *Helv. paediat. Acta*, 1955, **10**, 91-96. [Inst. Nat. Hyg., Paris 16.]

5349

LARAGH, J. H. and CAPECI, N. E. **Effect of administration of potassium chloride on serum sodium and potassium concentration.** *Amer. J. Physiol.*, 1955, **180**, 539-544. [Dept. Med., Coll. Phys. Surg., Columbia Univ., New York.]

Ten balance studies were performed on 3 dogs given a standard diet of constant electrolyte content. The effect of administration of 20 per cent. KCl solution by mouth was studied when the dogs were on a normal Na intake and also after prolonged Na restriction and after Na depletion by peritoneal dialysis.

There was a significant increase in serum Na after the administration of KCl, especially during Na restriction. This is believed to be due to release of Na ion into the extracellular space in exchange for K. There was no significant change in the balances of Na and water after administration of massive amounts of KCl; the KCl had no diuretic effect. In Na depletion there was a large and persistent increase of blood K after the administration of KCl; one of the dogs died in this experiment. The high blood K was apparently not related to incapacity to excrete K, nor was change in body fluid space critical; the Na depletion apparently limited the capacity of the animals to remove K from the extracellular fluid. The adverse effect of high blood K on cardiac muscle may be irreversible and the administration of K ion during Na depletion is therefore dangerous.

G. F. Garton.

5350

FREGLEY, M. J. Taste thresholds of normal and hypertensive rats for NaCl: effects of sodium content of diet. *Federation Proc.*, 1955, 14, 50. *Proc. [Dept. Physiol., Harvard Med. Sch., Boston, Mass.]*

5351

KRAKUSIN, J. S. and JENNINGS, R. B. Radioautographic localization of Na²² in the rat kidney. *Arch. Pathol.*, 1955, 59, 471-486. [Dept. Biochem., Northwestern Univ. Med. Sch., Chicago, Ill.]

Rats weighing about 200 g. received either commercial rat diet containing 38 m. equiv. Na per 100 g. or a low-Na diet with 0.42 m. equiv. per 100 g. ²²NaCl was given intravenously or intraperitoneally in doses of 5 or 10 μ C. Na and K were estimated spectrophotometrically in urine and serum and radio-activity was measured. Autoradiographs were made from kidney sections after freeze-drying.

After intraperitoneal injection equilibrium of ²²Na in plasma was reached in 30 min. and maintained for 4 hr. in normal and Na-deficient rats. In normal rats plasma ²²Na declined steadily for 96 hr.; in Na-deficient rats it remained constant. In both groups the rate of ²²Na excretion became fairly constant after from 48 to 72 hr., but it was much greater in the normal rats.

In experiments on distribution of ²²Na in the kidney, the kidney pedicles were clamped from 15 sec. to 5 min. after the start of intravenous injection of 5 μ C. of ²²Na. The ²²Na concentration first built up in the outer cortex, especially in Na-deficient rats; the outer medulla then became faintly visible and the inner medulla in about half a minute was strongly active. In animals killed 3 or 4 days after injection of ²²Na there was still

strong activity in the inner medulla, even in normal rats with very low plasma activity.

Effects of corticotropin, cortisone, deoxycorticosterone and vasopressin were not demonstrable. Organic mercurial diuretics and osmotic diuresis produced increased accumulation of ²²Na in the inner cortex of the kidney, suggesting inhibition of re-absorption of Na in the proximal convoluted tubules or in their straight portions.

The interpretation of the findings is discussed at length.—D. Duncan.

5352

Hove, E. L. and HERNDON, J. F. Potassium deficiency in the rabbit as a cause of muscular dystrophy. *J. Nutrition*, 1955, 55, 363-374. [Dept. Animal Husb. Nutrit., Alabama Polytech. Inst., Auburn.]

Weanling rabbits weighing from 200 to 600 g. and young rabbits weighing 2000 g. were given K-deficient diets of extracted casein 20, sucrose 57, cellulose 10, lard 6, cod liver oil 2, calcium phosphate 3.6, magnesium sulphate 0.65, sodium chloride 0.55, iron citrate 0.15, manganese sulphate 0.02 and trace minerals 0.03 per cent., with vitamins E, K and those of the B group; some of the animals received 40 per cent. extracted soya bean meal in place of the casein. Different levels of K as bicarbonate were added to the basal diet. Feed and water were available to appetite. Urine samples were collected during 24 hr. three times weekly for estimation of creatine and creatinine. Blood was analysed for K and Na. At death or termination of the experiments the animals were examined for pathological conditions.

A level of 0.6 per cent. K in the diet was essential for maximum growth; with 0.3 per cent. or less death occurred within 6 weeks, usually with severe and rapidly increasing muscular dystrophy and closely associated creatinuria. Other findings were myocardial necrosis and scarring, numerous small gallbladder concretions, multiple haemorrhagic areas in the stomach, swollen, pale kidneys, occasional jaundice and atonic intestinal tract. Large supplements of Na added to the K-deficient diet produced slightly better growth, but did not prevent death and pathological signs. In K deficiency blood cell Na increased and urine Na fell.

G. F. Garton.

See also Absts. 5126, 5142, 5273, 5330, 5376, 5691, 5692, 5956.

HALOGENS

5353

LEVI, J. E. and SILBERSTEIN, H. E. Lack of effect of fluorine ingestion on uptake of iodine³¹ by the thyroid gland. *J. Lab. Clin. Med.*, 1955, 45, 348-351. [Dept. Med., Sinai Hosp., Baltimore, Md.]

Thirty patients who had no clinical sign of thyroid disease were given $^{50}\mu\text{C}$ of ^{131}I by mouth. Uptake of ^{131}I by the thyroid was measured every 24 hr. thereafter. After the first counts were taken, the patients were given 4 mg. fluoride ion as sodium fluosilicate in a single daily dose for the first 3 weeks and in 2 daily doses of 2 mg. each for the remaining 7 weeks. At the end of the first 3 weeks a second dose of ^{131}I was given and another uptake test was made. Only 17 of the group continued to take fluoride for the last 7 weeks until the third uptake test.

No effect on concentration of I by the thyroids was found as a result of the administration of fluoride.—B. W. Simpson.

5354

AUSKAPS, A. M. and SHAW, J. H. Hemoglobin concentration, thyroid weight and growth rate in rats during minimum fluoride ingestion. *J. Nutrition*, 1955, 55, 611-621. [Harvard Sch. Dent. Med., Boston, Mass.]

Eight groups, each of 6 male and 5 or 6 female weanling rats from 12 litters, were studied. Four groups received a purified diet (Abst. 2317, Vol. 17) and 4 a diet of natural foodstuffs, consisting of whole wheat flour 27, yellow maize meal 26.5, whole milk powder 30, maize oil with added vitamins A, D, E and K 5, crude casein with added water-soluble vitamins 9, salt mixture 2 and NaCl 0.5 per cent. The diets and water were available to appetite; 2 groups, one on each diet, received distilled water; another 2 received distilled water with NaF added to give 1 p.p.m. of fluoride, 2 received 5 and 2 had 20 p.p.m. fluoride. After 11 months the animals were killed and the extent of the caries present was estimated; fluoride was estimated in the humerus, femur and thyroid.

In all 8 groups growth and reproduction were normal. There was no depression of Hb formation, no detectable fluoride uptake by the thyroid gland, no hypertrophic change in the thyroid and no decrease in resistance to a severe respiratory infection at any level of fluoride intake. The incidence of dental caries was significantly reduced when the fluoride intake was 20 p.p.m.

G. F. Garton.

5355

HIRAO, M. [Blood picture of experimental fluorosis. 1. Changes of erythrocyte, haemoglobin, colour index, reticulocyte, blood platelet and the size of erythrocyte. 2. Influence on the leucocytes of rabbits ingesting sodium fluoride. 3. Influence on the bone marrow of rabbits ingesting sodium fluoride.] *Shikoku Acta Med.*, 1954, 5, 344-353; 370-375; 376-383. [Dept. Int. Med., Sch. Med., Tokushima Univ.] English summary.

1. Three groups of mature rabbits received NaF at rates of 10, 30 and 50 mg. F daily per kg. body-weight, and 1 group of immature rabbits at the 30 mg. rate; there was a control group at each stage of development. Those given NaF lost weight and showed signs of hyperchromic macrocytic anaemia and increases in counts of reticulocytes and blood platelets.

2. Mean weekly values for differential leucocyte counts are tabulated. Leucopenia was found in the latter half of the experiment.

3. Tables give numbers of nucleated cells and differential counts for samples of bone marrow taken at intervals of 4 weeks. The numbers of nucleated cells fell and histological examinations showed fatty marrow in the 10-mg. group and gelatinous marrow in another [not identified]. The changes in marrow were such as to produce the blood changes described. (From summaries.)

D. Harvey.

5356

CANDELI, A. and SCASSELLATI SFORZOLINI, G. Ricerche sulla fissazione del fluoro da parte dei tessuti scheletrici. [Researches on the fixation of fluorine in skeletal tissue.] Ulteriori ricerche sulla fissazione del fluoro da parte dei tessuti dentari. [Further researches on the fixation of fluorine in dental tissues.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1458-1460; 1726-1727. [Ist. Igiene, Univ. Perugia.]

It was desired to know whether or not fluorine was taken up by the organic part of the teeth and skeleton. The organic part was obtained by decalcification of bone with HNO_3 , the inorganic part by calcination or alkaline hydrolysis. F was estimated in both fractions of beef bone, tendon and cartilage, and of bone from a kid, before and after immersion for 24 hr. at 37°C . in 3 per cent. NaF. Both fractions of all the tissues fixed fluorine to a very considerable extent.

Similar tests with adult human teeth showed that much fluorine was fixed by the organic and inorganic fractions, but more by the latter.

E. M. Hume.

5357

MCLENDON, J. F. Similar effects of lathyrisin and fluorosis on bones of rats. *Federation Proc.*, 1955, 14, 443. *Proc.* [Dept. Radiol., Albert Einstein Med. Centre, Philadelphia, Pa.]

5358

HOMER, R. S. Effect of potassium iodide on plasma cholesterol of rats. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 354-356. [Harold Brunn Inst., Mount Zion Hosp., San Francisco, Calif.]

Male rats, about 12 weeks old, were divided into 3 groups of 25, 23 and 10 and were given a diet free of fats and sterols for 3 days. After 24 hr.

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on the diet the rats were bled for initial plasma cholesterol estimations. The rats were anaesthetised and given daily by stomach tube 200 mg. KI or KCl, or water alone. Three hours after the last tube feeding the rats were bled again.

Plasma cholesterol rose in all 3 groups. After water the rise was 16 mg. per 100 ml., after KCl 13, but after KI 44.—B. W. Simpson.

See also Absts. 4645, 5086, 5148-50, 5668.

IRON AND COPPER

5539

STERN, P., KOŠAK, R., MISIRLIJA, A. and HUKOVIĆ, S. Bedeutung der Darmflora für die Eisenresorption. [Significance of the intestinal flora for absorption of iron.] *Arch. exp. Pathol. Pharmacol.*, 1955, 225, 162-163. *Proc. [Saraievo.]*

5360

PETERS, T., APT, L. and ROSS, J. Iron-phosphate interactions influencing gastrointestinal iron absorption. *Federation Proc.*, 1955, 14, 415-416. *Proc. [Radioisotope Unit, Veterans Admin. Hosp., Boston, Mass.]*

5361

BOTHWELL, T. H. and MALLETT, B. Diurnal variation in the turnover of iron through the plasma. *Clin. Sci.*, 1955, 14, 235-239. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

The turnover of Fe estimated morning and evening in the plasma of 20 patients by intravenous injection of ^{59}Fe was significantly affected by changes in plasma Fe concentration. The pattern of response was not uniform and the daily turnover could not be accurately calculated from the clearance of a single dose of ^{59}Fe from the plasma.

A. Hepburn.

5362

DUBACH, R., MOORE, C. V. and CALLENDER, S. Studies in iron transportation and metabolism. 9. The excretion of iron as measured by the isotope technique. *J. Lab. Clin. Med.*, 1955, 45, 599-615. [Dept. Int. Med., Sch. Med., Washington Univ., St. Louis, Mo.]

For part 8 see Abst. 3909, Vol. 25.

Excretion of Fe was measured in 5 normal human subjects, in 3 female patients with hypochromic anaemia and in 2 others with anaemia of haemolytic origin, one a woman with a sickle-cell anaemia and the other a man with hereditary sphaerocytosis. Estimations were made also of faecal excretion in dogs with haemolytic anaemia produced by phenylhydrazine given by mouth, and of the excretion by the skin during sweating induced in a normal man and woman and in a man with hypoplastic anaemia.

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In human subjects the loss of Fe in faeces was normally about 0.5 mg. daily, and no increase in rate appeared at or near 120 days after injection of radio-active Fe, when destruction of cells incorporating it was likely to be greatest. In the patients who were deficient in Fe the excretion was less and in those with haemolytic anaemia it was greater than in the normal persons. Only minute amounts appeared in the sweat secreted by the normal or the pathological subject. In the dog during severe Hb destruction when it was estimated that 240 mg. Fe were released in the process, only about 3 per cent. of that amount was excreted.

These amounts are small but, if the total excretion by man is taken to be between 0.5 and 1.0 mg. daily, such a loss may have significance for the normal person whose intake is 15 mg. and who may be absorbing less than 10 per cent. of it.

D. Harvey.

5363

MAZUR, A., BAEZ, S. and SHORR, E. The mechanism of iron release from ferritin as related to its biological properties. *J. Biol. Chem.*, 1955, 213, 147-160. [Dept. Med., Cornell Univ. Med. Coll., New York.]

Crystalline ferritin contained small amounts of ferrous Fe as well as free sulphhydryl groups. As oxidation or blocking of the latter decreased ferrous Fe and reduction increased it, it is suggested that the sulphhydryl groups serve to prevent the auto-oxidation of the ferrous Fe. The conversion of ferric-disulphite-ferritin to ferrous-sulphhydryl-ferritin by the liver is probably mediated by glutathione. Sulphhydryl ferritin was dissociable at pH 7.4 into ferrous Fe, which could combine with the Fe-binding protein of human plasma. Severe hypotension due to haemorrhage in dogs also produced the transfer of ferrous Fe from ferritin in the hypoxic liver to the plasma.

The vasodepressor activity of ferrous-sulphhydryl-ferritin was abolished when ferrous Fe was removed.

A hypothesis based on oxidation and reduction for the role of ferritin in Fe transport and haem synthesis is advanced.—A. Hepburn.

5364

SALERA, U., TAMBURINO, G. and SARTI, R. Ricerche sull'eliminazione del ferro per la via biliare. [Elimination of iron through the bile.] *Bol. Soc. Ital. Biol. sper.*, 1953, 29, 1527-1530. [Ist. Patol., Univ. Rome.]

5365

KALDOR, I. Studies on intermediary iron metabolism. 6. The absorption and storage of iron in experimental anaemia. *Austral. J. Exp. Biol. Med. Sci.*, 1954, 32, 801-805. [N.S.W. Red Cross Blood Transfusion Serv., Sydney.]

For previous parts see Absts. 3914, 4735, Vol. 23; 2118, 4618, Vol. 25.

Four groups of rats were on experiment for from 26 to 28 weeks; they were a control group with no treatment, a group given, for the first 16 weeks, doses of phenylhydrazine to maintain an Hb value 60 per cent. of that of the control rats and thereafter allowed to recover, a group given Fe in drinking water from the 12th to the 16th week and a group given both of these experimental treatments. At the end the rats were killed.

Means for bodyweight and liver weight were unaffected but that for spleen weight was greater in each phenylhydrazine group than in those without anaemia and greatest in the group given both treatments. Fe was estimated in blood serum, liver and spleen; its level followed the same pattern, and in the 2 tissues of the animals given Fe alone, an increase also occurred, but smaller than in the anaemic rats. Phenylhydrazine had no effect on Fe-binding capacity of serum.

It is concluded that absorption of Fe is increased both by anaemia and by an increase in intake, and it is inferred that the giving of Fe is permissible only if the anaemia is the result of Fe deficiency. In other forms of anaemia, especially if repeated blood transfusions are made, accumulation of Fe may lead to early haemosiderosis.—D. Harvey.

5366

CRISCUOLO, D., CLARK, R. T. (Jr.) and MEFFERT, R. B. (Jr.) Effects of low and high iron supplementation on hypoxic rats. *Amer. J. Physiol.*, 1955, **180**, 215-218. [Dept. Physiol. Biophys., U.S. Air Force Sch. Aviation Med., Randolph Field, Tex.]

Two groups each of 100 rats were given a diet of evaporated milk with added Mn and Cu; those in one group had 0.04, those in the other 0.4 mg. Fe daily. After 6 weeks, when the low-Fe group showed signs of anaemia, the groups were further subdivided equally, half of the animals being kept in ground level conditions and half subjected to decompression equivalent to an altitude of 20,000 ft. for 22 hr. daily for 6 weeks. At the end they were killed; weight, Hb, red blood cell count and volume, oxygen uptake by liver slices, myoglobin content of muscles and weight and ascorbic acid content of adrenals were estimated.

Survival did not differ between high altitude and ground level animals and the increase in Hb in hypoxic animals found in the high-Fe but not in the low-Fe group was concluded not to be indispensable for survival. Myoglobin and oxygen values were generally higher in altitude than in ground level rats, but the differences were not all statistically significant.—D. Harvey.

5367

WOLFF, H. P., LANG, N. and KNEDEL, M. Untersuchungen mit Cu^{64} über die Binding des Kupfers an Serum-eiweisskörper. [Studies with ^{64}Cu on the binding of copper to serum proteins.] *Ztschr. ges. exp. Med.*, 1954-55, **125**, 359-368. [Med. Poliklin., Univ. Marburg a.d. Lahn.]

See also Absts. 4649, 5052, 5431, 5956.

OTHER MINERALS

5368

ASKEW, H. O. Biology and trace elements. *Trans. Roy. Soc. N.Z.*, 1955, **82**, 871-891. [Cawthron Inst., Nelson.]

5369

GRANT, W. C. Effect of cobalt on hematocrit, body weight and metabolism. *Federation Proc.*, 1955, **14**, 61-62. *Proc.* [American Cyanamid Co., Res. Div., Lederle Labs., Pearl River, N.Y.]

A study with rats.

5370

MAYNARD, L. S. and COTZIAS, G. C. The partition of manganese among organs and intracellular organelles of the rat. *J. Biol. Chem.*, 1955, **214**, 489-495. [Div. Physiol., Dept. Med., Brookhaven Nat. Lab., Upton, N.Y.]

^{55}Mn rapidly disappeared from the blood of rats and of a human subject after intraperitoneal injection of physiological amounts of Mn. In rats, tissue rich in mitochondria, liver, pancreas and kidney, had the highest concentration of the isotope. Most was found in the cell organelles; of this the mitochondria contained about 2/3. The concentration in the mitochondria was possibly related to the action of Mn as a respiratory coenzyme.—A. Hepburn.

5371

BOLTON, W. The effect of injections of oestradiol dipropionate into immature pullets upon the manganese content of the blood plasma and of some tissues. *Brit. J. Nutrition*, 1955, **9**, 170-173. [Poultry Res. Centre, W. Mains Rd., Edinburgh 9.]

Oestradiol dipropionate was injected into 2 groups of 12 immature pullets, 11 weeks old; one group had a daily dose of 1 mg. and the other rising daily doses up to 2 mg. The birds were killed after 12 days and Mn was estimated in blood and tissues. Five non-laying and 7 laying birds were controls for Mn content of blood.

No Mn was detected in the plasma of control non-laying pullets; in that of laying pullets there was 6.35 μg . per 100 ml. and in that of treated birds 34.9 μg . for the rising dose and 13.8 μg . for

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the steady dose. Mn in the liver of the treated birds was about 78 μg ., the value lying between those for non-layers, 58.4 μg ., and for layers, 89.3 μg .

It is suggested that the liver acts as a labile reserve of Mn for egg production.—J. S. Thomson.

5372

HALVERSON, A. W., HENDRICK, C. M. and OLSON, O. E. Observations on the protective effect of linseed oil meal and some extracts against chronic selenium poisoning in rats. *J. Nutrition*, 1955, 56, 51-60. [S. Dakota State Coll., College Station.]

Studies were made on groups of rats weighing 70 to 80 g., given diets all of which contained salts 2, animal-protein factor 0.1, dried brewers' yeast 2 and lard 3 per cent.; the remaining 92.9 per cent. consisted of maize, seleniferous maize and purified casein alone or with linseed meal or its fractions. The seleniferous maize was used in amount necessary to give the desired level of Se and sound maize was then used to complete the diet. Vitamins A and D were

supplied weekly. The animals were weighed twice weekly; the livers were examined for gross damage and weighed at the end of each experiment.

The protective effect of the linseed meal against Se poisoning was evident under several different conditions. The inclusion of 6 or 12 per cent. casein in the diets did not alter or mask the protective effect of the meal; meals prepared by several different methods were all found to be active. The protective principle was effective against inorganic Se as well as against the form which occurs in maize.

The protective principle was extracted from linseed meal with hot 50 per cent. aqueous alcohol. It was soluble in water and was not precipitated from solution by an excess of lead; the ash of active extract was not protective.—G. F. Garton.

5373

GERSHOFF, S. N. Comparative sulfur metabolism studies of rats and rabbits. *Federation Proc.*, 1955, 14, 434. *Proc. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]*

See also Absts. 4986, 4987, 5250, 5705, 5708, 5972.

ACID BASE EQUILIBRIUM

5374

KANTER, G. S. Heat and excretion in man. *J. Appl. Physiol.*, 1955, 7, 533-536. [Dept. Physiol., Albany Med. Coll., N.Y.]

The subjects, 15 male students, were exposed to temperatures of 120° to 130° F. in a hot room at low humidity, 10 to 20 per cent. Urine was collected and the subjects were weighed hourly. No water was given.

Most subjects tolerated only 4 hr. at 125° F. before fatigue, dizziness and thirst "destroyed their morale". They lost about 0.6 per cent. of their bodyweight hourly. The urine output was low and excretion of Na and Cl fell; that of K tended to increase. Bicarbonate disappeared from the urine after about 2 hr. and acidosis occurred.

The pH of the urine fell steadily and phosphate excretion rose. The arterial blood showed the existence of true acidosis, but this was not due to hypoventilation, because the CO₂ content fell slightly. The acidosis was therefore of metabolic origin.—D. Duncan.

5375

BIANCA, W. The effect of thermal stress on the acid-base balance of the Ayrshire calf. *J. Agric. Sci.*, 1955, 45, 428-430. [Hannah Dairy Res. Inst., Kirkhill, Ayr.]

Two Ayrshire calves 4 months old were kept in a hot room at 35° C. and 34 mg. per litre humidity

for from 2½ to 4½ hr. until rectal temperature reached 42° C. Venous blood samples were drawn and urine was collected before exposure and just before it ended. Respiration rate increased from about 45 to about 230 respirations per min. Plasma CO₂ combining capacity and CO₂ tension were significantly reduced. Lactic acid concentration in the blood and pH of the urine were significantly increased. The slight tendency of the pH of the plasma to rise was not significant.—T. D. Bell.

5376

HOLLIDAY, M. A. (with LUKENBILL, A. and HANCOCK, C.) Acute metabolic alkalosis: its effect on potassium and acid excretion. *J. Clin. Invest.*, 1955, 34, 428-433. [Dept. Paediat., Indiana Univ. Med. Centre, Indianapolis.]

In groups of rats on an electrolyte-free diet chloride deficiency and alkalosis were produced by peritoneal dialysis. In 3 groups bicarbonate and in 1 group nitrate replaced chloride. In one of the bicarbonate replacement groups a load of NaHCO₃, and in another a load of NaH₂PO₄, was supplied intraperitoneally and by mouth. Compared with controls, all animals with alkalosis excreted large amounts of K with reduction of cell K and gain of cell Na as a result. Ingestion of Na accentuated these effects. The effects of alkalosis on excretion of ammonia and titratable acid were variable.

F. C. Aitken.

METABOLISM OF WATER

5377

CASTILLON DU PERRON, M., JOLIET, J. F. and ANDRIVET, S. Sur l'élimination de l'eau pulmonaire au cours de l'effort. [Elimination of water through the lungs during work.] *C.R. Acad. Sci.*, 1955, **240**, 1925-1926.

The apparatus already described (Abst. 724, Vol. 25) was used to measure moisture expired after exercise for from 3 to 4 min. during which oxygen was breathed. For 5 subjects the amounts per ml. oxygen consumed were 0.51, 0.59, 0.63, 0.54 and 0.49 mg.; for the same subjects at rest they were, respectively, 0.61, 0.64, 0.65, 0.63 and 0.61 mg. It is concluded that, over short periods of exercise, the amount of water eliminated is less than during rest, and that the results with this apparatus are equal in accuracy to those obtained with apparatus of the Benedict type.—D. Harvey.

5378

SCHMIDT-NIELSEN, B., SCHMIDT-NIELSEN, K., JARNUM, S. A. and HOUPP, T. R. Dehydra-

tion and rehydration in the camel. *Federation Proc.*, 1955, **14**, 132-133. *Proc.* [Centre Recherches Sahariennes, Beni Abbes, Algeria.]

5379

LEPKOVSKY, S., LYMAN, R., FLEMING, D. and NAGUMO, M. Gastrointestinal regulation of water and its effect upon food intake. *Federation Proc.*, 1955, **14**, 440-441. *Proc.* [Dept. Poultry Husb., Univ. California, Berkeley.] A study with rats.

5380

SARETT, H. P. and SNIPPER, L. P. Effects of water restriction on growing rats receiving powdered milk diets. *Federation Proc.*, 1955, **14**, 448-449. *Proc.* [Mead Johnson Res. Labs., Evansville, Ind.]

See also Absts. 5142, 5217, 5342-45, 5349, 5717.

METABOLISM OF OTHER SUBSTANCES

5381

JANSEN, B. C. P. Choline. [Choline.] *Voeding*, 1955, **16**, 411-416. A review.

5382

WILGRAM, G. F., BEST, C. H. and BLUMENSTEIN, J. Recent advances in choline deficiency. *Federation Proc.*, 1955, **14**, 163-164. *Proc.* [Banting and Best Dept. Med. Res., Univ. Toronto.]

A study with rats.

5383

MULFORD, D. J. Diet of adult female rats and relation to kidney lesions in choline deficient offspring. *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 177-178. [Dept. Biochem., Sch. Med., Univ. Kansas, Lawrence.]

Mother rats were given a basal diet low in choline or the same with additions, per g. food, of 1 mg. choline chloride, 0.06 μ g. vitamin B₁₂, or both. Their young when weaned were given the same basal diet for 7 days; they were then killed and their kidneys were examined. In the groups in order the numbers of young examined were, males, 33, 40, 29, 26 and females, 34, 33, 34, 33.

Of these the numbers showing haemorrhages are stated to be: males, 26, 29, 8, 4, females 21, 6, 0 and 1 [table gives 4, not 1, for the fourth group of females].

In comparison with vitamin B₁₂, choline had little effect in preventing haemorrhage in the kidneys, but what effect it had was greater among females than among males.—D. Harvey.

5384

DEBUSK, B. G. and WILLIAMS, R. J. Effect of lipoic acid on the growth rate of young chicks and rats. *Arch. Biochem. Biophys.*, 1955, **55**, 587-588. [Biochem. Inst., Univ. Texas, Austin.]

Rats and chicks fed on a basal diet containing choline, the water-soluble vitamins and vitamins A, D and E grew and utilised their food better when minute amounts of lipoic acid were added, although there was no sign of deficiency.

A. Hepburn.

5385

BORCHERS, R. and MOHAMMAD-ABADI, D. Indican excretion by rats fed raw soybean meal. *Federation Proc.*, 1955, **14**, 428. *Proc.* [Dept. Biochem., Univ. Nebraska, Lincoln.]

See also Absts. 5128, 5302.

METABOLISM OF CELLS, TISSUES, ETC.

GENERAL PHYSIOLOGY

5386

DIOGUARDI, N. Considerazioni intorno al metabolismo ossidativo del tessuto epatico. Ruolo di un sistema capace di liberare energia. [The oxidative mechanism of liver tissue. Role of a system capable of liberating energy.] *Acta vitaminol.*, 1955, 9, 9-13. [Int. Clin. Med. Gen., Univ. Milan.] French, English, German and Spanish summaries.

Respiration was studied in liver homogenates from fasted rats, either in Ringer saline alone or with the successive addition of metabolic substrates (Krebs's medium), coenzymes and hexokinase with adenosine triphosphate.

Each addition progressively increased the rate of oxygen consumption by the homogenates. Substitution of glucose-1-phosphate or glucose-6-phosphate for the substrates and coenzymes was not effective. Heart tissue behaved like liver. In kidney and brain tissue the additions of substrates and coenzymes increased oxygen consumption, but the further addition of hexokinase and adenosine triphosphate had little effect.

It is concluded that the availability of free energy, as well as the presence of substrates and coenzymes, limits the endogenous respiration of tissue homogenates.—D. Duncan.

5387

BODA, D. and KISS, A. Beziehungen zwischen Energieumsatz und Flüssigkeitsaustausch der Zellen. [Relation between energy exchange and fluid exchange of cells.] *Helv. paediat. Acta*, 1955, 10, 17-26 (with discussion 26-27). [Infektionsspital, Budapest.]

5388

HOOPER, C. R. and TURNER, C. W. *In vitro* metabolism of the rat mammary gland and observations on *in vitro* actions of thyroid hormones. *Missouri Agric. Exp. Stat. Res. Bull.* No. 563, October 1954, pp. 66.

In rat mammary gland tissue *in vitro* respiration, aerobic glycolysis and CO₂ production were all closely related to the physiological status of the gland. Oxygen consumption and CO₂ production increased during the first half of gestation, increased sharply after parturition and diminished with ageing or involution of the mammary tissue. Adenosine triphosphate synthesis in mammary gland homogenates and the influence of triiodothyronine and thyroxine on some metabolic processes were studied also.—B. W. Simpson.

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5389

RENOLD, A. E., HASTINGS, A. B., NESBETT, F. B. and ASHMORE, J. Studies on carbohydrate metabolism in rat liver slices. 4. Biochemical sequence of events after insulin administration. *J. Biol. Chem.*, 1955, 213, 135-146. [Dept. Biol. Chem., Harvard Med. Sch., Boston, Mass.] For previous parts see Absts. 954, Vol. 22; 2170, Vol. 24; 923, Vol. 25.

5390

WILSON, T. H. and VINCENT, T. N. Intestinal absorption of sugars *in vitro*. *Federation Proc.*, 1955, 14, 305. *Proc. [Dept. Biochem., Army Med. Serv. Grad. Sch., Washington, D.C.]*

5391

KHESIN, R. B. Obmen belkov v vazlichnykh strukturnykh elementakh tziotoplazmy kletok pecheni belykh kryss. [Protein metabolism in the different structural elements of the cytoplasm of rat liver cells.] *Biokhimiya*, 1954, 19, 407-413. [Inst. Biol. Med. Khim., Akad. Med. Nauk SSSR, Moscow.]

The rate of inclusion of labelled amino-acids into the protein of different structural entities in the liver cell was investigated in male white rats weighing 200 to 350 g. The animals were injected subcutaneously with methionine-³⁵S and tyrosine-¹⁴C and killed after varying intervals. Liver homogenates were separated into fractions corresponding with the cell components, and rates of uptake of the labelled substances by these components were then measured.

The rate of inclusion into the microsomes was greater than into the centrifugate or large granules. The rate into the latter was considerably slower than that into serum albumin, which is localised in corresponding ultracellular structures. The large granules consist of 2 components, the mitochondria with a slow rate of uptake and lighter granules with a much faster rate. When protein formation is rapid, the rate of amino-acid uptake by these large granules exceeds even that of the microsomes. Ribonucleic acid is almost absent from the mitochondria and its rate of P uptake runs parallel to the amino-acid uptake of the cell structures of which it is a component. The results are compared with those of studies of the exocrine cells of the pancreas.—D. W. Taylor.

5392

ROGNONE, L., SPOSITO, M., RUSSO-CALA, S. and URBANI, E. Il comportamento di alcuni

sistemi interessati nella sintesi delle proteine (dipeptidasi-RNA) nel danno epatico provocato nel ratto dalla somministrazione di tetracoloro di carbonio. [Behaviour of some systems involved in protein synthesis (dipeptidases, RNA) in liver damage produced in the rat by carbon tetrachloride.] *Arch. ital. Malat. Appar. diger.*, 1955, 21, 87-123. [Ist. Anat. Comp., Univ. Rome.]

In the livers of rats poisoned with CCl_4 the total protein content and the dipeptidase activity did not differ significantly from those in normal controls. Ribonucleic acid was increased, and the Feulgen reaction showed considerable nuclear changes. The mode of action of CCl_4 is discussed. D. Duncan.

5393

NICOLAIDES, N., REISS, O. K. and LANGDON, R. G. Studies on the *in vitro* lipid metabolism of the human skin. 1. Biosyntheses in scalp skin. *J. Amer. Chem. Soc.*, 1955, 77, 1535-1538. [Dept. Med., Univ. Chicago, Ill.]

Normal skin was obtained at operation from the scalp of a woman aged 53 and slices about 0.5 mm. thick were prepared and incubated for 6 hr. with glucose and acetate- $1\text{-}^{14}\text{C}$ in Krebs Ringer phosphate buffer. The lipid constituents were then isolated and separated.

Of the total ^{14}C available, 12.2 per cent. was incorporated into the total skin lipids, 3 to 6 times as much as was incorporated by rat liver slices under identical conditions. Of the total ^{14}C activity in the lipids, free fatty acids contained 3.9, esterified acids 47.8, sterols 2.6 and squalene 39.6 per cent. On a weight basis much more ^{14}C was incorporated into esterified than into free fatty acids.

The specific activity of squalene was ten times that of sterols. Of the minor components the wax alcohols appeared to contain some radioactivity.

The results do not support the view of Popják (Abst. 3444, Vol. 24), who considered that squalene is not a precursor of cholesterol.—D. Duncan.

5394

POPJÁK, G. and TIETZ, A. Biosynthesis of fatty acids in cell-free preparations. 2. Synthesis of fatty acids from acetate by a soluble enzyme system prepared from rat mammary gland.

TIETZ, A. and POPJÁK, G. 3. Coenzyme A dependent reactions in a soluble enzyme system of mammary gland. *Biochem. J.*, 1955, 60, 147-155; 155-165. [Nat. Inst. Med. Res., Mill Hill, London, N.W.7.]

For part 1 see Abst. 3448, Vol. 24.

2. A soluble enzyme system prepared from buffered homogenates of the mammary gland of lactating rats was incubated in the presence of

^{14}C -carboxyl-labelled acetate and the effect of several substances on fatty acid synthesis was investigated.

Fatty acid synthesis in aerobic systems required the presence of adenosine phosphates. Stimulation of synthesis occurred when oxaloacetate or α -oxoglutarate was added; to a smaller extent succinate also promoted synthesis. The addition of malonate and α -oxoglutarate together brought about a considerable increase in the amount of ^{14}C -acetate incorporated into fatty acids.

Aerobic incubation caused inhibition of fatty acid synthesis only in the presence of oxaloacetate; no inhibition was apparent when α -oxoglutarate and malonate were added together.

Fatty acid synthesis was almost inhibited by HgCl_2 and arsenate; cyanide and 2:4 dinitrophenol caused some inhibition, azide and fluoride had no effect.

3. The soluble enzyme preparations described above contained about 50 μg . coenzyme A per ml. That coenzyme A activated acetate and other α -fatty acids was inferred from the formation of hydroxamic acids by reaction with hydroxylamine. The enzyme preparations contained "endogenous" substrates which gave rise to acetyl-coenzyme A and higher acyl-coenzyme A. α -Oxoglutarate and malonate had no effect on the formation of acetyl-coenzyme A. Inhibition of fatty acid synthesis by HgCl_2 was shown to be due to blocking of the formation of acetyl-coenzyme A.

When the enzyme preparation was treated with Dowex-1 ion-exchange resin it lost its ability to effect synthesis of fatty acids from acetate: the resin removed coenzyme A and diphosphopyridine nucleotide from the system, and restoration of synthetic activity was brought about when these coenzymes were re-introduced or when a boiled enzyme preparation was added.—G. A. Garton.

5395

PERRY, W. F. and BOWEN, H. F. Incorporation of acetate into fatty acid by liver slices of adrenalectomized rats. *Amer. J. Physiol.*, 1955, 180, 21-22. [Dept. Physiol. Med. Res., Univ. Manitoba, Winnipeg.]

Liver slices were obtained from adrenalectomized rats which had been fasted for 18 to 20 hr. or fed to appetite on Fox Chow diet, or pair-fed on the same diet, and from a normal rat as control for each adrenalectomized animal. The slices were incubated for 3 hr. at 37°C . in Krebs Ringer bicarbonate buffer containing $2\text{-}^{14}\text{C}$ -sodium acetate, after which the fatty acids were isolated and ^{14}C activity was estimated.

Compared with liver slices from similarly fed control rats, the slices from the adrenalectomized animals incorporated less acetate into fatty acids under all the conditions tested.—G. A. Garton.

5396

PERRY, W. F. and BOWEN, H. F. The effect of growth hormone on lipogenesis in intact and adrenalectomized rats. *Endocrinology*, 1955, **56**, 579-583. [Dept. Physiol., Univ. Manitoba, Winnipeg.]

Liver slices were prepared from normal rats, intact rats given growth hormone by injection, adrenalectomized rats and adrenalectomized rats given growth hormone. The slices were incubated with Na acetate-2- 14 C in Krebs Ringer bicarbonate buffer at 37° C. for 3 hr.; fatty acids were then isolated and tested for radio-activity.

Fatty acid synthesis in liver slices was inhibited by growth hormone given to both intact and adrenalectomized animals; in the latter the low incorporation of acetate was even further depressed.

G. A. Garton.

5397

GEYER, R. P., BOWIE, E. J., GONGAWARE, M. S. and RYAN, M. A. Studies on the metabolic interplay of fatty acids, succinate and electrolytes. *Arch. Biochem. Biophys.*, 1955, **55**, 104-113. [Harvard Sch. Pub. Health, Dept. Nutrit., Boston, Mass.]

Slices of heart, liver, kidney and spleen from normal rats were incubated with octanoate-1- 14 C in a medium containing 70 millimoles of K⁺ or Li⁺ per litre and in the presence or absence of succinate. The radio-activity of respired CO₂ and of acetate-carboxyl-C were studied. Similar experiments, with liver slices, were made with pentanoate-1- 14 C or palmitate-1- 14 C as substrate.

The formation of 14 CO₂ from labelled octanoate was decreased in the presence of succinate in heart and kidney. The effect of succinate on octanoate metabolism in liver slices, but not in kidney slices, was conditioned by the K⁺ concentration.

In further experiments, the formation of 14 CO₂ from octanoate-1- 14 C or succinate-2- 14 C by slices of liver, kidney, heart and spleen was studied. Succinate or octanoate alone was readily metabolised to 14 CO₂, except in the spleen, in which succinate was not readily broken down to CO₂.

The results are discussed in relation to the tricarboxylic acid cycle.—G. A. Garton.

5398

ARTOM, C. Effect of choline administration on the oxidation of fatty acids by extrahepatic tissues. *J. Biol. Chem.*, 1955, **213**, 681-687. [Dept. Biochem., Bowman Gray Sch. Med., Wake Forest Coll., Winston-Salem, N.C.]

Homogenates of liver, kidney, heart, brain and testis were prepared from young male rats which had been kept on low-protein diets. The homogenates were incubated in air in the presence of an emulsion of palmitate-1- 14 C and the radio-

activity of the respired CO₂ was measured. Some animals were given choline either by injection or by mouth shortly before being killed.

The administration of choline increased production of 14 CO₂ from palmitate in liver, kidney and heart homogenates; the same effect was produced occasionally with brain tissue, but not with testis.

G. A. Garton.

5399

KATZ, J. and CHAIKOFF, I. L. The metabolism of propionate by rat liver slices and the formation of isosuccinic acid. *J. Amer. Chem. Soc.*, 1955, **77**, 2659-2660. [Dept. Physiol., Sch. Med., Univ. California, Berkeley.]

The metabolic patterns of lactate in rat liver slices, studied with 14 C, resembled those of acetate, but from propionate much less 14 C was incorporated into fatty acids and ketone bodies and more into glucose and especially into succinate. Malonate reduced the production of 14 CO₂ from propionate-1- 14 C, but enhanced that from lactate-1- 14 C. Labelled succinate accumulated from propionate, but not from lactate. In paper chromatograms the "succinate" spot contained also isosuccinic acid up to a third of the total.

The results are consistent with the carboxylation of propionate to succinate by rat liver, and apparently there are enzyme systems which can add CO₂ to the β - and α -carbons of propionate, yielding, respectively, succinate and isosuccinate.

D. Duncan.

5400

RUDNEY, H. The synthesis of β , β -dimethylacrylic acid in rat liver homogenates. *J. Amer. Chem. Soc.*, 1955, **77**, 1698-1699. [Dept. Biochem., W. Reserve Univ. Med. Sch., Cleveland, Ohio.]

The results of isolation and degradation of β , β -dimethylacrylic acid formed from acetate-1- 14 C in rat liver homogenates are in agreement with the hypothesis of Bloch *et al.* (*J. Amer. Chem. Soc.*, 1954, **76**, 3859) that the substance is a precursor of cholesterol.—D. Duncan.

5401

FORSSBERG, A. and LARSSON, S. The "feeding centre" of the hypothalamic region of the rat brain. *Experientia*, 1955, **11**, 158-160. [Inst. Radiophys., Karolinska Sjukhuset, Stockholm.] German summary.

Rats received intraperitoneally 200 μ C. of Na₂H³²PO₄ after they had been fed or fasted for 24 hr., and were killed 15 to 60 min. later. Other rats received the isotope before the fast. Radioactivity was measured in samples of frozen hypothalamus, cerebrum, blood, liver and muscle.

Concentration of 32 P in the muscles, cerebrum and blood was similar in fed and fasted rats. The part of the hypothalamus containing the feeding

centre took up more activity in hungry than in fed rats and the adjacent areas less. The amounts of total P did not differ. The concentrations of hydrolysable end-groups of adenosine triphosphate plus creatine phosphate were similar in distribution to ^{32}P .

It is suggested that hunger may be regulated through a mechanism involving the reactions suggested by Nachmansohn (*J. Cell. Comp. Physiol.*, 1952, 39, 137). The analyses also indicate the existence of biochemical differences between closely adjacent areas of brain tissue.—D. Duncan.

5402

FREINKEL, N. and INGBAR, S. H. The relationship between metabolic activity and iodide-concentrating capacity of surviving thyroid slices. *J. Clin. Endocrinol.*, 1955, 15, 442-458. [Thorndike Mem. Lab., Boston City Hosp., Mass.]

5403

FREINKEL, N. and INGBAR, S. H. Effect of metabolic inhibitors upon iodide transport in sheep thyroid slices. *J. Clin. Endocrinol.*, 1955, 15, 598-615. [Thorndike Mem. Lab., Boston City Hosp., Mass.]

See also Abstr. 5205.

GROWTH AND METABOLISM OF TUMOUR CELLS

5404

INFANTE MIRANDA, F. Las mucoproteínas del plasma en los estados cancerosos. [Plasma mucoproteins in cancer.] *Rev. clín. española*, 1955, 57, 81-87. [Clín. Med., Univ. Granada.] English, German and French summaries.

Plasma mucoproteins were estimated in 37 cancer patients, 19 others with different disorders and 10 healthy controls. The mean values for the 3 groups, in mg. per 100 ml., were 72, 4.8 and 3.66. The highest values were in tumours of the mucosae and organs and especially in female genital tumours. In the non-cancer patients high values occurred in cirrhosis, pulmonary tuberculosis and abscesses and Malta fever. The plasma mucoprotein may be of diagnostic value, especially in relation to the presence of metastases.—D. Duncan.

5405

BUSCH, H. and GREENE, H. S. N. Studies on the metabolism of plasma proteins in tumor-bearing rats. *Yale J. Biol. Med.*, 1955, 27, 339-349. [Dept. Med., Sch. Med., Yale Univ., New Haven, Conn.]

Rats implanted with the Walker 256 carcinoma or the Jensen sarcoma were injected with glycine or lysine labelled with ^{14}C ; the amino acids were incorporated into tumour proteins to give specific activities of the same order of magnitude as those of other tissue proteins 1 to 6 hr. after injection. When rat plasma protein labelled with glycine or lysine was injected, the specific activity of tumour protein was considerably greater than that of other tissue proteins. The specific activity of the proteins of both microsomal and mitochondrial fractions separated from tumour cells was also considerably greater than that of the corresponding fractions from liver, kidney or lung. It was calculated that the daily turnover of plasma protein by the tumour was approximately equal to the weight of the tumour. C. Warner.

5406

ALLISON, J. B., HILF, R. and WANNEMACHER, R. W. Sulfur amino acids and development of tumor-host relationships in rat. *Federation Proc.*, 1955, 14, 426. *Proc. [Bur. Biol. Res., Rutgers Univ., New Brunswick, N.J.]*

5407

BENSON, J., LEV, M. and GRAND, C. G. Increased spontaneous occurrence of fibroadenomas of the breast in the albino rat influenced by a high fat diet. *Amer. J. Pathol.*, 1955, 31, 583-584. *Proc. [Mt. Sinai Hosp., Miami Beach, Fla.]*

5408

BISCHOFF, F., LOPEZ, G., RUPP, J. J. and GRAY, C. L. Carcinogenic activity of cholesterol degradation products. *Federation Proc.*, 1955, 14, 183-184. *Proc. [Santa Barbara Cottage Hosp. Res. Inst., Santa Barbara, Calif.]*

See also Abstr. 4881, 5152.

METABOLISM OF GROWTH, REPRODUCTION AND SENESCENCE

GROWTH

5409

BEHNKE, A. R. Surface area-weight-stature relationships. *Federation Proc.*, 1955, 14, 11. *Proc. [Naval Radiol. Defence Lab., San Francisco, Calif.]*

5410

SCHLEDT, E. Beitrag zur Ossifikation der Wirbelsäule. [On the ossification of the spinal column.] *Langenbecks Arch. klin. Chirurg.*, 1954-55, 280, 241-260. [Anat. Inst., Univ. Zürich.]

Stages of ossification of the spinal column are described from a series of human embryos and fetuses from 7 to 123 mm. in length. The ossification of the vertebral arches is perichondral.

D. Duncan.

5411

BERGSTRÖM, A. L. OLOW, I., SÖDERLING, B. and GUNTHE, M. B. Developmental-psychologic studies on premature infants. *Acta paediat.*, 1955, **44**, 182-183. *Proc.*

5412

LLEWELLYN-JONES, D. Premature babies in the tropics. *J. Obstet. Gynecol. Brit. Empire*, 1955, **62**, 275-279. [Gen. Hosp., Kuala Lumpur.]

After 12 months' experience in a premature baby unit in Malaya it is suggested that the international standard of prematurity, a birthweight of 5½ lb. (2500 g.) or less, is unrealistic for that country. If an upper weight limit of 4 lb. 7 oz. (2000 g.) is adopted, the incidence of prematurity and mortality among those babies then approximates the U.K. and U.S. figures. It is concluded that each country and each race will have to decide upon its own standard of prematurity.

Simple management of premature babies, dictated by a shortage of nursing staff at the hospital, is described, and tables are given to show the mortality rates in different weight groups and among babies of different races.—F. E. Hytten.

5413

TOMPKINS, W. T. and WIEHL, D. G. Epiphyseal maturation in the newborn as related to maternal nutritional status. *Amer. J. Obstet. Gynecol.*, 1954, **68**, 1366-1376 (with discussion 1376-1377). [Nutrit. Res. Clin., Pennsylvania Hosp. (Philadelphia Lying-in Hosp.).]

The babies studied were an unselected series of over 300 which weighed 5.5 lb. or more at birth and 3 of 39 weeks' gestation which weighed between 5 and 5.5 lb. The mothers had been registered at the Nutrition Research Clinic at Pennsylvania Hospital since the 16th week of pregnancy or earlier and were divided into 4 groups given no special supplement, or a polyvitamin concentrate, or a protein concentrate designed to provide 50 g. extra protein daily, or both. There was no serious deficiency in the diets, which contained on the average 76 g. protein daily and 860 mg. Ca. The stage of maturation of the epiphyseal centres of the knee and heel of each baby was estimated by X-ray photography within 5 days after birth and in about half of them a month later. Results are shown in tables and histograms.

Maturation of the epiphyseal centre at the distal end of the femur was well advanced in all babies at birth, but the centre at the proximal end of the

tibia was absent in 20 per cent. That in the os calcis was absent in 48 per cent., and it developed significantly later in white than in negro infants and in boys than in girls. There was no statistically significant effect of supplements on the os calcis centre, but the tibial centre was present in more infants from supplemented than from unsupplemented groups, though the difference was significant only in boys. There was no effect on the distal femoral centre.

Among the babies who had no os calcis centre at birth, about a third still lacked it a month later. The sex and race differences were much less, but girls were still slightly ahead of boys. When the tibial centre was well developed at birth it progressed less in the first month than when it was just beginning to develop. The same was true of the femoral centre; those largest at birth did not grow at all in the first month.

The presence of the tibial centre in the knee at birth was considered a more sensitive index of maturity than that of the os calcis or femur.

D. Duncan.

5414

ACHESON, R. M., KEMP, F. H. and PARFIT, J. (with JEFFERSON, E., MYNORS, L. and HEWITT, D.). Height, weight and skeletal maturity in the first five years of life. *Lancet*, 1955, **268**, 691-692. [Social Med. Unit, Univ. Oxford.]

5415

BOYD, E. Pictorial and graphic analysis of the body build of one boy. *Amer. J. Dis. Child.*, 1955, **89**, 332-340. [Child Res. Council, Denver, Colo.]

A longitudinal study of changes in body shape during growth on about 100 children from birth to 20 years, based on yearly photographs, anthropometrical measurements and X-ray photographs (see Abst. 3292, Vol. 13) should be completed within the next 5 years. This is a preliminary report on one subject to illustrate the methods. Changes in relative proportions with age are shown by the iconometric method of Wilmer and Seammon (*Human Biol.*, 1945, **17**, 314), i.e., by enlarging a series of whole-body photographs to constant height. For comparisons with other boys, anthropometric data are plotted in different ways against tentative smoothed percentile values for the group.—W. M. Deans.

5416

THOMSON, J. Weight and height of children aged four years. *Med. Officer*, 1955, **93**, 317-318. [Dept. Child Life, Univ. Edinburgh.]

The study was of 104 boys and 109 girls all born in the same maternity unit and aged 4 years \pm 7 days. Measurements were made of weight and of crown-heel and crown-rump lengths in supine

position. Mean values were for boys, 35.59 lb. and 40.55 and 24.24 in. and for girls, 34.48 lb. and 40.02 and 23.83 in. The means are greater than those reported in 1926 for Edinburgh children by Paton and Findlay (*Med. Res. Council Spec. Rep. No. 101*). Rather than that the comparison for an individual child should be made with values for standard tables it is suggested that regression equations should be used to predict weight from measured height.

For boys

$$y = 569.5 + 11.65 (x - 102.9)$$

and for girls

$$y = 551.85 + 12.6 (x - 101.665)$$

where y is weight in oz. and x is height in cm.

D. Harvey.

5417

KARLBERG, P., IGGBOM, S. and PERMAN, A. A diagram for evaluation of the growth of Swedish children. *Acta paediat.*, 1955, 44, 178-179 (with discussion 179). *Proc.*

5418

CHEESEMAN, E. A. and WALBY, A. L. The physique of Belfast school children. *Ulster Med. J.*, 1954, 23, Suppl. 3, pp. 63. [Dept. Social Med., Queen's Univ., Belfast.]

Belfast schoolchildren from 5 to 13 years old born on the first 7 days of each month, 12,700 in all (about 1 in 5), formed the sample and measurements of height, weight and intercrystal diameter were obtained for 11,425 of them, 5755 boys and 5670 girls, by a single team of workers during the year 1951-52.

The results are presented in tables and graphs, occupying about half the paper, for boys and girls separately, and in both metric and British units, with hints on their use. The principal tables give mean, S.E. of mean, S.D., median, first and ninth deciles and percentage coefficient of variation of height, weight and intercrystal diameter for each year of age. Similar particulars are given for weight and intercrystal diameter for height at 5-cm. intervals between 100 and 155 cm. There are also a number of distribution tables and graphs of dispersions. The results are compared with those obtained at routine school medical inspections in Belfast and with those of Daley ("Report on the Heights and Weights of School Pupils in the County of London in 1949", London County Council, 1950), and of Sutcliffe and Canham ("The Heights and Weights of Boys and Girls", John Murray, London, 1950) for England. The mean heights and weights of the Belfast children were consistently less than those of the London children and the differences increased with age, from under 1 cm. and 1 kg. at 5 years to about 3 cm. and 3 kg. at 13. Some of the weight difference may be due to differences in clothing.

Weight for a given height was also generally greater in the London children. Compared with the English children, the Belfast children, especially the boys, increased in height less steeply with age, and their heights and weights showed greater dispersion.—W. M. Deans.

5419

WOLFF, O. H. Obesity in childhood: a study of the birth weight, the height, and the onset of puberty. *Quart. J. Med.*, 1955, 24, 109-123. [Dept. Paediat., Univ. Birmingham.]

Literature is reviewed. The study concerns the first 100 obese children seen at a new obesity clinic, of which a dwarf and one who had had poliomyelitis were excluded. Birthweight was normal. Comparisons of height and weight are made with Engelbach's 1932 [presumably American] standards and Widdowson's 1947 data for English children of the professional class. The average obese child was 1.6 in. taller than the ordinary American, but only 0.3 in. taller than the English professional. When weight was reduced in greater or less degree after prescription of a 1000-Cal. diet with 50 to 60 g. protein the rate of gain in height was less, down to about 82 per cent. of Engelbach's standard, the greater the percentage loss of weight. If no weight was lost, gain in height was above standard. This is interpreted as meaning that the primary disturbance is not an abnormal growth-regulating mechanism but a disturbance of the regulation of appetite, resulting in excessive eating. Further, the limits of approximately 82 and 108 per cent. of standard are thought to indicate the limits within which in these children restriction of food, or excess of food, can affect growth in height.

Puberty occurred about 1 year in advance of average or 6 months in advance of tall children. Reduction of weight might be expected to delay the onset of puberty and so to give a still greater ultimate height of obese subjects since "in the normal child, growth ceases within four to five years of the onset of puberty", which is taken as at the average age of 12.9 years (Hogben *et al.*, *Brit. J. Soc. Med.*, 1948, 2, 29).—I. Leitch.

5420

NEWMAN, R. W. and MUNRO, E. H. The relation of climate and body size in U.S. males. *Amer. J. Phys. Anthropol.*, 1955, 13, 1-17. [Quartermaster. Res. and Development Centre, Natick, Mass.]

A study of 15,000 young white men, measured on induction into the army, is reported. Mean annual and mean January and July temperatures and July noon "effective" temperature for 48 states were related to the mean weight: surface area (DuBois), weight, surface area and height of the men born in them. There was a significant

negative correlation between temperature and weight, surface area and weight per unit surface area, which was greatest for January temperature. This correlation cannot in general be attributed to difference in racial derivation of the state groups or, on a test of distribution of income per head in 1950, to difference in economic status. Since the effect of cold was greater than that of heat, adaptation for heat disposal by restricting mass relative to surface area cannot be regarded as causal. A combination of "expanded" appetite and muscular activity in colder regions is taken as the most likely explanation.—I. Leitch.

5421

MØLLGAARD, H. Analyse des Wachstums mittels Differentialgleichungen der Partialprozesse des synthetischen Stoffwechsels. [Analysis of growth by differential equations of partial processes of synthetic metabolism.] *Ztschr. Tierernährung Futtermittelk.*, 1955, 10, 1-25. [Lab. Physiol., Landwirtschaftl. Versuchsstat., Copenhagen.]

Studies of growth are usually confined to recording liveweight gain and consumption of food units, or to metabolism experiments on retention of N, Ca and P. Since modern biology teaches that the body components are not fixed, but are constantly renewed, it is proposed that growth should be measured, starting from a fixed convenient weight and age at which composition of the carcass is known, and adding to that from the results of metabolism experiments to get composition at a later desired age and weight. Differential equations for the purpose are outlined.

This theory was tested with data for pigs, 7 sows and 6 barrows (castrated boars) for composition in terms of N, Ca and P at 60 days and (in the sow used as illustration) 8 balances between then and 175 days. Composition in terms of protein ($N \times 6.25$), Ca and P is shown to be represented by 3 straight lines. The rates of increase are therefore represented by hyperbolic functions of age and the effect of any change in diet is measured by the change in the constant of the equation, at least over the most important age interval 60 to 190 days.

Illustrative examples of the effect of interruption in the supply of pyridoxine and of the addition of antibiotics to a constant diet are discussed. In the last example aureomycin produced additional weight gain and an economy of feed consumption per unit gain. Detailed metabolism studies on 2 controls and 4 pigs with aureomycin showed that a little more fat was laid down per unit metabolisable energy by the aureomycin pigs and slightly less heat was lost. But the difference was not such as to explain the difference in weight gain or feed used. The deduction is "that every factor

that causes increased retention of water in the body will always give the appearance of improved utilisation, when utilisation is expressed as feed units per kg. growth."—I. Leitch.

5422

SCHINCKEL, P. G. The relationship of skin follicle development to growth rate in sheep. *Austral. J. Agric. Res.*, 1955, 6, 308-323. [Agric. Coll., Roseworthy, S. Australia.]

5423

SCHULTZE, M. O. Effects of malnutrition in early life on subsequent growth and reproduction of rats. *J. Nutrition*, 1955, 56, 25-33. [Dept. Agric. Biochem., Inst. Agric., Univ. Minnesota, St. Paul.]

Studies were made on the offspring of female rats during pregnancy and lactation rations which contained 8 or 16 per cent. of a mixture of essential amino-acids plus 5.1 per cent. ammonium citrate, or 12.2 per cent. of a mixture of 16 amino-acids. These rations (for the details see Abst. 4989, Vol. 25) were accessible to the young until they were 4 weeks of age and to some of the young male rats until they were about 20 weeks old; the animals were then transferred in groups of 4 or 5 to metabolism cages and were given, to appetite, a diet containing rolled oats 84, casein 6.5, salt mixture 3, wheat germ oil 2, maize oil 1, sucrose and a vitamin mixture, and DL-methionine 0.33 per cent. Weight increases were recorded for 6 to 12 weeks after the animals had reached the weight of 35 to 40 g.; females were mated at about 150 g.

The weight increase of the stunted young rats during the first 6 weeks of re-alimentation was about 80 per cent. of that attained by animals in which early growth had not been retarded. During the second 6 weeks of re-alimentation the growth of male rats was severely retarded; many reached a subnormal stationary weight and were permanently stunted. Male rats with early growth restricted for 20 weeks made an incomplete recovery during re-alimentation. The retardation of growth in the female rats did not affect their reproductive performance, and the survival of their young and their growth before weaning were normal.—G. F. Garton.

See also Absts. 5027, 5190, 5502, 5536, 5606.

REPRODUCTION AND LACTATION: MAMMALS

5424

OLIVER, M. F. and BOYD, G. S. Plasma lipid and serum lipoprotein patterns during pregnancy and puerperium. *Chin. Sci.*, 1955, 14, 15-23. [Dept. Cardiol., Royal Infirmary, Edinburgh.]

The subjects were 12 normal primigravidae 18 to 31 years old, studied fortnightly from the ninth week until confinement, and several more blood samples were taken up to 20 weeks *post partum*.

The infants weighed at birth between 6 lb. 1 oz. and 8 lb. 12 oz., and the stage of gestation of all the samples was calculated back, the last one before delivery being taken as representative of the 39th week.

The mean plasma total cholesterol rose steadily from a mean of 187 ± 35 mg. per 100 ml. at the 9th to 282 ± 57 at the 31st week, and fell again from 283 ± 60 at the 33rd week to 239 ± 56 at confinement and 201 ± 45 at the 20th week *post partum*. Both free and ester fractions were affected, but the free : ester cholesterol ratio fell somewhat at the 39th week. Plasma phospholipins and the cholesterol : phospholipin ratio rose by about 25 per cent. between the 9th and the 31st week. The proportion of cholesterol carried on the β -lipoproteins rose also to the 32nd week. By the 20th week *post partum* all but one of the women had ceased lactation and had had at least one menstrual period, but none of the values had dropped to those in the first trimester.

The pattern of circulating lipids in the last trimester is similar to that seen in coronary sclerosis.—D. Duncan.

5425

HELLER, L. Stickstoffbilanzen in den letzten drei Schwangerschaftsmonaten. [Nitrogen balances in the last three months of pregnancy.] *Arch. Gynäkol.*, 1954-55, **185**, 566-572. [Frauenklin., Univ. Frankfurt a.M.]

The pregnant volunteers lived during the experiment under strictly controlled conditions and did light work in the laboratory. The diet was not standardised, but provided about 2850 Cal. daily. The main source of protein varied in a 4-day cycle of bread, vegetables, meat and fish. One subject was studied for 8 consecutive days and one for 4 days in the eighth month of pregnancy, 4 each for 4 days in the ninth month and 4 for 4 days in the tenth. Each balance period was preceded by 2 days of low-protein diet. The mean daily intake was 110 g. protein, providing 17 per cent. of the total energy.

The mean N retention in the 3 months studied was 5.03, 5.92 and 6.35 g. daily, representing a total of 483.9 g. [given as 473.9 in the summary], or 2900 g. protein. It is recognised that the last balances were made 3 weeks *ante partum*, so allowance should be made for the losses of N expected in the last days of pregnancy. The author concludes that to fulfil the demands of pregnancy at least 90 g. protein daily, and preferably 100 to 120 g., should be taken in the last 3 months, amounts which agree closely with the National Research Council's recommended allowance.—D. Duncan.

5426

NORDIN, B. E. C. and ROPER, A. Post-pregnancy osteoporosis. A syndrome? *Lancet*, 1955, **263**,

431-434. [Dept. Med., Postgrad. Med. Sch., London.]

Four young women developed backache and compression fractures of vertebrae during or soon after pregnancy. There was nothing to suggest inadequate intake of Ca or vitamin D and biochemical and X-ray investigations indicated that the disorder was not osteomalacia but osteoporosis. Increase of adrenocortical activity during pregnancy is suggested as a cause. Recovery was apparently spontaneous, though 2 of the subjects were treated with testosterone and oestrogens and one with methyl androstenediol.—W. M. Deans.

5427

HAFEZ, E. S. E. and KAMAL, M. A. M. Physiochemical investigation on placental fluids of buffalo. *Indian J. Vet. Sci.*, 1955, **25**, 39-45. [Dept. Animal Breeding, Fac. Agric., Fouda Univ., Giza, Egypt.]

The uteri were removed from 23 pregnant Egyptian buffaloes, representing 5 stages of the first 5 months of pregnancy. The diameter of the foetus was better than the weight as an indication of the stage of pregnancy. Sp. gr. of the amniotic fluid ranged from 1.004 to 1.009, that of allantoic fluid from 1.006 to 1.012, with a tendency to increase with the advance of pregnancy. There were only traces of reducing sugars and the presence of glycogen was doubtful in amniotic fluid, and in allantoic fluid there were small quantities of reducing sugars and no glycogen. Neither fluid contained ketone bodies, and creatinine was not detected by qualitative analysis in the amniotic fluid, but in allantoic fluid it was present in increasing amount as pregnancy advanced. There was little N in amniotic fluid. Allantoic fluid contained 58 mg. total N per 100 ml. with 2.25 mg. creatinine and 2.25 mg. amino-N in early pregnancy. These values increased significantly to 169, 44.19 and 15.38 mg. per 100 ml. at the latest stage of pregnancy examined.—T. D. Bell.

5428

WHIPPLE, G. H., HILL, R. B. (Jr.), TERRY, R., LUCAS, F. V. and YULE, O. L. The placenta and protein metabolism. Transfer studies using carbon¹⁴-labeled proteins in dogs. *J. Exp. Med.*, 1955, **101**, 617-626. [Dept. Pathol., Sch. Med. Dent., Univ. Rochester, N.Y.]

Three pregnant bitches, 2 at term and one at mid-pregnancy, were given ¹⁴C-labelled plasma intravenously and 2 more, one at term and the other at mid-pregnancy, were given ¹⁴C-labelled lysine by mouth. The pregnancies were terminated 2 to 4 days later and ¹⁴C was estimated in maternal and foetal tissues.

N.A. and R., October 1955

When the ^{14}C was given intravenously the maternal plasma contained about 10 times as much as the foetal plasma, but the concentrations in other tissues were similar in mother and foetus. When the ^{14}C was given by mouth, plasma and tissue levels were similar. The only notable deviation was in Hb; foetal Hb always contained considerably more ^{14}C than maternal. Compared with previous experiments it seems that "the pregnant dog metabolizes considerably more plasma protein per unit of time than does the normal dog", owing to an increased turnover of tissue protein and not to loss. Up to 1 per cent. of the dose of ^{14}C was transported across each placenta daily at term, much less at mid-term. There was a considerably greater daily transfer to each foetus after ^{14}C given by mouth than after intravenous ^{14}C [but there were only 3 and 4 foetuses present in the former and 7 and 11 foetuses in the latter and they were examined after different periods of time, so that comparison is difficult].

Neither plasma protein labelled with ^{131}I nor Evans Blue crossed the dog placenta and artificial raising of the level of plasma protein from 5.8 to 9.1 g. per cent. on the day of delivery did not cause a rise in foetal plasma protein.

The general conclusion is that the dog's placenta does not pass protein freely, but actively "accepts and possibly modifies" maternal circulating protein for foetal needs.—F. E. Hytten.

5429

NELSON, M. M. and EVANS, H. M. **Maintenance of pregnancy in absence of dietary protein with progesterone.** *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 444-446. [Inst. Exp. Biol., Univ. California, Berkeley.]

In a previous paper (Abst. 2444, Vol. 25) it was shown that, in the absence of dietary protein, pregnancy could be maintained in 70 per cent. of rats by daily injections of 4 mg. progesterone. To determine whether this was the optimum amount, daily amounts ranging from 1 to 8 mg. were tested. In the first series with rats killed at the 13th day of pregnancy, maintenance of pregnancy increased as the amount of progesterone rose to 6 mg. daily. In a second series in which the animals were killed at the 21st day of pregnancy, maintenance of pregnancy increased as the amount of progesterone rose to 4 mg. daily. At this level 70 per cent. of the animals showed live foetuses. Greater amounts did not prove to be more beneficial.—J. S. Thomson.

5430

CARTER, M. W., MATRONE, G. and SMART, W. W. G. (Jr.) **Effect of genistin on reproduction of the mouse.** *J. Nutrition*, 1955, **55**, 639-645.

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[Animal Nutrit. Sect., Dept. Animal Indust., N. Carolina Agric. Exp. Stat., Raleigh.]

A diet containing 0.2 per cent. pure genistin or 0.08 per cent. in the form of soya bean meal caused the vagina to open significantly earlier in immature mice. The numbers of litters born were 59 and 77 per cent. and on control diet 82. Average numbers of young born to each female were 3.2, 4.5 and 4.9. The average number of young per litter and their average weight were not significantly different.—A. Hepburn.

5431

MAGNUSSON, G., BERGSTRÖM, I. and ODEBLAD, E. **Studies on the uptake of Fe^{59} in rat embryo, placenta, uterus and mammary gland.** *Acta radiol.*, 1955, **43**, 227-232. [Med. Clin., Serafimerlasarettet, Stockholm.]

Pregnant rats received by subcutaneous injection on the 20th day of gestation 200 μC . of Fe^{59} per kg. bodyweight. Embryos, placentas and mammary gland tissue removed from 1 to 7 days later were fixed and sectioned and distribution of the isotope was studied by autoradiography and with a scintillation counter.

From 1 to 5 days after injection the foetus contained more Fe^{59} than the placenta. There was much Fe^{59} in the mammary gland after 7 days, but it is not known whether this was related to the onset of lactation. In the foetus there was much Fe^{59} in blood and liver and a moderate amount in choroid plexus. The yolk sac placenta contained more than the allantoic placenta and none was found in maternal placenta and uterus. High accumulation was associated with endochondral ossification in cartilage, probably because of the presence of growing capillaries.—D. Duncan.

5432

ROGERS, T. A. and KLEIBER, M. **Precursors of milk-fat in the lactating cow.** *Federation Proc.*, 1955, **14**, 123. *Proc. [Coll. Agric., Univ. California, Davis.]*

5433

KLEIBER, M., BLACK, A. L., BROWN, M. A., BAXTER, C. F., LUTOK, J. R. and STADTMAN, F. H. **Glucose as a precursor of milk constituents in the intact dairy cow.** *Biochem. biophys. Acta*, 1955, **17**, 252-260. [Dept. Animal Husbandry, Coll. Agric., Univ. California, Davis.] French and German summaries.

The cows were 2 Jerseys 6 years old, 4 and 3 months after calving. The first weighed 457 kg., gave 10 kg. milk daily, had a plasma volume of 20 litres by the Evans Blue method and an initial plasma glucose value of 60 mg. per 100 ml. Corresponding values for the second cow were 526 kg., 15 kg., 20 litres and 61 mg. The cows received by

intravenous injection glucose uniformly labelled with ^{14}C , at the rates of 6.27 and 2.76 μC . per kg. bodyweight in 1 g. glucose. The specific radio-activity of CO_2 and milk components is expressed by the quotient

$$\frac{\mu\text{C. per g. atom in C substance}}{\mu\text{C. injected per kg. bodyweight}} = \text{s.u.,}$$

i.e., the number of "standard units".

The activity of respired CO_2 reached a peak of about 9 s.u. 30 or 40 min. after the injection; the peak was lower than those after labelled acetate, propionate or butyrate (Absts. 778, Vol. 24; 2458, Vol. 25). In 3 hr. 1.6 times as much ^{14}C was recovered in milk as expired. In trial 1, 56 per cent. of the ^{14}C was recovered in milk in 2 days; of this 83 per cent. was in lactose, 11 per cent. in milk fat, 4 per cent. in casein and 2 per cent. in other substances, mainly albumin. In the other cow the recovery in milk in 2 days was 70 per cent., and its percentage distribution was in lactose 79, milk fat 13, casein 5, albumin 2 and citric acid 0.7. The highest specific activity in fat was lower than after acetate, but higher than after butyrate.

In 3 hr. after injection the specific activity of the plasma had declined to 1 per cent. of the initial value as calculated from plasma volume, blood sugar and injected dose.

About 4/5 of the lactose carbon came from plasma glucose or a pool in rapid exchange with plasma glucose, as did 1/5 of the C in citrate and 5 per cent. of the C in casein and milk fat.

D. Duncan.

5434

Goro, T. and OSHIMA, M. [Studies on the induced lactation of the goat by synthetic oestrogen.] *Bull. Nat. Inst. Agric. Sci., Japan* [G], 1955, No. 10, 91-106. In Japanese: English summary.

5435

EL RIDI, M. S., AZOUB, W. M. and HAY, A. A. Über die Wirkung von Squalen auf die Förderung der Laktation von Ratten bei Fütterung mit gereinigter squalenfreier Nahrung. [Effect of squalene on promotion of lactation in rats after feeding a purified squalene-free diet.] *Hoppe-Seyler's Ztschr.*, 1955, 299, 283-287. [Dept. Biochem., Kasr El Aini Fac. Med., Cairo.] English summary.

It was earlier shown (Abst. 783, Vol. 21) that an extract from fenugreek oil promoted lactation in female rats on a fat-free diet. The active fraction was rich in squalene.

Young female rats received when they weighed 40 to 50 g. a squalene-low diet containing, per cent., cane sugar 65, casein 20, lard (containing about 4 mg. squalene per 100 g.), 9, salt mixture 4 and

vitamin mixtures 2. On this diet they grew and bred as well as controls on stock diet, but lactation failed. In 19 rats given the experimental diet with the addition of 10 mg. squalene daily, lactation was normal. The reason for the beneficial effect of squalene is not understood.—D. Duncan.

5436

IKI, K. Vergleichende Beobachtung von Fett und Lipoiden in Milchdrüsen von drei verschiedenen Tierarten. [Comparative observations on fat and lipids in the mammary glands of three different species of animal.] *Bull. Yamaguchi Med. Sch.*, 1953, 1, 131-136. [Anat. Inst., Fac. Med., Univ. Okayama.]

A histological study was made of the fats staining with Victoria Blue and Sudan III in the lumen of the mammary glands of the dog, rabbit and guinea pig during pregnancy and lactation.

E. M. Hume.

See also Absts. 4702, 4708, 4746, 5109, 5139, 5149, 5157, 5190, 5213, 5233, 5268, 5296, 5489, 5513, 5525, 5552, 5702, 5712.

REPRODUCTION: BIRDS

5437

RUPE, C. O. and FARMER, C. J. Amino acid studies in the transformation of proteins of the hen's egg to tissue proteins during incubation. *J. Biol. Chem.*, 1955, 213, 899-906. [Dept. Biochem., Northwestern Univ. Med. Sch., Chicago, Ill.]

Microbiological estimations were made of the amino-acid content after hydrolysis of the white, yolk and embryo of hen's eggs at intervals during 400 hours' incubation. Histidine and valine fell slightly, but the other amino-acids remained constant in total amount throughout incubation. During the first 250 hr. the yolk was the sole source of amino-acids for the embryo; thereafter much use was made of the white. The different amino-acids of the yolk were used to different extents, glycine most and tryptophan least; but the amino-acids in the white were used in the same ratio as they occurred.—C. Warner.

5438

SZEPSENWOL, J., SHONTZ, M. E. and MASON, J. Nitrogen concentration in embryonic tissues of the chick throughout development. *Amer. J. Physiol.*, 1955, 180, 519-524. [Winship Clin. Sch. Med., Emory Univ., Emory University, Ga.]

Total N, N.P.N., peptides, amino-acids, ammonia and amide N were estimated daily from the eighth day of incubation until hatching, in smooth muscle of the alimentary tract, heart, skeletal muscle, liver, brain and chorio-allantoic membrane of chicken embryos. The embryos were from eggs

N.A. and R., October 1955

from different breeds, between which no chemical difference was found. Two series of embryos were used, one for estimation of total N and the second for the other components; 5 to 20 embryos were analysed in each series for each day of incubation.

Total N increased continuously in all the tissues except liver, in which, after an initial increase, it remained constant between the thirteenth and twenty-first days. The greatest increase in total N occurred in skeletal muscle. N.P.N. was between 6 and 12 per cent. of total N. N.P.N. increased simultaneously with total N except in the digestive tract, where it reached a peak on the sixteenth day of incubation and then decreased slightly, while total N continued to increase. Peptide and amino-acid N increased gradually throughout development in all organs except liver and digestive tract, where they remained constant. The increases which occurred in total N and N.P.N. and its 2 components, peptide and amino-acid, were not parallel. The amide and ammonia N in the tissues were low and showed no appreciable change throughout development.—G. F. Garton.

5439

SZEPSENWOL, J., MASON, J. and SHONTZ, M. E. **Phospholipids and nucleic acids in embryonic tissues of the chick.** *Amer. J. Physiol.*, 1955, **180**, 525-529. [Winship Clin., Sch. Med., Emory Univ., Emory University, Ga.]

The P of the lipid, deoxyribonucleic acid, ribonucleic acid and protein were estimated daily from the eighth day of incubation until hatching, in the heart, liver, digestive tract, skeletal muscle, brain and chorio-allantoic membrane of chicken embryos. There was no significant chemical difference among eggs from several breeds. One series of embryos was used for estimating lipid P and a second series for nucleic acid; 6 to 30 embryos were analysed for each day of incubation in each series.

On the eighth day of incubation lipid P was highest in the liver and lowest in chorio-allantoic membrane; on succeeding days it increased in all 6 tissues studied, the greatest increase occurring in brain. Before hatching, lipid P decreased slightly in all the tissues except in brain, where it continued to increase. No correlation was found between the degree of activity of the 3 muscle tissues and their phospholipin content. The P of deoxyribonucleic acid and protein showed no appreciable change in whole embryos between the third and eighth days of incubation, but ribonucleic acid P increased slightly. In embryos of 8 to 21 days, deoxyribonucleic acid P rose slightly in heart, digestive tract, skeletal muscle and liver, decreased slightly in brain and did not change in chorio-allantoic membrane. Ribonucleic acid P

increased in all the tissues except liver, where it decreased. No absolute parallel was found between the changes in protein and ribonucleic acid content of a tissue.—G. F. Garton.

5440

CLEGG, R. E., HEIN, R. E., SUELTER, C. H. and McFARLAND, R. H. **The distribution of radioactive phosphorus in the electrophoretic components of egg yolk proteins.** *Poultry Sci.*, 1955, **34**, 210-214. [Kansas State Coll., Manhattan.]

The distribution of ^{32}P given to laying hens in the electrophoretic patterns of egg yolk proteins is shown in diagrams.—D. Duncan.

5441

SALEM, H. and REDA, H. **Calcium and phosphorus metabolism and egg shell formation in Egyptian birds.** *Poultry Sci.*, 1955, **34**, 197-205. [Fac. Agric., Univ. Cairo.]

Ten hens received a basal diet adequate for laying except for a low Ca content providing about 0.2 g. Ca daily; half received 1.5 g. and half 3 g. CaCO_3 daily and those with the higher intake had also 3 g. cod liver oil. Later 5 birds on the lower Ca intake received daily for 10 days 0.3 g. diethylstilboestrol.

Detailed results for representative birds are shown in tables. Birds in both groups absorbed about the same amount of Ca, less than 1 g. daily. The serum Ca on both laying and non-laying days was somewhat higher in the birds on the lower intake, and was significantly raised by diethylstilboestrol. The birds on the high Ca intake laid smaller eggs and retained Ca; those on the lower intake were just in positive balance. P retention was lower and so was serum P with the high-Ca diet. The hormone did not affect P metabolism.

D. Duncan.

See also Abst. 5371.

SENESCENCE

5442

SILBERBERG, M. and SILBERBERG, R. **Diet and life span.** *Physiol. Rev.*, 1955, **35**, 347-362. [Snodgrass Lab., St. Louis City Hosp. Div., Mo.]

5443

SHOCK, N. W. and YIENGST, M. J. **Age changes in basal respiratory measurements and metabolism in males.** *J. Gerontol.*, 1955, **10**, 31-40. [Sect. Gerontol., Nat. Heart Inst., Nat. Insts. Health, Bethesda, Md.]

The subjects were 152 men aged from 41 to 90 years in an old people's home; all were up and about.

There was no evidence of systematic change with age in respiratory rate, ventilation volume, tidal volume or pulse rate. There was a progressive rise in the oxygen content of expired air and falls in the CO_2 content of expired air, CO_2 elimination, oxygen uptake and calculated heat production. The decrement in B.M.R. with age was significant.

The linear regression equation gives a value for the decline in B.M.R. with age which agrees closely with that obtained by Quénuille *et al.* (Commonwealth Agric. Bureaux Tech. Commun. No. 17, 1951).—D. Duncan.

5444

GILLUM, H. L., MORGAN, A. F. and JEROME, D. W. (with VOTAW, M. H. and SNOWDON, M.)
Nutritional status of the aging. 4. Serum cholesterol and diet.

MORGAN, A. F., MURAI, M. and GILLUM, H. L. 6.
Serum protein, blood nonprotein nitrogen, uric acid and creatinine. *J. Nutrition*, 1955, 55, 449-468; 671-685. [California Agric. Exp. Stat., Univ. California, Berkeley.]

For other parts see Absts. 3986, 5576, 5649, Vol. 25.

4. Free and total cholesterol were estimated in the serum of normal subjects, 234 men and 296 women aged from 50 to over 80 years who were living in their own homes. Total cholesterol ranged from 106 to 720 mg. per 100 ml. blood; the mean for men was 241 ± 8 and for women 270 ± 8 . Free cholesterol was 27 to 28 per cent. of the total for all groups. The mean for 43 other men over 60 years of age who were living in a county home was 209 ± 12 mg. per cent. Women had significantly higher levels than men between ages 60 and 80. In both sexes there was a sharp decrease at 75 or 80 years. There was a downward trend in the levels of the men with each decade, but in the women aged 60 to 75 there was a sustained high level after a sharp decrease at 54 to 59.

There was a positive correlation between both cholesterol intake and fat intake and serum cholesterol in both sexes; the correlation was lower when fat was of animal origin only. There was slight positive correlation between protein intake and serum cholesterol. In women there was a striking parallel between serum ascorbic acid and serum cholesterol; this was not apparent in men. In men, but not in women, who were 20 per cent. or more underweight or overweight, serum cholesterol was low or high, respectively, as were fat and cholesterol intakes. No relation was found in any group between blood pressure and serum cholesterol.

The N.P.N. constituents of the blood were studied in 255 and serum protein values in 573 men and women over 50 years of age, as part of the study already described.

The average serum protein value was 6.47 ± 0.06 g. per cent. for the men and 6.44 ± 0.05 for the women, the range 5.2 to 7.4. No correlation with protein intake was found, nor was there any age or sex difference, but there was a small positive correlation with Hb. Blood N.P.N. was 38 ± 1.4 mg. per cent. for the men and 34 ± 1.2 for the women; after 70 years the difference was not significant. In the men, but not in the women, N.P.N. was positively correlated with protein intake. Blood uric acid was 3.24 ± 0.19 mg. per cent. for the men and 2.98 ± 0.18 for the women; after 70 years the differences were less and the values lower. There was no correlation with fat intake, but there was a small positive correlation with protein intake in the men only. The mean blood uric acid for 9 men and 14 women aged from 18 to 40 years was 2.53 and 2.33 mg. per cent., respectively. The mean blood creatinine values, which were unaffected by sex or age, were 1.53 ± 0.11 mg. per cent. for the men and 1.50 ± 0.08 for the women. There was no correlation with protein intake. In the 23 young adults studied the mean values were 1.27 ± 0.10 mg. per cent. for the men and 1.18 ± 0.07 for the women.

G. F. Garton.

5445

ACKERMANN, P. G., BUEHLER, H. J., TORO, G. and KOUNTZ, W. B. **Serum cholesterol, phospholipid and lipoprotein levels in elderly male subjects. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 447-448. [St. Louis Chronic Hosp., Mo.]**

In connection with previous studies (Abst. 3195, Vol. 25), serum cholesterol, phospholipids and S₁ 12-20 lipoproteins were estimated in between 60 and 80 men aged from 53 to 94 years in St. Louis Chronic Hospital.

S₁ 12-20 lipoproteins declined slightly with age, and were significantly correlated with serum cholesterol ($r = +0.56$). Phospholipin values were linearly related to cholesterol values.—W. M. Deans.

5446

EIBER, H. B., GOLDBLOOM, A. A., DEUTSCHBERGER, O., CHAPMAN, I. and LOEWIE, W. R. **An outline of the newer methods of study of atherosclerosis, with emphasis on the 80-100 year group. *Geriatrics*, 1955, 10, 213-220. [Bird S. Coler Mem. Hosp., New York Med. Coll., Flower and Fifth Ave. Hosp., New York.]**

The methods were applied to chemistry and to lipoprotein and electrophoretic patterns of blood, to X-ray studies of aorta and to electrocardiograms, and pathological changes in retinal vessels, aorta and coronary arteries. The subjects numbered 650 in the age range 20 to 106 years. The tendencies were for total lipids, certain lipoprotein classes and the atherogenic index calculated from them, and the degrees of aortic calcification and dilatation

to rise until ages between 60 and 75 years and thereafter to fall, but the question of what occurs in the general metabolism in this threshold phase remains unanswered.—D. Harvey.

5447

LYOYD, L. E. and McCAY, C. M. The utilization of nutrients by dogs of different ages. *J. Gerontol.*, 1955, 10, 182-187. [Cornell Univ., Ithaca, N.Y.]

Twelve female beagles were used, 4 showing signs of ageing, 9 to 12 years old, 4 young adults 2 years old and 4 pups 3 months old. All were fed in turn on dog meal alone or with the addition of lard or casein or both, or a protein- and mineral-deficient diet of cornflakes with or without lard to yield rations high, medium or low in protein and

high and low in fat. Digestibility data were obtained for dry matter, protein, fat and carbohydrate and balance data for N, Ca and P.

Old age had no effect on the digestibility of the dry matter of the ration, but young pups could not digest the protein of a low-protein ration so well as adults or old dogs, and the fat in high-fat rations was also less easily digested.

Average balance data over the entire period showed the mature and adult dogs to be in negative Ca balance, while the pups were in positive balance except for the period on the cornflake diet of low Ca content. P was retained on all diets; retention was much higher in the pups. N was stored on all the rations except cornflakes; retention again was highest in the pups.—J. S. Thomson.

See also Absts. 5526, 5576, 5607, 5648.

EXPERIMENTAL STUDIES OF IMMUNITY AND MICRO-ORGANISMS

5448

RAMAKRISHNAN, S. P. Studies on *Plasmodium berghei* Vincke and Lips, 1948. 16. Effect of ketogenic diet on the course of blood-induced infection of rats. 17. Effect of different quantities of the same diet on the course of blood-induced infection in rats. 18. Effect of diet different in quality but adequate in quantity on the course of blood-induced infection in rats. 19. The course of blood-induced infection in pyridoxine or vitamin B₆ deficient rats. *Indian J. Malariol.*, 1954, 8, 85-88; 89-96; 97-105; 107-113. [Malaria Inst. India, Delhi.]

16. Of 10 rats, 8 weeks old, 5 received a standard diet and 5 a ketogenic diet containing, per cent., butter 93, salt mixture 1, glucose 5 and vitamin "B" complex 1. After a week all were inoculated with *Plasmodium berghei*. The rats on the ketogenic diet lost weight, and those on the standard diet gained it. Survival times are not recorded. The number of parasites observed daily and at the peak of infection was much less in the rats given the ketogenic diet.

17. In a previous study (Abst. 3500, Vol. 24; see also Abst. 996, Vol. 25) experimental starvation was extreme. In the present study 92 rats were fed on a standard diet; 27 were given what was deemed to be enough, and 41 were given half the amount. They were all inoculated with one million organisms of *Plasmodium berghei* after 2 or 4 weeks. Another 24 were given half the amount of diet without inoculation. Six separate experiments were made in which rats of different ages from 7 to 27 weeks were used, and in which progressively more suitable amounts of food were given. The number of animals that died was not significantly different in the fully-fed and half-starved groups,

but in the latter the number of parasites in the blood was less.

18. In similar experiments, rats were given *ad libitum* a vegetarian diet, a lacto-vegetarian diet or a mixed diet containing meat. A group having each diet was compared with a group having a standard diet. Inoculation took place after from 1 to 4 weeks. With a mixed diet containing a small amount of meat, the number of parasites in the blood was least, less even than with the standard diet. With a rice and peanut diet, the number was about the same as with the standard diet, but with all the other diets the numbers were greater and with a high-meat diet greatest of all.

19. In a similar experiment, of 10 rats from 6 to 7 weeks old and two 18 weeks old, 6 were given a diet deficient in vitamin B₆, 3 were given the same diet with 75 µg. pyridoxine hydrochloride per head daily, and 3 had a standard diet. The rats were maintained on the diets for 121 days before inoculation. The number of parasites was much less in the blood of the deprived animals and none of them died in the acute phase of infection, but all those in the other groups died.—E. M. Hume.

5449

HUNGATE, R. E. Mutualistic intestinal protozoa. *Biochem. Physiol. Protozoa*, 1955, 2, 159-199. [Dept. Bacteriol., State Coll. Washington, Pullman.]

5450

RICHTER-OTTO, W. Antibiotika und Darmflora. [Antibiotics and intestinal flora.] *Arch. Tierernährung*, 1955, 4, 364-391. [Inst. Vitaminforsch., Potsdam, Rehbrücke.]

A review.

5451

ÅGREN, G., DE VERDIER, C. H. and GLOMSET, J.
On the occurrence of a new type of phosphorylated, ninhydrin positive-compound in bacterial protein. *Acta Soc. Med. upsalien.*, 1955, **60**, 30-32. [Inst. Med. Chem., Univ. Upsala.]

The Schneider protein fraction was prepared as described in Abst. 59, Vol. 25, from cultures of *Lactobacillus casei* grown in medium containing ³²P. Apart from phosphoric acid, the greatest radioactivity was found in a ninhydrin-positive compound which corresponded to none of the known amino-acids.—D. Duncan.

5452

YU, T. C. and SINNHUBER, R. O. Stimulatory effect of calcium on growth of *Lactobacillus fermenti*. *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 238-240. [Oregon Agric. Exp. Stat., Seafoods Lab., Astoria.]

5453

WEAVER, J. M. Inhibitory compounds in raw soy beans. *Federation Proc.*, 1955, **14**, 301. *Proc. Dept. Biochem.*, Univ. Nebraska, Lincoln.]
A study with *Bact. coli*.

5454

BONSEMPLANTE, M. Funzioni ed importanza della microflora dei prestomaci, nel quadro della nutrizione dei ruminanti domestici. [Functions and importance of the microflora of the forestomachs in the nutrition of domestic ruminants.] *Riv. Zootec.*, 1955, **28**, 81-85; 136-139. [Ist. Zootec., Univ. Padua.]
A review.

5455

GYLLENBERG, H. and LAMPILA, M. A lactate-utilizing *Corynebacterium* from the rumen of cattle. *Maataloust. Aikakausk.*, 1955, **27**, 53-56. [Dept. Microbiol., Univ. Helsinki.] Finnish summary.

The bacterium was isolated from bovine rumen fluid by plating on peptone, yeast extract and lactate agar, at dilutions of 10⁻⁵ to 10⁻⁷. In pure culture, volatile acids were produced from lactate. The characters of this organism were similar in most respects to those recorded for *Corynebacterium enzymicum* (Bergey's Manual), which is regarded as of human origin. It is considered that this organism is derived from soil or hay, and that some corynebacteria are not so essentially of human origin as has been supposed.—J. C. Appleby.

5456

APPLEBY, J. C. The isolation and classification of proteolytic bacteria from the rumen of the sheep. *J. Gen. Microbiol.*, 1955, **12**, 526-533.

[Rowett Res. Inst., Bucksburn, Aberdeenshire.]

The basal medium consisted of 45 ml. 0.3 per cent. K₂HPO₄ plus 45 ml. solution containing, per cent., K₂HPO₄ 0.3, NaCl 0.6, MgSO₄ 0.06, and CaCl₂ 0.06, with 6 g. agar, 1 ml. resazurin solution and either 1.5 g. yeast extract or 90 ml. clarified rumen fluid from a sheep on a low-protein diet, all made up to 300 ml. with distilled water. Sometimes 1.5 g. peptone was added. When this solution was boiled and filtered, to 200 ml. were added 34 ml. of 6 per cent. sterilised casein solution, 13 ml. of sterile 6 per cent. Na₂CO₃ and 3.4 ml. of 3 per cent. cysteine hydrochloride. CO₂ was bubbled through to reduce the resazurin and bring the pH to from 6.8 to 7.4.

Two sheep received groundnut meal, flaked maize and hay, the third maize, oats, bran, linseed meal, white-fish meal and a little hay. Rumen samples were taken through fistulae and lightly centrifuged before serial dilutions were prepared and used as inocula for roll tube cultures in the basal medium. They were incubated at 38° C. for 4 or 5 days.

Total viable counts for all 3 sheep were about 10⁶ to 10⁷ per ml. rumen fluid. The majority of the proteolytic organisms isolated were facultatively anaerobic bacilli, and of 24 isolates of this genus, 19 were *Bacillus licheniformis* which existed in vegetative form in the rumen. Spores of this organism were present in large numbers in the hay. Other proteolytic organisms included 4 cultures of *Clostridium sporogenes*, 5 Gram-negative rods, including species of *Proteus* and probably *Flavobacterium arborescens*, one species of *Corynebacterium* and 6 strains of micrococci. The proportion of proteolytic bacteria in the rumen is estimated as, at most, 1 per cent.—D. Duncan.

5457

GARTON, G. A. and OXFORD, A. E. The nature of bacterial lipids in the rumen of hay-fed sheep. *J. Sci. Food Agric.*, 1955, **6**, 142-148. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Two wether sheep with rumen fistulae were fed on meadow hay, with access to water and a mineral lick. Samples of rumen contents were taken every second day and centrifuged to give a fraction consisting mainly of bacteria. The samples were combined and eventually dried in a vacuum spin freeze drier, and gave 110 g. dry substance, 0.5 to 1 g. being obtained from 1 litre of rumen contents. Lipids were extracted with ethanol and ether and amounted to 16.8 per cent. of the dry matter.

The fractionation of the lipids yielded, per cent., steam-volatile lower fatty acids 6.5, steam volatile neutral solid a trace, acetone-insoluble phospholipins 20.8, acetone-soluble neutral fat 20.2,

unsaponifiable 5.4, and water-soluble salts of acetic, propionic and butyric acids 47.1. No conjugatable dienoic or trienoic fatty acid, characteristic of grass fats, was found, and no cholesterol, the presence of which would have indicated cellular material of host origin such as desquamated rumen epithelium. The lipids were therefore derived mostly from bacteria, especially the species found free from plant fibres, such as saccharolytic forms.

The neutral fat contained fatty acids of high mean molecular weight, 312.0. The phospholipins had an N : P ratio of 1.6, indicating a mixture of mono- and di-aminophosphatides. No linoleic or linolenic acid was detected. The unsaponifiable matter contained a substance of approximate empirical formula $C_{27}H_{48}O_2$, but not identical with cholesterol monohydrate. Xanthophylls were present.—D. Duncan.

See also Absts. 4758, 4847, 4848, 5059, 5359.

MISCELLANEOUS FEEDING EXPERIMENTS

5458

SPEERLING, G., LOVELACE, F., BARNES, L. L., SMITH, C. A. H., SAXTON, J. A. (Jr.) and MCCAY, C. M. **Effect of long time feeding of whole milk diets to white rats.** *J. Nutrition*, 1955, **55**, 399-414. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

Six groups, each of 60 rats, were used to study the effect of 6 different diets on growth and life span, intake of food and fluids, reproduction and composition of the young, pathology, X-ray photographs of soft tissues, decay of teeth at the time of death, and bone density and Ca content. Twenty rats in each group were males, 20 were mated females and 20 were unmated females. The diets for 4 of the groups consisted mainly of whole fresh milk supplemented with traces of Mn, Fe, I, Cu and cod liver oil; one group received the milk alone, the second received milk with 10 per cent. sucrose dissolved in it, the third received the milk and had free access to dry sucrose and the fourth had similar access to a 10 per cent. solution of sucrose in water. The fifth group was given a mixed stock diet supplemented with 10 per cent. of its weight of cooked whole dried egg; the sixth received the stock diet alone. The animals were given the diets from weaning until they died.

The rats given milk containing dissolved sucrose were overweight throughout life; males failed to attain a normal life span and females failed in reproduction. Those given milk or milk containing dissolved sucrose had no decayed teeth at death, but those drinking milk with free access to sucrose either in solution or dry had much dental decay; the dry sucrose group suffered most from decayed molars. All the animals on milk diets had the densest bones in old age. The life span was not shortened by the consumption of 10 per cent. of whole egg in the diet; the life span of males was substantially increased thereby. Comparable animals consumed equal amounts of sucrose throughout life; females consumed more energy and more fluids per unit bodyweight than males.

The energy consumption remained fairly constant throughout life. Among the rats given milk diets about 20 per cent. had hair balls in the stomach; this was not modified by administration of ground cellulose. Mated females had more abscesses of the reproductive organs than virgin females. Among ageing rats there was a high incidence of diseases of the middle ear and lungs, but this could not be attributed to diet.—G. F. Garton.

5459

CLARK, H. E., HARRISON, D. L., SOULE, R. P. (Jr.) and RICHARDSON, D. **The nutritive value of proteins of muscle from hogs fed diets supplemented with aureomycin or terramycin hydrochloride.** *J. Nutrition*, 1955, **56**, 61-66. [Dept. Foods Nutrit., Kansas State Coll., Manhattan.]

Ten weanling pigs were given a ration of maize, soya bean meal, tankage, alfalfa meal, a mineral mixture and vitamin D; initially the diet provided 13 per cent. protein, during the growing period 15 per cent. and later 12 per cent. Ten similar pigs received the same diet plus 10 mg. aureomycin hydrochloride per lb. of basal ration and another 10 the diet plus 10 mg. terramycin hydrochloride per lb. Diets containing pork from these pigs were given to appetite to weanling rats for 4 weeks; N balances were measured during the last 7 days of the test and increments in liver N during the 4 weeks were estimated. In all diets pork provided 1.6 per cent. N; other constituents were Crisco 20, roughage 2, Richardson and Hogan salt mixture 5 and vitamin D oil 5, with dextrin to 100.

The presence of aureomycin and terramycin in the pork did not stimulate the growth of the rats, but N balance, expressed in terms of surface area, was significantly higher ($P < 0.05$) when pork from pigs on the basal ration was given to the rats than when pork from pigs given either of the antibiotics was given. The nutritive value of the pork proteins for the growing rat was similar to that of beef.—G. F. Garton.

5460

- SUR, G., REDDY, S., SWAMINATHAN, M. and SUBRAHMANYAN, V. **Supplementary value of the proteins of food yeast to cereal proteins.** *Bull. Central Food Technol. Res. Inst., Mysore*, 1954, **4**, 35-36.

In feeding experiments with rats food yeast supplements significantly improved the proteins of wheat and jowar (*Sorghum vulgare*) at the 10 per cent. total protein level. Ragi (*Eleusine coracana*) was also significantly improved, but rice only slightly.—A. Hepburn.

5461

- KIK, M. C. **Improvement of milled rice proteins by meat (lean beef) and fish (salmon) proteins.** *Federation Proc.*, 1955, **14**, 439. *Proc. [Univ. Arkansas, Fayetteville.]*

A study with rats.

5462

- MOHANDAS, A. E. and WERTZ, A. W. **Nutritive value of fenugreeek as supplement to Egyptian corn diet.** *Federation Proc.*, 1955, **14**, 446. *Proc. [Nutrit. Res. Lab., Sch. Home Econ., Univ. Massachusetts, Amherst.]*

5463

- HUNDLEY, J. M., ING, R. B. and KRAUSS, R. W. **An alga as a source of lysine and threonine in supplementing wheat flour.** *Federation Proc.*, 1955, **14**, 438. *Proc. [Nat. Inst. Health, Bethesda, Md.]*

5464

- COHN, C., SHRAGO, E. and JOSEPH, D. **Effect of food administration on weight gains and body composition of normal and adrenalectomized rats.** *Amer. J. Physiol.*, 1955, **180**, 503-507. [Dept. Biochem., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.]

Male rats were given either a solid diet to appetite or a liquid diet by stomach tube twice daily. The diet consisted of salt 20, casein hydrolysate 95, lactalbumin hydrolysate 10, liver powder 10, methionine 2, 2-methylnaphthoquinone 50, sucrose 110, dextrin 105, maize starch 110, Mazola oil 100 g., cod liver oil 5, wheat germ oil 5, and vitamin B syrup 30 ml.; for the solid diet 310 ml. 5 per cent. agar and 320 ml. water were added to the basal diet, for the liquid diet 30 g. cellulose flour and water to make 1000 ml. After a week on the diets one-third of the animals in each group were adrenalectomized, another third had a sham operation and the rest were killed and their body composition was estimated. The diets were continued for another 14 days, after which all the animals were killed and tissues were analysed for fat; total body N was also estimated.

The animals which were adrenalectomized and tube-fed were similar in body composition to tube-fed control animals. Adrenalectomized rats fed to appetite lost body fat and gained less weight than control animals fed to appetite. Tube-fed control animals contained more body fat than normal animals fed to appetite, although the diet was the same and weight gains were similar.—G. F. Garton.

5465

- VARTAINEN, I. and PAASONEN, M. **Selection of casein, gelatin and keratin in alloxan diabetes. Selection of proteins in alloxan diabetes. Selection of potassium and magnesium in alloxan diabetes.**

Influence of tyrosine on food selection in alloxan diabetes. *Ann. Med. int. Fenn.*, 1954, **43**, 324-328; 329-337; 338-340; 341-345. [2. *Med. Clin., Univ. Helsinki.*]

Rats caged individually were offered casein, gelatine, keratin, olive oil, sucrose and tap water and had access to mineral and vitamin supplements. After their dietary selection had become stabilised the rats were made diabetic by subcutaneous injections of alloxan over a period of from 1 to 32 days. Severe diabetes developed on the average in 17 days and the energy intake of the rats increased, the increase being only in protein and in the form of casein. The intake of fat and sucrose remained the same and that of keratin and gelatine was very low in both preliminary and diabetic periods.

The study of protein selection was continued with groups of normal and diabetic rats offered combinations of protein foods including casein, meat powder, dried egg yolk, dried fish, milk powder, fat-free egg yolk and egg yolk oil, and semolina. With a simple choice of 6 proteins, casein and egg yolk were most favoured by diabetic rats, whose energy intake per kg. bodyweight was 348 Cal. while that of healthy, non-diabetic rats was 269. The diabetic rats derived 40 per cent. of their energy from protein and the non-diabetic rats 13 per cent. The amino-acid content of the food patterns chosen by diabetic and non-diabetic rats was calculated. The intake of individual amino-acids by diabetic rats was increased by from 3.4 times to 6.8 times. The greatest increase was for alanine and aspartic acid and the least for glycine and cystine.

In another test, solutions of 1 per cent. magnesium chloride and potassium chloride were offered in addition to proteins. Although the diabetic rats were already consuming larger amounts of Mg and K in the food they showed also a higher intake of the solutions than the non-diabetic rats. The same result was obtained in 3 series of tests lasting for up to 112 days.

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Administration daily for 2 weeks of 1 g. tyrosine per kg. bodyweight by injection, and then of 5 g. per kg. by mouth, to 9 diabetic and 10 normal rats on self-selection diets of sucrose, casein, olive oil, water, vitamins and salts resulted in a lower intake of sucrose, which was more marked in the diabetic rats. Subcutaneous injection of tyrosine caused a transient rise in blood sugar.

A. M. Copping.

5466

SCHOTTLE, C. E., REBER, E. F., MORRILL, C. C. and LINK, R. P. **Experimental production of hyperkeratosis in rats and hamsters.** *Amer. J. Vet. Res.*, 1955, **16**, 183-188. [Dept. Vet. Physiol. Pharmacol., Coll. Vet. Med., Univ. Illinois, Urbana.]

Rats and hamsters were given synthetic rations with either a protein concentrate known to produce hyperkeratosis in cattle (Link and Reber, *North Amer. Vet.*, 1954, **35**, 274) or a commercial chlorinated naphthalene containing pentachloronaphthalene, which has a similar effect (Sikes, *Science*, 1952, **116**, 506).

In the rats both additions caused alopecia and limited growth and time of survival; with the chlorinated naphthalene the vitamin A content of liver was reduced. In the hamsters the protein concentrate caused no gross sign of hyperkeratosis and weight was affected less than in rats; its effect in reducing the vitamin A content of liver was greater than that of the chlorinated naphthalene. The rat is considered to be more susceptible than the hamster to the action of these substances in producing hyperkeratosis.—D. Harvey.

5467

CHENG, A. L. S., GRAHAM, T., ALFON-SLATER, R. B. and DEUEL, H. J. (Jr.) **Effect of diet and sex on the LD₅₀ of rats subjected to X-irradiation.** *Federation Proc.*, 1955, **14**, 429-430. *Proc.* [Dept. Biochem., Sch. Med., Univ. S. California, Los Angeles.]

5468

KING, J. T., LEE, Y. C. P. and McELROY, W. T. (Jr.) **Diet-induced heart failure in mice.** *Federation Proc.*, 1955, **14**, 86. *Proc.* [Dept. Physiol., Univ. Minnesota, Minneapolis.]

5469

ERSHOFF, B. H. and LEVIN, E. **Beneficial effect of an unidentified factor in wheat germ oil on the swimming performance of guinea pigs.** *Federation Proc.*, 1955, **14**, 431-432. *Proc.* [Dept. Biochem., Univ. S. California, Los Angeles.]

5470

URAM, J. A., FRENCH, C. E., BARRON, G. P. and SWIFT, R. W. **The effect of high levels of**

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terracyclin or streptomycin on growth, reproduction and lactation of the rat. *J. Nutrition*, 1955, **55**, 481-492. [Dept. Animal Nutrit., Pennsylvania State Univ., University Park.]

Three groups, each of 10 male and 30 female rats, were given at weaning finely ground Rockland rat diet alone or supplemented with 0.04 per cent. terramycin hydrochloride or streptomycin sulphate. They were mated at 4 months of age and again one month after their young were weaned.

There was no significant difference in reproductive ability between the groups. Weight gains of the offspring of animals given terramycin and streptomycin during the third to the fourteenth days *post partum* were significantly increased over weight gains of young from dams given the control diet; from the fourteenth to the twenty-first day *post partum*, when mother's milk was supplemented with solid food, there was still a significantly greater weight gain of male and female young given antibiotics. The second litters confirmed these results.

There was no significant difference in the average food intake of dams on different diets during lactation. Thirty-seven per cent. of the streptomycin and 80 per cent. of the terramycin was excreted in the faeces. Neither antibiotic had any significant effect on the fat content of the liver.

G. F. Garton.

5471

ROINE, P., ETTALA, T., RAITTO, A. and VARTIOVAARA, U. **The mode of action of aureomycin in the guinea-pig.** *Brit. J. Nutrition*, 1955, **9**, 181-191. [Dept. Nutrit. Chem., Univ. Helsinki.]

Groups of guineapigs were given to appetite a diet of ground clover and timothy hay 20, oatmeal 32, rye meal 22.4, casein 12, margarine 3.2, salt mixture 1.6, dried brewer's yeast 4, wheat germ 4 and cod liver oil 0.2 per cent., with 25 mg. ascorbic acid daily. One group of 9 young guineapigs received 100 mg. aureomycin hydrochloride per kg. bodyweight. All the animals lost weight from the second day of experiment and died within 10 days. When the aureomycin diet was given to 6 adult guineapigs all lost an average of 23 g. daily from the first day and died in 7 to 15 days. When aureomycin was given by mouth to groups of 4 or 5 animals in quantities of 25, 50 and 100 mg. per kg. bodyweight mortality was similar. Loss of weight and death occurred when 1 mg. aureomycin daily was given by subcutaneous injection to 4 animals, but smaller quantities did not prove harmful to groups of 3 or 4 animals. A group of 5 guineapigs which received an average of 0.2 mg. aureomycin daily by mouth died in 7 days, but a similar group given the same quantity subcutaneously remained in good health. With a

purified diet instead of the basal diet, results were similar and all 4 animals died within 8 days.

Bacteriological studies revealed the presence in the caecum of increased numbers of *Listeria* flora, particularly *Listeria monocytogenes*, when aureomycin was given by mouth, and this is believed to be the cause of the toxicity. Often the toxic effects were prevented or cured by previous or simultaneous administration of penicillin or chloramphenicol.—G. F. Garton.

5472

RUSHTON, M. A. **Dental effects of dietary aureomycin.** *Brit. Dent. J.*, 1955, **98**, 313-317.

Female hamsters were fed from 1 to 9 months of age on 3 similar diets, one with 35 per cent. and 2 with 28 per cent. powdered full cream milk, one of the latter with 0.002 per cent. aureomycin hydrochloride added. From each group 6 animals were killed and serial coronal sections were prepared and measured.

In the aureomycin group the epithelium extended less deeply along the molar roots, the thickness of dentine of the lower incisors was greater and the maturation of enamel was more advanced than in the other groups, the differences being statistically significant. The antibiotic is concluded to have had a general nutritional effect and not to have acted merely as a bactericidal or bacteriostatic agent.—D. Harvey.

5473

MELNYKOWYCZ, J. and JOHANSSON, K. R. **Formation of amines by intestinal microorganisms and the influence of chlortetracycline.** *J. Exp. Med.*, 1955, **101**, 507-517. [Dept. Bacteriol., Univ. Minnesota, Minneapolis.]

Paper chromatography of faeces and mixed faecal cultures from rats on a diet of fox checkers revealed the presence of putrescine and several other amines. These were mostly suppressed when chlortetracycline was added to the diet, or to the culture medium. It is suggested that the growth-stimulating effect of antibiotics may be due to reduction of output of toxic substances in the intestinal tract.—W. M. Deans.

5474

FERTMAN, M. B. **Newer concepts of experimental obesity.** *Arch. Int. Med.*, 1955, **95**, 794-805. [Endocrine Clin., Stanford Univ. Dept. Med., San Francisco, Calif.]

5475

FRENCH, R. G., ZIGHERA, C. Y. and MAYER, J. **Production of hypothalamic obesity in mouse.** *Federation Proc.*, 1955, **14**, 433-434. *Proc.* [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

5476

MAYER, J. and BARNETT, R. J. **Obesity following unilateral hypothalamic lesions in rats.** *Science*, 1955, **121**, 599-600. [Dept. Nutrit., Sch. Pub. Health, Harvard Univ., Boston, Mass.]

Lesions were produced electrically in the right side of the hypothalamus in 29 rats; 13 rats showed abnormally large appetites afterwards and 5 of them when killed weighed more than 350 g. In all these 5 the ventromedian nucleus was destroyed and parts of the periventricular, lateral and arcuate nuclei. The weight gains of rats with unilateral lesions were less than those of rats with bilateral lesions, a quarter of which weighed more than 500 g. 100 days after operation and another quarter more than 350 g.

It is suggested that in rats 2 centres, bilaterally arranged, normally prevent excessive eating, and the removal of one is about half as effective as the removal of both.—D. Duncan.

5477

MCCLURE, F. J. and FOLK, J. E. **Observations on the production of smooth-surface rat caries by diets containing skimmilk and whey powders.** *J. Nutrition*, 1955, **55**, 589-599. [Nat. Inst. Dent. Res., Nat. Inst. Health, Bethesda, Md.]

Seven synthetic diets were given to groups of weanling rats for periods of about 90 days. Three contained 35 per cent. skimmed milk powder; one of the powders was prepared by a freeze-drying process in which the temperature never exceeded 40° C., the second by a spray and the third by a roller process. The 4 other diets contained 25 per cent. whey powder with 10 per cent. casein to raise the protein content to about 13.5 per cent., the same as in the skimmed milk diets. One powder was spray- and another roller-dried; the third and fourth were these same powders after additional heat treatment (autoclaving). The incidence of caries, generally in lower buccal areas, was measured by the methods described in an earlier study (see Abst. 958, Vol. 24).

The results showed that the caries-producing effect of the diet was, in general, parallel with the degree of heating which the milk powder had undergone. Differences in sources of supply of the whey powders and in the findings for the groups with the autoclaved products, only one of which showed that that extra treatment increased the incidence, prevented the deduction that heat treatment in particular was the cause. The more general conclusion was that these results confirmed earlier findings with processed foodstuffs (see Abst. 2112, Vol. 23).—D. Harvey.

5478

MUHLER, J. C. and SHAFER, W. G. **Experimental dental caries. 8. Effect of thyroid-testosterone**

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administration on dental caries in rat. *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 191-193. [Dept. Chem., Univ. Indiana, Bloomington.]

Experiments with groups of weanling Sprague Dawley rats of both sexes, 225 in all, receiving a cariogenic maize diet and drinking water low in F, confirmed the authors' previous finding (Abst. 1048, Vol. 25) that dried thyroid added to the diet reduced the number of carious lesions and thiouracil increased it, and showed also that testosterone by intramuscular injection, though itself without effect, reinforced the effect of thyroid. It is suggested that the effect of the thyroid on the

teeth may be mediated through the salivary glands.

Analysis of the femurs showed that none of the treatments significantly affected F storage.

W. M. Deans.

5479

MATSUO, N. Studies on the toxicity of fish oil. 2. *J. Biochem., Tokyo*, 1954, **41**, 647-652. [Biochem. Inst., Tokyo Med. Coll.]

The toxicity of the ethyl ester of a highly unsaturated fatty acid from cuttlefish oil was shown to be due to the formation of peroxide by auto-oxidation. The toxicity was tested on rats.

E. M. Hume.

GENERAL METABOLISM AND FEEDING HABITS OF ANIMALS OTHER THAN MAMMALS AND BIRDS

5480

PATHAK, S. P. and SUWAL, P. N. Composition of liver fats of mature and embryo sharks (*Galeocerdo tigrinus*). *J. Amer. Oil Chem. Soc.*, 1955, **32**, 229-230. [Hindu Univ., Banaras, India.]

Fat was obtained from the liver of a mature female shark, *Galeocerdo tigrinus*, and from the pooled livers of 18 embryos of the same species. The mixed fatty acids of both specimens of fat were analysed by ester fractionation after preliminary resolution into groups of acids of differing unsaturation.

The total amounts of saturated fatty acids in the mature and embryonic liver fats were 43.3 and 39.1 per cent. : the palmitic acid content was about 25.0 per cent. in both. The unsaturated fatty

acids from the mature fat included 15.5 and 9.3 per cent. of the total as C_{20} and C_{22} acids, but C_{20} unsaturated acids accounted for only 4.0 per cent. of the total from the embryos and no C_{22} unsaturated acid was found.—G. A. Garton.

5481

FUKUDA, T., KIRIMURA, J., MATUDA, M. and SUZUKI, T. Microbiological determination of free amino-acids in the body fluid of the silkworm larva (*Bombyx mori*). *Nature*, 1955, **175**, 1041. [Sericult. Exp. Stat., Tokyo.]

The body fluid of the silkworm larva contained much greater amounts of the 17 amino-acids estimated, especially histidine and lysine, than human and rat plasma.—A. Hepburn.

5. HUMAN DIET IN RELATION TO HEALTH AND DISEASE

DIET

REQUIREMENTS

5482

VIVANCO, F. Necesidades alimenticias del hombre en el trabajo. [Dietary requirements of man for work.] *Arch. venezol. Nutricion*, 1954, **5**, 377-395. [Inst. Invest. Med., Inst. Nac. Nutric., Madrid.] English and German summaries.

Sources of error in the estimation of requirements are discussed and it is concluded that most official estimates, e.g., those of the British Medical Association, are too high. It is suggested that measurement of subcutaneous fat deposits might be useful in the study of standards for energy requirements under actual working conditions.—D. Duncan.

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5483

HEGSTED, D. M. World wide opportunities. *J. Amer. Dietetic Assoc.*, 1955, **31**, 236-242. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

The world-wide opportunities which are considered are those which are generally recognised as existing for the improvement of diets in areas which, by western standards, are regarded as underdeveloped. From his own work and that of colleagues in Peru the intakes in particular of Ca, protein and riboflavin have been found to be below recommended allowances. These recommendations are, for most nutrients, based on data collected elsewhere, and both the acceptability of such

standards and the wisdom of bringing intakes to the high levels they propose are questioned. Emphasis is laid on the lessons to be learned from field studies in these countries on the necessity for integrating agricultural and economic advances with nutritional needs.—D. Harvey.

5484

HEGSTED, D. M. Acerca de las recomendaciones dietéticas. [Dietary allowances.] *Arch. venezol. Nutricion*, 1954, 5, 215-221. [Dept. Nutrit., Harvard Sch. Med., Boston, Mass.] English and German summaries.

5485

AUSTRALIAN NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL, NUTRITION COMMITTEE. Recommended dietary allowances for Australia. *Med. J. Austral.*, 1954, ii, 113-115.

A table is given of allowances recommended for Australians. They are based on the needs of a reference man 25 years of age weighing 65 kg. and living in a warm temperate zone with mean annual temperature 64° F. and engaged in light industrial work. The allowances are for energy and 8 nutrients.—D. Harvey.

5486

SNYDERMAN, S. E., PRATT, E. L., CHEUNG, M. W., NORTON, P., HOLT, L. E. (Jr.), HANSEN, A. E. and PANOS, T. C. Phenylalanine requirement of normal infant. *Federation Proc.*, 1955, 14, 461. *Proc.* [Coll. Med., Univ., New York.]

5487

LEVERTON, R. M., JOHNSON, N., ELLISON, J., SKELLENGER, M., GESCHWENDER, D. and SCHMIDT, F. Amino acid requirement of young women: 4. Phenylalanine. *Federation Proc.*, 1955, 14, 441. *Proc.* [Nebraska Agric. Exp. Stat., Lincoln.]

5488

JONES, E. M., BAUMANN, C. A. and REYNOLDS, M. S. Methionine and lysine requirements of mature women. *Federation Proc.*, 1955, 14, 438-439. *Proc.* [Sch. Home Econ., Univ. Wisconsin, Madison.]

5489

HUSSLEIN, H. Die Ernährung der schwangeren Frau. [Feeding the pregnant woman.] *Wien. klin. Wochenschr.*, 1955, 67, 129-131.

In a lecture the needs of the normal pregnant woman for a good mixed diet containing adequate protein and fresh fruit and vegetables are discussed. Overweight is to be checked; energy intake should not be greatly increased and excess of salt is to be avoided. Problems of toxic conditions during pregnancy are discussed.—A. M. Copping.

5490

ORLSON, M. A. The calcium controversy. *J. Amer. Dietetic Assoc.*, 1955, 31, 333-339. [Dept. Foods Nutrit., Michigan State Coll., East Lansing.]

5491

GREENWALD, I. The human requirement for iodine. *Amer. J. Clin. Nutrit.*, 1955, 3, 215-224. [Coll. Med., Univ., New York.]

A review.

5492

EFREMOV, V. V. K voprosu ob izuchenii potrebnosti cheloveka v vitaminakh. [A contribution to the study of human vitamin requirements.] *Vop. Pitan.*, 1955, 14, No. 2, 8-13. [Inst. Pitan., Akad. Med. Nauk SSSR, Moscow.]

A review.

See also Absts. 5425, 5525.

FEEDING OF INFANTS AND CHILDREN

5493

CALAMARI, A. Problemas de alimentación del prematuro. [Problems of feeding the premature.] *Rev. española Pediat.*, 1955, 11, 177-183. [Inst. Provincial Niños, Arezzo.] French, English and German summaries.

In part this is a general discussion of the subject. At Arezzo 478 premature infants were studied, among whom mortality was 23.2 per cent.; among the 230 weighing less than 2000 g. it was 32.1 per cent. Infants fed on breast milk alone gained, on the average, 25-65 g. daily, and those fed on breast milk with 25 to 50 per cent. buttermilk added, 26-93 g.

Fresh human milk with a proportion of buttermilk is considered ideal for premature infants.

D. Duncan.

5494

GLEISS, J. and BÜSCHER, L. Beiträge zum Frühgeborenenproblem der Gegenwart. 7. Vergleichende Untersuchungen zur Ernährung der Frühgeborenen mit einer evaporierten 4/5-Milch, einer Frauenmilch mit Buttermilch-zusatz und einer mit unverdünnter, evaporierter Milch (Doppelmilch) angereicherten Frauenmilch. Zugleich ein Beitrag zur Fettoleranz des frühgeborenen Kindes. [The problem of the premature today. 7. Comparative studies of feeding premature infants on an evaporated 4/5 milk, breast milk with added buttermilk and breast milk enriched with undiluted evaporated milk (double milk). Also on the fat tolerance of the premature infant.] *Ztschr. Kinderheilk.*, 1955, 76, 126-137. [Kinderklin., Med. Akad., Düsseldorf.]

The study included 112 infants of birthweight less than 2300 g., in groups of 2 to 6 beds, not isolated from infection. From birth till jaundice disappeared they were given breast milk, at first diluted with a 5 per cent. sugar solution. Those that did not suck well were fed by indwelling tube. On the 10th day, all had 1.5 mg. vitamin D₃ by intramuscular injection. Those born at home or suspected of perinatal infection had antibiotic treatment [no further information]. There were 3 groups of 31, 31 and 50 infants, given, in that order, a 4/5 reconstituted evaporated cow's milk mixture with 4 per cent. sugar; a 4:1 mixture of breast milk and buttermilk; or breast milk with from 2 to 12 per cent. of undiluted, unsweetened evaporated (cow's) milk added. The third group did best in terms of daily weight gain, condition and absence of infection. In groups 1 and 2 there was a high incidence of interstitial pneumonia, in group 3 none. There was much less craniotabes and dyspepsia in group 3. This confirmed earlier observations.

The absence of fat dyspepsia in these premature infants given the "double" milk is attributed to the homogenisation of cow's milk fat in unheated breast milk containing its natural lipase.

I. Leitch.

5495

GLEISS, J. Zum Frühgeborenenproblem der Gegenwart. [The problem of the premature today.] 9. Über fütterungs- und umweltbedingte Atemstörungen bei Frühgeborenen. [9. Respiratory disturbances caused by feeding and environment in premature infants.] 10. Die Polyvinylchlorid-Dauersonde bei der Prophylaxe fütterungsbedingter Atemstörungen bei frühgeborenen Kindern. [10. The indwelling polyvinyl chloride tube for prevention of respiratory disturbances caused by feeding in premature infants.] *Ztschr. Kinderheilk.*, 1955, 76, 261-268; 269-280. [Kinderklin., Med. Akad., Düsseldorf.]

9. In a group of premature infants of which 256 survived and 133 died, respiratory disturbances were commoner among the former, except in those of birthweight between 2000 and 2250 g. They were mostly of the type clearly associated with feeding and mostly occurred during the first week of life. Accordingly, in a group of 194 prematures of all birthweights, alternate infants were fed for the first time after from 12 to 24 hr., or not fed until there were clear signs of hunger or thirst, as recommended by Gaisford and Schofield (Abst. 2532, Vol. 20). Delay of feeding reduced the incidence of respiratory disturbances due to feeding, but increased the mortality, owing to dehydration, so it is not recommended. Physiological causes of the respiratory disturbances are discussed.

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10. Compared with polyethylene, polyvinyl chloride tubing has the advantages of softer edges and resistance to boiling or sterilisation by heat. The same tube can be used for a week. The technique is fully described. Respiratory disturbances of the type associated with feeding did not occur among 389 premature infants fed in this way in the period 1952-54, nor did any other ill effect of tube feeding.—W. M. Deans.

5496

KAGAN, B. M., HESS, J. H., LUNDEEN, E., SHAFER, K., PARKER, J. B. and STIGALL, C. Feeding premature infants—a comparison of various milks. *Pediatrics*, 1955, 15, 373-382. [Kunststadter Labs. Paediat. Res., Sarah Morris Hosp. Child., Michael Reese Hosp., Chicago, Ill.] Spanish summary.

Premature infants of birthweight between 1000 and 2000 g. in 4 groups, 156 in all, were fed is calorically from the 7th to the 28th day, starting at 75 Cal. per kg. bodyweight, on human milk; a 4:1 mixture of human milk and skimmed cow's milk treated with *Streptococcus lacticus*; cow's milk powder modified to resemble human milk in proportions of protein, fat and lactose and in fatty acid composition; or a high-protein, high-ash, low-fat milk consisting of half-skimmed cow's milk with added carbohydrate.

The respective mean daily relative weight gains were 7.92 ± 0.44 (S.E.), 8.59 ± 0.30, 10.56 ± 0.31 and 11.52 ± 0.31 g. per kg. mean bodyweight; the differences between groups were significant, except that between the first 2. The results were similar when infants of birthweight below or above 1482 g. were considered separately, except that with the lighter infants the 2 cow's milk mixtures were equally effective. The differences in weight gain could not be related to energy intake which was planned to be uniform at 82 Cal. per kg. daily, nor to differences in intake of protein, fat or carbohydrate, but a linear relation between weight gain and ash intake was found. Analysis of the results of Gordon *et al.* (Abst. 2357, Vol. 17), who fed their subjects at the higher rate of 120 Cal. per kg. bodyweight daily, yielded a similar result. Other published studies are discussed, and it is suggested that owing to the immaturity of kidney function in premature infants high ash intake may lead to water retention, and that weight gain may, therefore, not be a satisfactory criterion of development.

W. M. Deans.

5497

STRÖDER, J. Leistungsfähige und wirtschaftliche Säuglingsernährung für die Empfehlung des Praktikers. [Efficient and economical infant diet for recommendation by practitioners.] *Münch. med. Wochenschr.*, 1955, 97, 221-224. [Kinderklin., Univ. Würzburg.]

The importance of simple principles in feeding infants is stressed. For healthy infants it is recommended that the diet bulk during the first 3 months of life should not exceed 1/5 of the body-weight, during the second trimester 1/6 and in the third and fourth trimesters 1/7. Five feeds daily are suggested in the early months, to be decreased to 4 by the end of the first year. Diluted cow's milk is preferred for bottle feeding with gruel during the first 3 months and then fruit and vegetable pulp is added. Whole milk may be given by about the eighth month. Juice of orange, lemon, tomato and carrot is suggested as source of vitamin C. The use of proprietary milk preparations and supplements for dyspepsia is outlined and discussed.—A. M. Copping.

5498

JELLIFFE, D. B. The value of prolonged breast feeding. *Indian J. Pediat.*, 1955, 22, 79-85. [Sect. Maternity and Child Welfare, All-India Inst. Hyg. Pub. Health, Calcutta.]

5499

WOOD, A. L. The history of artificial feeding of infants. *J. Amer. Dietetic Assoc.*, 1955, 31, 474-482. [Teachers Coll., Columbia Univ., New York.]

5500

AYKROYD, W. R. La F.A.O. y la nutrición de los niños. [FAO and the feeding of children.] *Arch. venezol. Nutricion*, 1954, 5, 197-213. [Div. Nutrit., FAO, Rome.] English and German summaries.

5501

SCRIMSHAW, N. S. La leche en relacion con la salud publica. [Milk in relation to the public health.] *Bol. Ofic. sanit. panamer.*, 1954, 37, 522-530. [Inst. Nutric. Centro América y Panamá.]

The nutritive value of milk is discussed with reference to the amounts of protein and vitamins that a supplement of milk could provide for children on poor diets in Central America. The necessity for clean milk and prevention of adulteration is emphasised. The disadvantages of skimmed milk and skimmed milk powder are outlined.

A. M. Copping.

5502

BAPTIST, N. G. and DE MEL, B. V. Growth and amino-acid intakes of children on a cereal-legume-vegetable diet. *Brit. J. Nutrition*, 1955, 9, 156-170. [Biochem. Lab., Dept. Physiol., Univ. Ceylon, Colombo.]

An experiment was made on the feeding of children between 1 and 6 years on an entirely vegetable diet, in which proteins were supplied by

3 cereals (rice, finger millet and wheat flour), 4 legumes (lentil, green gram, black gram and pigeon pea), local vegetables and coconut. Thirty were selected from about 50 children from poor families attending a crèche in Colombo where they got all their weekday meals, but only 23 completed the study. After 15 weeks on the normal crèche diet, one group had the all-vegetable diet and another group the same with $\frac{1}{2}$ oz. dried skimmed milk daily, for 17 weeks; both groups had Ca and vitamin supplements. Details of the diets and of the nutrients and essential amino-acids supplied by them are given. The crèche diet included a little meat and milk but compared with U.S. National Research Council recommendations was low in energy, Ca, vitamin B₁ and riboflavin; the all-vegetable diet with Ca and vitamin supplements was adequate except for Ca and riboflavin. Heights and weights were measured weekly.

No statistically significant difference was found between the group on the all-vegetable diet and that with milk also. The percentage increase in weight per week was significantly greater on both experimental diets than on the crèche diet, and the children showed greater vitality. It was concluded that, at least over short periods, a source of animal-protein factor is not essential for the growth of children. On the crèche diet growth was considered to be limited by shortage not of any one essential amino-acid but of total energy. On the assumption that the all-vegetable diet was adequate in essential amino-acids, a table of amino-acid requirements of children from 1 to 4 and 4 to 6 years on a rice diet under tropical conditions is presented.

The average daily cost of the all-vegetable diet was about 40 cents (7-2d.) per child.

W. M. Deans.

See also Absts. 4696, 4697, 5090, 5241, 5266, 5413, 5504, 5606.

DIETARY SURVEYS AND INDIVIDUAL STUDIES

5503

LATSKY, J. M. The basic approach to the problem of the recognition of human malnutrition. Some personal viewpoints. *S. African Med. J.*, 1955, 29, 291-297. [Union Dept. Nutrit.]

In this review of the usefulness and reliability of nutrition survey work it is argued that the clinician's primary role should be to exclude from a population under study subjects in whom active disease may be contributing to their undernourished condition. Thereafter the remaining subjects can be classified either as normal and adequately fed or as undernourished or malnourished because of the lack or ill balance of certain nutrients in their diets. The criteria may be somatometric or

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laboratory measurements supplemented by socio-economic studies.—D. Harvey.

5504

EPPRIGHT, E. S. and SWANSON, P. P. **Distribution of nutrients among meals and snacks of Iowa school children.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 256-260. [Dept. Food Nutrit., Iowa State Coll., Ames.]

The results of a 7-day diet study of 1188 children were analysed for energy and nutrient distribution among meals and snacks. For both boys and girls in each of 4 age groups lunch and dinner each provided about one-third or more of energy and nutrients. Breakfast provided 15 to 20 per cent. and snacks 13 to 17 per cent. of energy, but breakfast provided a higher proportion of nutrients than did snacks. Comparison of the results for the groups with the poorest and with the best diets showed that the disparity was not attributable to differences in any one meal.—F. C. Aitken.

5505

WARNICK, K. P., BRING, S. V. and WOODS, E. **Nutritional status of adolescent Idaho children. 1. Evaluation of seven-day dietary records.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 486-490. [Dept. Home Econ. Res., Univ. Idaho, Moscow.]

Seven-day records of food intake were kept by 274 schoolchildren aged 15 and 16 years. Boys consumed substantially more of all nutrients than did girls. The scarcest nutrients were ascorbic acid and vitamin A.

Statistically significant correlations were found between dietary intake and level in serum of ascorbic acid and between vitamin A intake and level of carotene in serum; significant correlations were not obtained between intakes of vitamin A and riboflavin and their levels in serum.

F. C. Aitken.

5506

DEN HARTOG, C. **Voedselconsumptie en enige van haar invloeden.** [Food consumption and some of its effects.] Wyt, Rotterdam, 1955, pp. 16.

In this inaugural lecture Professor den Hartog discusses diet and health in the Netherlands over the past 50 years with illustration drawn from studies elsewhere when Dutch data are not available. Improvements have been great. There is a tendency now to over-eat, associated with rising mortality from diabetes and coronary changes.

M. Eddison.

5507

Commissie tot onderzoek van de voedings- en gezondheidstoestand der Nederlandse bevolking. **Rapport betreffende het onderzoek naar de voedings- en gezondheidstoestand van de**

Nederlandse bevolking in de jaren 1941-1945, uitgezondert de z.g. hongervinter (1944-1945). Deel I, voeding. [Report on the investigation of the nutritional and health conditions of the Dutch people during the years 1941-1945, not including the so-called starvation winter (1944-1945). Part I, nutrition.] Pp. 90. Deel IA, voeding (bijlagen). [Part IA, nutrition (appendices).] Pp. 118. The Hague, 1953.

For this investigation the co-operation of 1979 families was obtained. In Holland at the time there were 2,254,000 families of 2 or more persons. Conclusions were drawn from data for the years 1941 to 1943, as in the next 2 years only part of the country was included in the investigation. The families were given a notebook and small scales and, with the help of trained visitors, they recorded the amounts of foods consumed in one week. These records were lost, but those of nutrient values remained available. For analysis the nutritional unit proposed by the League of Nations in 1936 was amended to take into consideration ages of children and occupations of breadwinners. Though all provinces were represented the numbers from different provinces were not proportionally correct. Seven occupational groups were listed: artisans, clerks, shopkeepers, professional people, agricultural labourers, farmers and nationally assisted persons. The amount of food consumed was found to vary within the occupational groups, increasing or decreasing with the incomes, except for professional people and assisted persons, where hardly any variation occurred within the group.

The energy value of the food consumed was below the range ± 15 per cent. of the standard recommended by the Education Bureau of the Nutrition Council in 35 per cent. of farmers' families and for all assisted persons; other groups showed values between those extremes. The mean intake was 3000 Cal. for farmers and 2000 Cal. for assisted persons. Energy intake fell for all groups in the years 1941 and 1942, but in 1943 it did so only in those families which previously had consumed fairly large amounts of food. The decrease was due mostly to a considerable fall in intake of fat, partly compensated by an increased intake of carbohydrate. The total amount of protein consumed remained fairly steady, but animal proteins tended to be replaced by vegetable proteins. Vitamin A intake was below normal in 50 per cent. of assisted persons and in 10 per cent. of professional people, with intermediate values for the other groups. Intake of vitamin B₁ was almost normal. Ascorbic acid intake varied with the season, normal values being found everywhere when fruit was plentiful; in winter intake was low for all assisted persons. With a norm of 1100 mg. Ca per man value, from 75 to 90 per cent. of the assisted families and between 15 and 70 per cent.

38

of the others did not reach that level. The intakes ranged from 800 to 1500 mg. daily. Fe intake increased from 1942 to 1943 and was rarely found to be below normal, the range being from 17 to 23 mg. daily. Variations in intake of nutrients in different regions were greatest in 1941.

M. Eddison.

5508

DEN HARTOG, C., NASS, C. A. G. and FRETZ, F. W. Onderzoek naar de voeding van de Leidse studenten. [Study of the diet of the Leyden students.] *Onderzoek. Meded. Nederlands Inst. Praev. Geneesk.*, 1955, pp. 38.

An inquiry by the Central Bureau of Statistics into the social conditions of students of the University who were living in Leyden showed that 42 per cent. of them did not have an adequate hot meal every day; it prompted this fuller investigation. In February 1950 a lengthy questionnaire was sent to all 4914 students registered for the academic year and 2900 replies were received; a second approach brought 90 more which were suitable for study. In the analysis a system of points was allocated according to the quality of the meals.

The number of students having one hot meal daily was 53 per cent. of the total; most had it in the evening. The adequacy of the meals of students living at home was greater than of those in rooms and first and sixth year students fared better than those of other years, the second-year ones being poorest. In rooms women students did better than men, although men spent more on their meals and gave lack of money as a reason for their inadequacy. In points awarded for beverages with emphasis on milk, men scored more than women, but for consumption of fruit the opposite was true.—M. Eddison.

5509

MONTINI, L. The parliamentary inquiry into destitution in Italy. *Internat. Labour Rev.*, 1955, 71, 60-78.

The author was vice-president of the commission of inquiry into destitution set up in 1951. The inquiry included a survey of the living conditions of 58,000 families representing all social classes and all parts of Italy, and a more detailed survey of 2000 destitute families receiving government assistance and representative of town life; the findings are briefly reported in some 3 pages of this article.

From the first survey it was estimated that 11.8 per cent. of all families (6 million people) had a "very low" standard of living; about half of these consumed no meat, sugar or wine, and the rest but little. Clothing was as bad, and housing even worse. About the same number had a "low" standard of living; 11 per cent. of them had no meat, sugar or wine. The two groups

together account for about a quarter of the population. Though families in these categories are found everywhere, in the south they amount to half of all families and in the islands to nearly as much.

The detailed survey showed that the average monthly expenditure of a poor town family of 2 adults and 2 children was 27,628 lire, of which 62 per cent. went on food, in contrast to 65,656 lire for Fiat workers in Turin and 56,764 lire for workers in Trieste found in contemporaneous inquiries and the hypothetical figure of 64,937 lire used to calculate the cost of living indices on which wage scales are based. The average daily consumptions were 2500 Cal. (Fiat workers 3140, workers in Trieste 3282); animal protein 19 g. (Fiat workers 49, Trieste workers, no figure given); fat 63 g. (91, 101); carbohydrates 390 g. (452, 396). For larger families the results were worse, and poor families in the south had barely 2270 Cal. with only 8 g. protein.—W. M. Deans.

5510

CLARK, F., MURRAY, J., WEISS, G. S. and GROSSMAN, E. Food consumption of urban families in the United States with an appraisal of methods of analysis. *U.S. Dept. Agric., Agric. Inform. Bull.* No. 132, October 1954, pp. vi + 203.

In 1948 and 1949 there were made in the United States a nation-wide survey of 1558 urban families, a survey of 1066 families in the 4 cities Birmingham, Ala., Buffalo, N.Y., Minneapolis-St. Paul, Minn. and San Francisco, Calif. and seasonal surveys, 1865 in number, of selected families in these same cities. Records were made over 1 week. The present report is in 2 parts.

The first part (pp. 2 to 13) gives the findings and compares them with results obtained in 1942 in a similar study (Family Food Consumption in the United States. Spring 1942. *U.S. Dept. Agric. Misc. Publ.* No. 550, 1944). Total expenditure on food in the spring of 1948 for the nation-wide study was, on the average, about \$26 per family of 3.29 persons; the average income before deduction of income tax was \$80 for the week. The mean cost of food eaten away from home was about \$4 per family. As a percentage of income expenditure on food was in the \$1000-2000 class 45 and in the \$5000-7500 class 24.

Average amounts of the more common foods purchased weekly per family were, milk 10.6 qt., eggs 1.8 doz. and, in lb., processed milk 1.6, cheese 1.0, bread 6.1, meat 10.5, sugar 2.9, fresh fruit 11.8, potatoes 7.0, fresh vegetables 9.2. Only for frozen fruits and vegetables, fresh fruits and beverages was income elasticity of expenditure so high that with a 10 per cent. difference in income there was as much as a 3 per cent. difference in expenditure. There was evidence that consumption

of milk by many of the children was probably below the amounts recommended. Seasonal variation in consumption was greatest for fruit and vegetables; for other groups of foods it was small.

The changes in food consumption between 1942 and 1948 were studied by dividing the families into 3 groups according to income. Consumptions of citrus fruit and tomatoes and of meat, poultry and fish increased considerably in the group with the lowest but changed little in that with the highest income. Consumption of sugar and sweets increased by 60 per cent. in the lowest and by 36 per cent. in the highest group because, it is thought, of the removal of rationing. For potatoes and sweet potatoes consumption declined by about 20 per cent. in all 3 groups.

In part 2 of the report (pp. 14 to 53) the problems and methods of analysing family food data are considered. Appendix A (pp. 55 to 173) contains 56 tables prepared from the data, Appendix B gives the methods used in collecting the data and in Appendix C the forms used in the survey are reproduced.—D. Harvey.

5511

CLARK, F. and LeBOVIT, C. B. **Food consumption of farm families, Meeker and Wright Counties, Minnesota, 1950.** *U.S. Dept. Agric., Agric. Information Bull. No. 127, January 1955*, pp. vii + 112.

A diet study was made in spring 1950 of 235 farming families; the data were for comparison with those collected in 1948 and 1949 for urban districts in the same State (see preceding Abst.). The recall method was employed for recording foods used in the preceding week. Income was mainly from the sale of dairy, livestock and poultry products and, after deduction of taxes, was, for more than half of the families, below \$2000 in 1949.

The average total money value of food for the week was \$18.88 per family of 2.64 persons. The value of food eaten away from home was \$0.61 per family. Mean amounts for some of the groups of foods used were, per household, milk (equivalent of all forms) 16.7 qt., eggs 2.2 doz. and, in lb., flour and cereals 5.8, bakery products 5.2, meat, poultry and fish 11.1, fresh fruit 6.4, potatoes 11.9 and fresh vegetables 3.7. On the average the U.S. National Research Council's recommended allowances (1948) for 9 nutrients were met, but diets were deficient in Ca and ascorbic acid for about one-third of the families and in vitamins A and B₁ and nicotinic acid for about one-sixth.

Comparison of country and city families showed that total money values of diets were about the same but that actual expenditure on food by country was only about half that by city families. The farming families used more grain products, fats, sugar, potatoes, milk and eggs but less fruit

and vegetables; their energy intake was greater and their amounts of vitamins A and C were less than those for city families. There was little difference in the extent to which the groups of families used foods which were bought ready processed.—D. Harvey.

5512

BABCOCK, M. J., CHURCH, H. N. and GATES, L. O. **Nutritional status of industrial workers. 2. Effects of education, age, income, and ethnic groups.** *Milbank Mem. Fund Quarterly*, 1955, **33**, 137-151. [New Jersey Agric. Exp. Stat., Rutgers Univ., New Brunswick.]

For part 1 see Abst. 2567, Vol. 25.

The effects on nutritional status of education to 4 grades, of age grouping in 3 categories and of income at 3 levels were examined by appropriate analyses of data used in earlier studies. The differences were found to be slight, the evidence being that intakes of Ca and P and the amounts of ascorbic acid in blood serum were greatest for those whose educational grade was highest, that intake of vitamin B₁ fell with advancing years and that low intakes of Ca and ascorbic acid were associated with low levels of income. It is concluded that when education in nutrition is to be provided it should be made available at all levels of educational attainment, age and income.

D. Harvey.

5513

McGANITY, W. J., BRIDGFORTH, E. B., MARTIN, M. P., NEWBILL, J. A. and DABBY, W. J. **The Vanderbilt cooperative study of maternal and infant nutrition. 8. Some nutritional implications.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 582-588. [Dept. Biochem., Sch. Med., Vanderbilt Univ., Nashville, Tenn.]

For Part 7 see Abst. 4111, Vol. 25.

The mean daily energy intakes of the subjects were 2140, 2200 and 2020 during the 1st, 2nd and 3rd trimesters, respectively. The need for an increment of 400 Cal. to meet "the hypothetical enhanced need of late pregnancy" is questioned; and it is concluded that the maximum energy intake is not, as is commonly supposed, during the third trimester. Of the patients studied 27 per cent. were given supplements; except for women with Fe-deficiency anaemia, to whom a supplement of Fe was of indisputable value, they did not differ from the unsupplemented group in respect of the incidence of maternal or foetal complications. The only physical finding which could be correlated with dietary or biochemical values was gingivitis; its incidence was about 30 per cent. when either the ascorbic acid intake was below 20 mg. daily or the level in the serum was below 0.2 mg. per 100 ml.; but even with very adequate dietary or serum ascorbic acid values the incidence of

gingivitis was still about 20 per cent. The relation of nutrition to abnormal obstetric conditions is summarised (see also Abst. 5103, Vol. 24), and the clinical findings are discussed in relation to energy and to protein intake. There was an increased incidence of pregnancy disease and of pre-eclampsia and eclampsia when intakes of energy and protein during the 3rd trimester were less than 1500 Cal. and 50 g.; it is emphasised that the disorders appeared "to be responsible for the lowered intake and not vice versa".—A. M. Thomson.

5514

STRAW, K. H. **Household budgets and nutritional analysis of food consumption in Barbados.** *Social Econ. Studies*, 1954, **3**, 5-38.

Household expenditure in Barbados tends to be seasonal, occurring more in what is known locally as the "crop season", 20 weeks between January and June when income derives from the sugar harvest, than in the "hard times", the remaining 32 weeks of the year. For the preparation of a cost-of-living index budgets were obtained from 1417 households of which 1336, 94.3 per cent., had weekly incomes of \$49 or less ($1\$ = 4s. 2d.$). From the data for these latter and with certain allowances for housing and clothing, since only 20 per cent. were paying rent and new clothes were generally bought in November and December, the average weekly pattern of expenditure per household weighted for season was calculated.

Average total expenditure was \$16.83, of which 50.8 per cent. was on food and accounted for by 12.3, 12.4, 4.7, 1.4, 3.3, 9.6, 0.5, 0.8, 3.2 and 2.6 per cent., respectively, on meat and fish, grain products and legumes, vegetables, fruit, sweets, dairy products with oils and fats, proprietary foods, condiments, beverages and food bought and eaten away from home. The highest individual items of expenditure were, in cents of a dollar, on rice 64, women's dresses 56, sugar 53 and bread 41. When expenditure within seasons was compared average weekly amounts were \$16.38 in "hard times" and \$15.29 in "crop season"; only in the food group was expenditure greater in "crop season" than in "hard times".

The nutritive value of the average diet was calculated after food purchased away from home had been distributed uniformly over the whole group and an allowance had been made for home-produced foods. Deficiencies which could be regarded as significant were found for Ca, riboflavin, vitamin A and animal protein, but the calculations were without reference to the nutrients in milk and yeast biscuits supplied to schoolchildren, in sugar cane chewed freely in the "crop season" and in the drinking water, which had 81 p.p.m. Ca.

The conclusion is that, on the basis of the proportion of income spent by its population on food,

Barbados is better off than the poorest but is a long way behind the richest countries of the world.

D. Harvey.

5515

BARRÓN, A. G. **Estudios de nutrición en el Perú. [Studies of diet in Peru.]** *Arch. venezol. Nutrición*, 1954, **5**, 263-284. [Inst. Bioquím., Fac. Med., Lima.] English and German summaries.

Work done at the *Instituto de Bioquímica y Nutrición* in Lima and published elsewhere or about to be published is reviewed.—D. Duncan.

5516

CHIRIBOGA, C. C. **La dieta del indio. [The diet of the Indian.]** *Arch. venezol. Nutrición*, 1954, **5**, 343-346. [Dept. Nutrit., Minist. Salud Púb., Peru.] English and German summaries.

The diet of Peruvian Indians appears since at least the sixteenth century to have violated all the laws of nutrition. Maize is the staple food. Next in importance is quinoa (*Chenopodium quinoa*), a small grain which is fairly rich in protein and rich in P and Fe and has good contents of Ca and of some B vitamins. In growth experiments with rats its protein had a biological value as high as that of milk protein at the 9 per cent. level. It was not improved by additions of tryptophan and leucine.

It is concluded that the Indians may have become adapted to a low protein intake, and that the high value of quinoa has probably helped their survival.

D. Duncan.

See also Absts. 5563, 5703.

GENERAL STUDIES: DIET PLANNING: EDUCATION

5517

TREMOLIÈRES, J. and CLAUDIAN, J. **Algunos aspectos de los hábitos alimenticios del hombre. [Dietary habits of man.]** *Arch. venezol. Nutrición*, 1954, **5**, 425-462. [Paris.] English and German summaries.

See Abst. 3419, Vol. 23.

5518

AUERSWALD, W. **Moderne Ernährungsprobleme. [Modern problems of nutrition.]** *Wien. klin. Wochenschr.*, 1955, **67**, 81-83. [Vienna.] A review.

5519

STARE, F. J. **Current trends in nutrition research.** *Acta paediat.*, 1955, **44**, 183 (with discussion 184). *Proc.* [Dept. Nutrit., Harvard Sch. Med., Boston, Mass.]

5520

KING, C. G. **Advances in nutrition research.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 225-229. [Nutrit. Found., New York.]

N.A. and R., October 1955

- 5521
FLANZY, M. Alimentation et technologie. [Diet and technology.] *Bull. Soc. sci. Hyg. aliment.*, 1955, **43**, 32-47.
- 5522
JOLLAFFE, N. Recent advances in nutrition of public health significance. *Metabolism*, 1955, **4**, 191-203.
- 5523
GOUNELLE, H. and TEULON, H. Alimentation et climat. [Diet and climate.] *Bull. Soc. sci. Hyg. aliment.*, 1955, **43**, 5-18. [Centre Recherches Foch.]
- 5524
RICHTER, C. Los anti-alimentos. [Antinutrients.] *Arch. venezol. Nutricion*, 1954, **5**, 397-405. [Paris.] English and German summaries.
- The term "antinutrients" is preferred to "antimetabolites". There are several groups. Antivitamins are of 4 types; vitamin analogues which block the action of the vitamin, substances like salicylic acid with no chemical relation to any vitamin, those which precipitate vitamins in insoluble form or otherwise inactivate them, and vitaminases.
- Substances such as phytin and oxalic acid are considered as antiminerals. The role of an antinutrient is also ascribed to alcohol, as an antagonist of sugar. Poor digestibility of some foods may be due to the presence in them of such antinutrients.
- D. Duncan.
- 5525
PURANDARE, N. A. Diet in pregnancy. *Antiseptic*, 1955, **52**, 259-266. [Shahranpur Rd., Nasik City, India.]
- 5526
SWANSON, P., PESEK, I., ANGUS, R., LIU, R. and SCHOENLEBER, F. Utilization of nutrients by elderly women. *Federation Proc.*, 1955, **14**, 452. *Proc.* [Nutrit. Lab., Home Econ. Res., Iowa State Coll., Ames.]
- 5527
HAWES, D. G. H. Food in mental hospitals. *Lancet*, 1955, **268**, 1214-1215.
- A brief account of possible shortcomings.
- 5528
TAYLOR, S. H. Emotional adjustment and physical development in approved school boys. *Med. Officer*, 1955, **93**, 275-278. [Desford Boys' Sch., City of Leicester Child. Dept.]
- Among boys in an approved school holding 140 or more there were indications of an association between emotional difficulties and poor growth in height; 3 illustrative case histories, with height curves, are given. Entrants with enuresis were shorter and lighter than those of similar age without enuresis. Curves of average height for age for the periods 1934-39, 1940-44 and 1945-48 show the normal increase, and disappearance of a former retardation of growth between the ages of 11½ and 12½, but the approved school boys of 1945-48 had attained only the heights of London County Council schoolboys in 1938.
- W. M. Deans.
- 5529
STEPP, W. Die Milch im Lichte der modernen Ernährungsforschung. [Milk in the light of modern nutritional research.] *Münch. med. Wochenschr.*, 1955, **97**, 323-325; 360-363. [1. Med. Klin., Univ. Munich.]
- A review.
- 5530
HOLMES, S. Report on the possibility of using "Tilapia mossambica" as human food. *Fiji Agric. J.*, 1954, **25**, 79. [Dept. Nutrit., S. Pacific Health Serv.]
- Fishpond culture of *Tilapia mossambica* is recommended for increasing the food supply of institutions in Fiji. The *Ipomea reptans* which grows in the pond would provide an excellent green vegetable of high food value.—J. S. Thomson.
- 5531
VERGARA URIBE, A. Harina de pescado para consumo humano. Pruebas de aceptabilidad al gusto. [Fishmeal for human consumption: tests of palatability.] *Arch. venezol. Nutricion*, 1954, **5**, 365-375. [Nutrit. Directorate, FAO en Latinoamérica, Chile.] English and German summaries.
- A sample of South African fishmeal purified for human consumption was tested. When it was added to a number of cooked dishes several of the tasters noticed in some preparations the fishy taste or smell or a gritty texture, but most dishes were acceptable. White bread with 7 per cent. of the meal was eaten by 140 schoolchildren for 50 days without complaint. The 90 g. bread given to each provided daily 4.58 g. protein and 446 mg. Ca, with appreciable quantities of vitamin B₁₂, Fe, P and other nutrients.
- It is hoped that fishmeal will provide an important source of cheap protein for children.
- D. Duncan.
- 5532
MASSEYEFF, R., CAMBON, A. and BERGERET, B. Les camerounais devant un aliment nouveau. [Attitude of the Cameroon people to a new food.] *Encyclopédie Mensuelle d'Outre-Mer*, April 1955, **5**, No. 56, pp. 5.

A fish hydrolysate was prepared in France and tested in municipal restaurants in Yaoundi and Douala and in some rural districts. Opinions of it were sought and were generally favourable; only about 12 per cent. of the 3900 people questioned expressed disapproval. Among those not in favour were young girls in school at Douala and the Muslim population of a village in the north.

D. Harvey.

5533

WILLIAMS, R. R. Los cereales en la alimentación latinoamericana. [Cereals in Latin-American diet.] *Arch. venezol. Nutricion*, 1954, 5, 355-364. [Williams Waterman Found.] English and German summaries.

The enrichment of cereals with vitamin B₁, riboflavin, nicotinic acid and Fe would be of great value in the Latin-American countries. Difficulties encountered in a survey of the possibilities of enrichment of wheat, rice and maize are discussed.

D. Duncan.

5534

MOSQUEDA SUÁREZ, A. La arepa criolla. [Criollo maize bread.] *Arch. venezol. Nutricion*, 1954, 5, 407-423. [Inst. Nac. Nutric.] English and German summaries.

The form of maize bread called *arepa* has greater importance in Venezuela than in the neighbouring countries. It is almost always prepared at home, though in Caracas there are a few places where it is produced industrially. The method of preparation is described; usually the cuticle and part of the germ are removed before the maize is washed, dried and ground. The flour is mixed with water and salt and the *arepa* is baked on an iron or clay girdle [flat plate] over a wood fire.

The composition of 16 samples of *arepa* is given in a table. They contained, per 100 g., 3.76 to 6.18 g. protein, 10.9 to 211 mg. Ca, 23 to 154 mg. P and 1.4 to 6.6 mg. Fe. The percentages of the requirements for an adult man of 65 kg. met by 100 g. *arepa* were energy 5.19 to 6.7, protein 6.4 to 9.5, Ca 2.2 to 9.4, Fe 11.7 to 28.8, carotene 0.12 to 1.4, vitamin B₁ 1.25 to 7.5, riboflavin 1.3 to 3.1 and nicotinic acid 0.8 to 3.4.

It is considered that the maize should be enriched with Fe and the above 3 vitamins of the B complex. Four experiments in enrichment were made and the cost was worked out.

The economic importance of *arepa* and the organisation of a campaign for maize enrichment are discussed.—D. Duncan.

5535

SZKILLADZIOWA, W. and SIOZKÓWNA, J. Próby zastosowania drożdży jadalnych do podniesienia wartości odżywczej potraw. [Tests on the use of edible yeasts in increasing the

food value of nourishing dishes.] *Rocz. Państwowego Zakł. Hig.*, 1954, 5, 369-382. Russian and English summaries.

In recipes for dishes containing wheat, potato, cabbage or vegetables as sources of protein there were included amounts of a mixture of equal parts of dried *Saccharomyces* and *Torula* which supplied from 7 to 15 g. yeast per portion. Of 22 which were tested 19 were found satisfactory. Growth curves are reproduced for rats given 1 of 4 prepared dishes, 3 of which contained yeast, and for control animals given egg white instead of yeast. (From summary.)—D. Harvey.

5536

HAIGHT, T. H. and PIERCE, W. E. Effect of prolonged antibiotic administration on the weight of healthy young males. *J. Nutrition*, 1955, 56, 151-161. [Naval Med. Res. Unit No. 4, U.S. Naval Training Centre, Great Lakes, Ill.]

Six companies each of 55 Navy recruits were arranged at random in 3 groups. All the subjects received once daily for 7 weeks one of 3 preparations identical in appearance and consisting of 250 mg. of aureomycin, 100,000 units of buffered procaine penicillin or a calcium carbonate placebo. Records of nude height and weight were made at the start of the experiment and after 4 and 7 weeks. Calculations were made for individual and group weight changes, both actual and relative to the standard weight for age and height. The final data were available from 310 subjects.

Changes after 4 and 7 weeks revealed a distinct difference in favour of the antibiotic groups; the differences between the aureomycin and the penicillin group were not significant. The average change after 7 weeks was 4.8 lb. for the aureomycin, 4.1 lb. for the penicillin and 2.7 lb. for the placebo group.

To estimate normal group to group variation a similar study was made in which no treatment was given; in this experiment no significant difference was found.—G. F. Garton.

5537

STABE, F. J. Teaching of nutrition in the medical curriculum. *Acta paediat.*, 1955, 44, 179 (with discussion 179). *Proc.* [Dept. Nutrit., Harvard Sch. Med., Boston, Mass.]

5538

COLL, P. L. Algunos apuntes doctrinales sobre nutrición y salud pública. [Some matters of principle on nutrition and public health.] *Arch. venezol. Nutricion*, 1954, 5, 237-261. [Inst. Nac. Nutric.] English and German summaries.

The prevention of disorders produced by inadequate diet is considered to be the domain of the public health authority, but "social nutrition" is a wider problem with agronomic, cultural, economic, political and other aspects; it lies outside the field of public health.—D. Duncan.

5539

SANTA MARIA, J. V. Nueva organización de las actividades alimentarias en Chile. [New organisation of food services in Chile.] *Arch. venezol. Nutricion*, 1954, 5, 327-342. [Univ. Chile.] English and German summaries.

Several former branches of nutrition services in Chile have, since 1952, been united under the National Health Service into a sub-department of nutrition, with research, dietetic, educational and technological sections. Public health centres have been set up.—D. Duncan.

5540

RODRIGUEZ CABRERA, J. H. Educación alimentaria en Venezuela. [Diet education in Venezuela.] *Arch. venezol. Nutricion*, 1954, 5, 179-195. [Inst. Nac. Nutric.] English and German summaries.

FOOD ECONOMICS AND STATISTICS

5541

WALSH, R. M. A further note on methods of increasing domestic consumption of farm products. *J. Farm Econ.*, 1955, 37, 110-114. [Market Development Branch, U.S. Dept. Agric.]

Some of the suggestions made by Wilcox (Abst. 2608, Vol. 25) are elaborated. It is stated that an increase in consumption of about one-fourth or one-third among the poorest tenth of the population would absorb most of the present U.S. agricultural surpluses.—W. M. Deans.

5542

FOX, F. W. Agricultural foundations of nutrition. 12. Conclusion. *S. African Med. J.*, 1955, 29, 282-284. [S. African Inst. Med. Res., Johannesburg.]

Besides the purely agricultural aspects discussed in earlier parts (see Abst. 4068, Vol. 25) other conditions must be considered. The Conservation Act of 1946 has done much to counteract misuse of the soil but, economically, stability of prices must be ensured and, socially, rural amenities must be provided, if the business of farming is to maintain its attractiveness in competition with urban life.—D. Harvey.

5543

NEL, L. W. A. Food balance sheet of the Union. *Farming in S. Africa*, 1955, 30, 10-12. [Div. Econ., Pretoria.]

The provisional food balance sheet for 1953 shows that for 13,153,000 people in the Union of South Africa 6,080,100 short tons of food were available, providing, daily, 2748 Cal., 73.88 g. protein and 64.22 g. fat. Comparison is made

with data for the period 1935 to 1939 and with annual values since 1947. Increase in amounts of food has resulted in the energy available per head being 20 per cent. greater than before the war.

D. Harvey.

5544

ROUX, R. An approach to minimum wage fixing in Guatemala. *Internat. Labour Rev.*, 1955, 71, 1-33. [Internat. Labour Office, Geneva.]

In this account of the work of an I.L.O. technical assistance mission which visited Guatemala in 1951-52 to advise on the introduction of a minimum wage, there are 3 pages on food costs. From earlier investigations, the typical working-class family was assumed to consist of parents and 3 children in towns and parents and 4 children in the country and to spend 63 per cent. of its income on food. The minimum nutrients per consumer unit daily recommended by the Institute of Nutrition for Central America and Panama for town and country people, respectively, were: Cal. 2600, 3000; total protein 78, 79 g., of which 20 g. was animal; Ca 0.7, 0.9 g.; Fe 23, 20 mg.; vitamin A 4250 I.U. for both; vitamin B₁ 1.4, 2.7 mg.; riboflavin 1.0 mg. for both; nicotinic acid 15, 18 mg.; ascorbic acid 75, 50 mg. Tables give the amounts of foods required to provide a town and a country family with these. In February 1952 the town family diet for a week cost 8.07 quetzals in Guatemala City, and by allowing for other expenditure a minimum living wage of 1.83 quetzals a day was deduced.

The minimum wage eventually fixed for the textile and garment industries throughout the country, including home-workers, was 1.25 quetzals a day.—W. M. Deans.

See also Abst. 4671.

DIET IN ETIOLOGY OF DISEASE

METHODS OF ASSESSING STATE OF HEALTH

5545

EDWARDS, D. A. W., HAMMOND, W. H., HEALY, M. J. R., TANNER, J. M. and WHITEHOUSE, R. H. Design and accuracy of callipers for measuring subcutaneous tissue thickness. *Brit. J. Nutrition*, 1955, **9**, 133-143. [Dept. Clin. Res., University Coll. Hosp. Med. Sch., London.]

Preliminary experiments with callipers of the Franzen type suggested the following recommendations: (1) the faces should be rectangular and of size 6×15 mm., with well rounded edges and corners; (2) the pressure exerted at the faces should not vary by more than 2.0 g. per sq. mm. over the range of openings from 2 to 40 mm.; (3) a standard pressure of 10 g. per sq. mm. should be applied; (4) readings to the nearest 0.5 mm. and preferably to 0.1 mm. should be possible. A commercial callipers adapted to conform to these specifications was tested. For conversion to a logarithmic scale the formula

$$z = 100 \log_{10} (\text{reading in tenths of 1 mm.} - 18)$$

was used, for which a table is reproduced. It was found that standard deviations of the differences between duplicate readings by one observer at the triceps, subscapular and supra-iliac sites were from 2 to 4 units, equivalent to 0.3 to 0.6 mm. at a jaw opening of 7 mm. When the sites were marked on the bodies of subjects the equivalent figures for different observers were roughly twice as large. It is considered that these modifications will eliminate all important instrumental sources of error and that experimental error would be almost entirely that due to differences in picking up skinfolds, which could be reduced "by rigorous specification of technique and training of observers". Of the sites tested in these trials, the biceps seemed to be least satisfactory, the triceps and subscapular fairly good and the supra-iliac site intermediate.—A. M. Thomson.

5546

NEWMAN, R. W. Skin-fold changes with increasing obesity in young American males. *Human Biol.*, 1955, **27**, 53-64. [Quartermaster Res. Development Centre, Natick, Mass.]

Skin-fold measurements were made on recruits to the United States Army before their basic training; of the men 1702 were white and 292 negroid. The average age was 20.7 years, range 17 to 28. The sites selected for measurement were: chest, above and to the right of the right nipple; arm, on the back and halfway up the upper arm;

back, immediately below the right scapula; abdomen, to the left of the navel; and thigh, above the right kneecap. Measurements were made 3 times in each site by each of 2 technicians and value was taken.

The results showed no reason why body fat of negroes should not be calculated on the same equation as that of whites, but there was a relative lack of obese negro subjects, so data on these are inadequate. Among those whose combined skin-fold value on abdomen, arm and chest totalled 45 mm. or less the lines for mean values for each thickness when plotted against the sum for the 3 areas closely approximated to straight lines; differences between races were not significant. The negroid group had low values for chest and arm and high values for abdomen and the differences in fat distribution were visible.

When all the subjects were considered together the deposition of fat became relatively greater on the torso than on the extremities as obesity was greater. This is probably because of physical limitation of storage space in the extremities.

D. Duncan.

5547

NICOLINI, A. Le sideropenie. Utilità della prova di carico con ferro. [Iron deficiency: usefulness of the load test with iron.] *Lattante*, 1954, **25**, 684-687. *Proc.* [Osp. Maggiore, Milan.]

GENERAL STUDIES

5548

BETKE, K. Ernährung und Ernährungsstörungen im Säuglingsalter. [Nutrition and nutritional disturbances in infancy.] *Monatsschr. Kinderheilk.*, 1955, **103**, 29-35. [Freiburg i. B.]

5549

PRATT, A. G. and READ, W. T. (Jr.) Influence of type of feeding on pH of stool, pH of skin, and incidence of perianal dermatitis in the newborn infant. *J. Pediat.*, 1955, **46**, 539-543. [Maternity Nursery, Cooper Hosp., Camden, N.J.]

The pH of stool, of the peri-anal skin after cleaning with water, and of the axillary skin was tested in 251 babies aged between 2 and 9 days. One hundred and forty were breast fed, 50 were fed on a mixture which simulated breast milk and in which lactose was the sole carbohydrate and 61 were fed on a mixture of cow's milk, maltose and dextrin. There was little difference between the groups in stool pH, which was just over 6 during the first 3 days of life; after the fourth day the mean values for pH of stool and peri-anal skin fell

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in the babies on breast or simulated breast milk, but altered little in those given the cow's milk mixture. There was a wide range with considerable overlapping, but the differences are said to be statistically significant. The axillary skin *pH* became more acid with age in all groups.

The percentage incidence of peri-anal dermatitis was 7.1 in breast-fed infants, 14.0 in those on simulated breast milk and 19.7 in those on the cow's milk mixture. It is concluded that this supports the belief that the incidence of peri-anal dermatitis is greater when the stool is more alkaline, although there was no real difference in *pH* between the stools in breast milk and simulated breast milk groups.—F. E. Hytten.

5550

JEUNE, M., CHARRAT, A. and LOAEC, Y. Un cas de galactosémie du nourrisson. [Galactosaemia in an infant.] *Pédiatrie*, 1954, 9, 813-821. [24 Place Bellecour, Lyons.]

A case of galactosaemia is described, the second recorded in France. Diagnosis was based on the presence of cataract, and of galactose in the urine which disappeared on withdrawal of cow's milk from the diet. The infant failed to thrive on a soya milk diet and died. It was one of a family of 7 of which 4 were living and 2 had died in early infancy with a state strongly suggesting that they too had had galactosaemia. Warning is given that if galactosaemia has been diagnosed in an infant all subsequent children should be carefully watched from birth.—E. M. Hume.

5551

DOUGLAS, C. A. Trends in the risks of childbearing and in the mortalities of infants during the last 30 years. *J. Obstet. Gynaecol. Brit. Empire*, 1955, 62, 216-231. [Dept. Health, Scotland.] A review.

5552

JEANS, P. C., SMITH, M. B. and STEARNS, G. Incidence of prematurity in relation to maternal nutrition. *J. Amer. Dietetic Assoc.*, 1955, 31, 576-581. [Dept. Paediat., Coll. Med., State Univ. Iowa, Iowa City.]

Pregnant women of low income, living in a predominantly rural area and numbering 404, whose dietary habits had been studied (Abst. 1064, Vol. 22), gave birth to 28 premature infants. Of these, 4 were twins and 4 were severely deformed. One was stillborn and deformed and 5, including 2 deformed, died. All the deaths and deformities were among infants of women whose diets were classified as poor or very poor, and the incidence of prematurity was strikingly high in women on very poor diets. Among the better nourished, prematurity tended to be associated with frequency

and high total number of pregnancies, and with multiple births; all their premature infants lived and were in good condition when leaving hospital. A. M. Thomson.

5553

LEPKOVSKY, S. and BORSON, H. J. Nutrition and nutritional disease. *Annu. Rev. Med.*, 1955, 6, 93-124. [Div. Poultry Husb., Univ. California, Berkeley.]

5554

DENOIX, P. F. and BERNARD, P. F. Alimentation et cancer. [Diet and cancer.] *Bull. Soc. sci. Hyg. aliment.*, 1955, 43, 22-31. [Inst. Gustave Roussy.]

5555

HULSHOFF, A. A. Medical examination of repatriated Dutch nationals from Indonesia, 1946-1951. *Acta Leidensia*, 1954, 24, 133-146 (with discussion 146-149). See Abst. 1138, Vol. 25.

5556

LOWENSTEIN, F. W. A study of blood pressure in relation to diet in Chinese and Caucasian students in New York City. *Amer. Heart J.*, 1955, 49, 562-580. [Columbia Sch. Pub. Health, New York.] Interlingua summary.

Chinese students born in the Orient but living in the United States were selected and grouped according to their dietary habits. The types of diets and the numbers of men and women, respectively, in the groups were: Chinese diet, 32, 17; mixed Chinese and American diet, 40, 16; American diet, 38, 19. In a fourth group were 70 male and 30 female Caucasians on American diet. Medical histories were taken to exclude any with signs of hypertension and to provide information on the occurrence of cardiovascular or renal disease in their parents. Weight, height and chest circumference were recorded and blood pressure was measured at 4 periods of the year. Mean data and comparisons between groups are summarised for each period.

In physical characters for both sexes Chinese were smaller than Americans. Cardiovascular and renal disease was more common in parents of Caucasians than of Chinese.

Mean blood pressures were lower for Chinese than for Caucasian men but no significant difference was found for women. Data were thought to be too few to allow the difference to be attributed to diet. For both sexes and in all groups blood pressure fell in successive periods, but the fall was not seasonal since it did not take place at the same examination in each group, but in Caucasians at the earlier and in Chinese at the later dates. Sex differences were smaller among

Chinese than among Caucasians and may have been due to the preponderance of femaleness in Chinese males, the endocrine aspects of which are suggested as deserving further study.

For an earlier report see Abst. 1147, Vol. 25.
D. Harvey.

5557

PAQUIN, A. J. The rate of body weight loss following surgical stress of uniform intensity. *Ann. Surg.*, 1955, 141, 383-387. [Dept. Surg., Cornell Univ. Med. Coll., New York.]

The surgical stress studied in 12 comparable men with carcinoma of the bladder was radical total cystectomy performed by surgeons of similar skill. Weight was measured under standard conditions immediately before anaesthesia was induced and at daily intervals after operation. It was found that, in general, loss of weight occurred for between 7 and 30 days, after which weight was fairly constant. Rate of loss was expressed in terms of daily loss per kg. initial weight and was corrected to 70 kg. For comparison Benedict's data (*Carnegie Inst. Washington Publ.* No. 203, 1915) for fasting subjects were used.

Although the total number of subjects was small, loss of weight appeared to be uniform, an average of 4.1 g. per kg. daily with range from 2 to 6 g. for the patients, with a corresponding amount of 6.26 g. for the fasting subjects.

D. Harvey.

5558

COOKE, A. M. Osteoporosis. *Lancet*, 1955, 268, 877-882; 929-937. [Radcliffe Infirmary, Oxford.]

A shortened version of the Lumeian lectures for 1955 delivered to the Royal College of Physicians of London is reproduced with 143 references. Inpatient records of Radcliffe Infirmary and some other sources provided 50 cases of spinal osteoporosis in 43 women and 7 men. Their age distribution, males and females, respectively, in decades from 30 years upwards was 1, 1: 0, 4; 3, 8; 2, 11; 0, 15; 1, 3; 0, 1. The preponderance of females points to an endocrine effect. Of these patients 37 were given hormones, most of them both oestrogens and androgens; 5 had oestrogens only and 3 androgens only. Later information was obtained from 27, of whom all but 4 reported subjective improvement. In view of the large number of elderly people likely to be similarly affected the encouragement of some physical activity and the maintenance of adequate intakes of protein, Ca and P should be borne in mind by those responsible for their care.

D. Harvey.

5559

WILKINSON, J. The diagnosis of onyala. *East African Med. J.*, 1954, 31, 549-556. [Church

of Scotland Mission Hosp., Tumutuini, P.O. Karatina, Kenya Colony.]

The 3 conditions from which onyala may be distinguished are thrombocytopenic purpura, scurvy and the bite of certain snakes. The blood bullae which form in the mouth are typical for diagnostic purposes.—E. M. Hume.

5560

HARRIES, J. R. A case of onyala in a male Taita showing diminution or absence of megakaryocytes. *East African Med. J.*, 1954, 31, 557-559.

A mild case of onyala is described. The unknown causative factor apparently depressed the formation of megakaryocytes by the reticulo-endothelial system, and did not destroy the platelets after their liberation into the peripheral bloodstream. The same factor probably caused an increase in the capillary permeability. The effects of the factor were short-lived, and it is improbable that the treatment given with ascorbic acid and vitamin K had any effect. The cause is thought to have been endogenous.—E. M. Hume.

See also Absts. 5196, 5714.

DEFICIENCY DISEASES

General

5561

PORTILLA, J. M. Síndrome pluricausal infantil. [Multiple deficiencies in infants.] *Arch. venez. Nutrición*, 1954, 5, 463-467. [Inst. Nac. Nutrición, Quito, Ecuador.] English and German summaries.

Five infants with multiple deficiencies of different types were treated in Quito. One was believed to have kwashiorkor, not previously described from Quito, and a later visit to the district from which it came showed that in some families all the children seemed to have kwashiorkor.—D. Duncan.

5562

DEMAEYER, E. M. and VANDERBORCHT, H. Évolution de la courbe pondérale et de certains constituants biochimiques et hématologiques du sang dans le kwashiorkor. [Course of the weight curve and of certain biochemical and haematological constituents of the blood in kwashiorkor.] *Ann. Soc. belge Méd. trop.*, 1954, 34, 417-432. [Inst. Recherche Sci. Afrique Centr., Centre Kivu-Lwiro, Belgian Congo.] English and Flemish summaries.

A study was made of 79 infants aged from 1 to 6 years with severe kwashiorkor; nearly all suffered from intestinal parasites and malaria and many had a congestive lesion of the lung. In 3 age groups, 1½ to 2, 2½ to 3 and 4 to 6 years, they were treated with a skimmed milk diet which was

gradually increased to be a high-protein, mixed diet yielding 150 Cal. per kg. bodyweight daily by the 15th to 20th day, according to the individual child's response. After the disappearance of oedema the mean weight of the infants in all groups was significantly lower than the standard weight of healthy American or Uganda children of the same age group, but the daily weight gain under treatment was much in excess of the gain in normal children. Serum proteins were estimated in the 79 infants on admission and in 55 on discharge; in 24 the changes in the albumin fraction during treatment were followed in detail. As in other series, the total protein and albumin were reduced on admission and rose on treatment. Analysis of the data showed that the regeneration of albumin was a function of the logarithm of the time under treatment, from which it was possible to determine how long any child would have to remain in hospital before the albumin reached a given level.

Serum amylase was estimated in a small number of the patients and was significantly lower than in healthy members of the local population and also than the corresponding American values; the value rose rapidly in the first few days of treatment, remained stationary for about 5 weeks and then rose further. Cholesterol and cholesterol esters also were low on admission and rose during treatment. Haematological studies showed moderate anaemia associated with raised mean corpuscular volume and reduced mean corpuscular Hb concentration. There was only a very moderate improvement in the anaemia while the child was in hospital. The findings are discussed. The methods used and the values obtained are described in detail.

L. Wills.

5563

DUFOUR, G. and DUFOUR, Y. Observations sur la croissance des nourrissons et sur quelques aspects de carence alimentaire à La Réunion. [Growth of infants and some aspects of nutritional deficiency in the island of Réunion.] *Méd. trop.*, 1954, 14, 741-748.

Vital statistics of Réunion showed a high infant mortality rate which had remained stationary in spite of an intensive antimalarial campaign and improved antenatal care. The mortality rate for the age group from 1 to 5 years also was very high. Examination of pregnant women in 1952 showed, in addition to severe undernourishment, an enlarged heart in 20.2 per cent.; the percentage fell to 8.4 in 1953 when whole rice had replaced polished rice, rice being the staple diet of the people. Other signs of deficiency of the vitamin B complex were common. Cirrhosis of the liver was absent from the adult population, but a condition diagnosed as kwashiorkor was frequent in young children. The malnutrition was probably of

recent origin and due to the sudden large increase in the population which followed the antimalarial campaign and caused extreme poverty. During the cane harvest the state of nutrition improved; at the same time the mean birthweight rose above that found in other months. Weaning was general at 8 months; a marked flattening of the weight curve followed weaning, and the kwashiorkor syndrome was frequently seen. The most severe cases were among the white or coloured, not among the African, infants.—L. Wills.

5564

DIAMOND, I. Kwashiorkor in a white American male. *Amer. J. Pathol.*, 1955, 31, 596. *Proc. [Sch. Med., Univ. Louisville, Ky.]*

Findings correspond to those hitherto described only in African negroes.

5565

WOŹNIAK-TORBIK, E., PUDLIK, K., SZCZYGEŁOWA, M., BERGER, S. and SZCZYGEŁ, A. Sezonowe wahania w stanie odżywienia młodzieży żywnościowej zbiorowo lub indywidualnie. [Seasonal variations in nutritional status of children living in school boarding houses or in their parents' homes.] *Rocz. Państwowego Zakł. Hig.*, 1955, 6, 23-32. Russian and English summaries.

From December 1951 to November 1952 a periodical assessment was made of the nutritional status of high school children, one group living in the school boarding house and the other at home, to see if there was any seasonal variation.

Signs of vitamin A deficiency were found clinically in only 2 per cent. of the children in the boarding house; the absence of any sign is attributed to the distribution of cod liver oil during the winter. Vitamin C deficiency occurred in 7 per cent. during the winter and in 2 per cent. in the autumn. Signs of riboflavin and nicotinic acid deficiencies were noted more often in winter than at any other period. Biochemical examination confirmed the clinical findings.

In a group of children attending high school for the first time, clinical and biochemical signs of vitamin A, riboflavin and nicotinic acid deficiencies were less frequent than in the boarding house children, but there were more cases of vitamin C deficiency. (From summary.)—J. S. Thomson.

5566

FIELD, C. E. Nutritional problems in the Federation. *Med. J. Malaya*, 1955, 9, 179-194. [Penang.]

In this lecture nutritional disorders found in young children in Malaya are reviewed and, of a number of questions posed, 2 are discussed in more detail. The clinical manifestations of beriberi are

so variable that the condition appears to require further investigation. Kwashiorkor in classic form is not, in the author's experience, widespread, but findings in 8 cases are quoted to show that minor degrees of it are common and that, when either severe infection or infestation with roundworm is superimposed, the complete picture will generally appear.—D. Harvey.

5567

USBORNE, V. **Home and dispensary findings in a survey of Wasukuma children.** *East African Med. J.*, 1954, 31, 531-536. [E. African Med. Surv.]

A survey was made in their own homes of 629 children under 11 years of age, belonging to the Sukuma tribe, living in the Kwimba district of Sukumaland in Tanganyika, just to the south of Lake Victoria. Maize, millet and sweet potatoes are the common crops. The survey included other than nutritional conditions. Kwashiorkor was not seen. The number of children with xerosis was 60, dental caries of the milk teeth 17, hypochromotrichia 128, fluorosis 11 and indented tongue 9.—E. M. Hume.

5568

GUNASEKARA, D. B. **Nutrition studies of a prison population.** *Ceylon Med. J.*, 1954, 2, 224-233. [Med. Res. Inst., Colombo.]

A nutritional study of 638 inmates of a prison in Ceylon included a single clinical examination, especially for signs of vitamin deficiency, a record of weight and an estimation of the nutrients in the diet. Choice of diet, vegetarian or non-vegetarian, was permitted and change from one to the other allowed. Little difference existed between the diets; their respective protein contents were 84 and 96 g.

After the examination reference was made to weights at admission which were available for 391 men; analysis of the data showed that they formed a group representative of the whole population. Of the 391 inmates, 244 had gained, 124 had lost and 23 had not altered in weight since admission; the evidence was that, with reference to weight on admission, it was probable that men under 120 lb. would gain, those between 120 and 140 lb. would show no change, and those over 140 lb., of whom there were few, would lose. Duration of stay appeared not to affect weight change.

Signs of vitamin deficiency were grouped in relation to length of stay. During the first year xerophthalmia, phrynoderma, angular stomatitis and glossitis were less frequent; phrynoderma was commonest between 1 and 4 years; sore canthi were less common under 2 years. In general, signs of deficiency of vitamin A and riboflavin were

relatively infrequent under 1 year; the vegetarian and non-vegetarian diets contained, respectively, 2330 and 2315 I.U. vitamin A and 0.87 and 0.92 mg. riboflavin. Only with phrynoderma was the association of mosaic skin statistically significant. There was no significant difference in the prevalence of any condition among men who gained, lost or showed no change in weight.—D. Harvey.

5569

RADHAKRISHNA RAO. **Enfermedades en la India debidas a deficiencias en la nutrición. [Disorders in India attributed to dietary deficiencies.]** *Arch. venezol. Nutricion*, 1954, 5, 223-235. [Haffkine Inst., Bombay.] English and German summaries.

5570

BLANKENHORN, M. A. **Effect of vitamin deficiency on the heart and circulation.** *Circulation*, 1955, 11, 288-291. [Dept. Int. Med., Coll. Med., Univ. Cincinnati, Ohio.]

5571

CHARMOT, G. **L'étiologie des cirrhoses africaines. [The etiology of cirrhosis in Africans.]** *Méd. trop.*, 1954, 14, 689-702. [Corps de Santé Colonial.]

5572

SANDSTEAD, H. R., KOEHN, C. J. and SESSIONS, S. M. **Enlargement of the parotid gland in malnutrition.** *Amer. J. Clin. Nutr.*, 1955, 3, 198-214. [Lab. Biochem., Nat. Inst. Arthritis Metabol. Dis., Nat. Inst. Health, Bethesda 14, Md.]

The populations studied were 3168 Asians in a field study (Sandstead and Koehn, to be published), 1094 patients in a mental hospital in District of Columbia and 165 Indian patients at mission hospitals in New Mexico and Arizona. In these respective groups the incidence of enlargement of parotid glands was 13.7, 3.5 and 12 per cent. The glands were not tender or painful. Some histological and tissue culture examinations were made; although these were few, the hypertrophy appeared to be non-inflammatory and due to a swelling of individual cells with, in the chronic stage, replacement of acinar tissue by fat.

From the information available from diet studies intakes of energy were sometimes low and those of fat and vitamins A, B₁ and C and riboflavin were probably inadequate. The conditions with which the enlargement was generally associated were those of underweight, cheilosis and pellagroid pigmentation when present together, and, to lesser degrees, calf muscle tenderness and anaemia.

D. Harvey.

N.A. and R., October 1955

5573

DRESNER, E. Aetiology and pathogenesis of rheumatoid arthritis. *Amer. J. Med.*, 1955, 18, 74-111. [Dept. Med., Coll. Med., Univ. New York.]

In a review with 441 references, a short section is included on the possible part played by vitamin deficiencies.

5574

WALKER, A. R. P. Does a low intake of calcium cause or promote the development of rickets? *Amer. J. Clin. Nutrit.*, 1955, 3, 114-120. [Human Biochem. Unit, S. African Inst. Med. Res., Johannesburg.]

A review.

See also Absts. 4696, 5737.

Vitamin A

5575

BERGER, S. and SEGAL, P. Współzależność adaptacji i poziomu witaminy A w surowicy krwi. [The mutual dependence of dark adaptation and vitamin A values in blood serum.] *Roczn. Państwowego Zakł. Hig.*, 1955, 6, 47-54. Russian and English summaries.

In a study of 23 persons, aged from 24 to 67 years, some of whom complained of defective eyesight, a relationship was found in most of them between capacity for dark adaptation and the vitamin A value in the blood serum. It is suggested that the 2 tests supplement one another and that a combination of both tends to a more accurate estimation of vitamin A status. (From summary.)—J. S. Thomson.

5576

GILLUM, H. L., MORGAN, A. F. and SAILER, F. Nutritional status of the aging. 5. Vitamin A and carotene. *J. Nutrition*, 1955, 55, 655-670. [California Agric. Exp. Stat., Univ. California, Berkeley.]

For other parts see Absts. 3986, 5444, and 5649, Vol. 25.

Carotene and vitamin A were estimated in blood from 514 healthy subjects over 50 years of age resident in San Mateo County, California. All were living in their own homes except 30 men dwelling in a county home. Physical examinations and 7-day dietary records were made. A small negative correlation was found between advancing age and the values for carotene and vitamin A. The mean values by decades, in μg . per cent., were for vitamin A 60, 54 and 50 for men, and 57, 57 and 50 for women. Corresponding carotene values were 119, 116 and 109 for men and 123, 127 and 113 for women. Differences

between the values for the sexes were not significant. About half the subjects, both male and female, had vitamin A values between 40 and 60 μg . per cent. Variation was wider in the carotene values, 62 per cent. of the subjects having values between 60 and 150 μg . per cent. From the records of dietary intake of pre-formed vitamin A and carotene the probable daily equivalents in terms of vitamin A were 2387 μg . for men and 1833 for women living in their own homes, and 1354 μg . for the men in the county home, which amounted, respectively, to 33, 27 and 21 μg . per kg. bodyweight. Of the total vitamin A potency, carotene represented 27, 29 and 18 per cent. in the 3 groups, respectively. About 11 per cent. of the men and 20 per cent. of the women in their own homes took vitamin A supplements more or less regularly and so raised their average total daily intakes from 10,640 to 11,470 I.U. for the men and from 8450 to 10,200 I.U. for the women. Thickening of the bulbar conjunctiva was seen in 94.1 per cent. of the subjects but was not correlated with the values for vitamin A in the serum, being no greater in those with the lower than with the higher values. The same was true for other changes in the skin and conjunctiva usually associated with deficiency of vitamin A. Thickening of the bulbar conjunctiva as a sign of vitamin A deficiency is considered to be of questionable value. I. M. Sharman.

5577

HILLMAN, R. W., NERB, L. and HERTZ, H. The blood plasma vitamin A/carotene ratio and tocopherol concentration in relation to the metabolic state. *Amer. J. Digest. Dis.*, 1955, 22, 128-131. [Dept. Med., Brooklyn Hosp., N.Y.]

The B.M.R. and the concentration of vitamin A and carotene in the plasma were estimated in 25 patients with suspected thyroid dysfunction. Serum cholesterol was estimated in 24 and plasma tocopherol in 16 of them. The B.M.R. ranged from -23 to +50 per cent. In the plasma, per 100 ml., cholesterol ranged from 133 to 431 mg., vitamin A from 8 to 64 μg ., carotene from 41 to 310 μg ., and tocopherol from 0.1 to 0.7 mg. There appeared to be no relation between the value for vitamin A or carotene and the B.M.R. or between those values and that for cholesterol. There was also no relation between the plasma vitamin A: carotene ratio and serum cholesterol or B.M.R., between plasma tocopherol and plasma vitamin A or carotene or between plasma tocopherol and serum cholesterol or B.M.R. In 3 cases of hyperthyroidism in which serial estimations were made, the vitamin A and carotene values for 2 tended to vary inversely with the B.M.R. The plasma tocopherol level rose during control of the thyroid state in all 3 cases.—R. J. Ward.

5578

- AGARWAL, L. P. and ADHAULIA, H. N. **Role of vitamin A in healing corneal ulcers.** *Amer. J. Ophthalmol.*, 1954, **38**, 810-816. [Dept. Ophthalmol., Med. Coll., Agra, India.]
See Abst. 2651, Vol. 25.

5579

- ANDRÉ, L. M. and GANZIN, M. **Étude préliminaire de la prévention possible des carences protidiques par les lipides végétaux riches en carotène.** [Preliminary study of the possible prevention of protein deficiency by means of vegetable fats rich in carotene.] *Bull. Soc. Pathol. exot.*, 1954, **47**, 597-614. [Sect. Aliment. S.G.H.M.P., Hôp. Gén., Inst. Pasteur, Brazzaville.]

Results of several surveys are referred to, but special attention is given to one in the village of Koungoulou in the region of Sibiti in mid-Congo. The village is in the forest, far from the more industrialised regions of the Congo. It is inhabited by 2 tribes, the Bakota and Bayaka, each eating in its old-established, traditional way. Signs of deficiency were shown by only about 10 per cent. of the children. The children take part in the adult meals as soon as they can sit. The chief food is cooked bananas with palm oil and green-stuffs. Fish is eaten during 5 months of the year, and sometimes meat from the chase, but very little from domestic animals. Seventy-seven meals were inventoried and the mean daily content of nutrients was calculated per head for adults and children alike. The amount of food eaten appeared to be limited only by appetite. The daily intakes calculated were Cal. 2254, protein 27 g., fat 88 g. and carbohydrate 391 g. The amount of carotene supplied daily by palm oil alone was 32,000 µg. The mean blood values shown by the children for vitamin A and carotene were very high, 284 and 874 I.U. per cent., respectively. The authors believe that they have observed signs of vitamin A excess among the people consuming these large amounts of carotene. Although the protein intake was so low, the kwashiorkor syndrome was absent. It is considered that the optimum utilisation of the small amount of protein is promoted by the ample supply of palm oil. It is suggested that the action of carotene is mediated by the effect of vitamin A in depressing the activity of the thyroid gland.—E. M. Hume.

Vitamin D

5580

- HARRISON, H. E. **Vitamin D and calcium requirements.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 483-485. [Baltimore City Hosp., Md.]

5581

- MELLANDER, O. **The need of vitamin D in growing individuals.** *Acta paediat.*, 1955, **44**, 177. *Proc.*

5582

- WINBERG, J. **The incidence of rickets in Sweden.** *Acta paediat.*, 1955, **44**, 176-177. *Proc.*

5583

- SYDOW, G. v. **The desirability of uniform principles in the prophylaxis of rickets.** *Acta paediat.*, 1955, **44**, 177 (with discussion 177). *Proc.*

5584

- BILLE, B. S. V. **Non-rachitic craniotabes.** *Acta paediat.*, 1955, **44**, 185-202. [Child. Hosp., Sundsvall, Sweden.] French, German and Spanish summaries.

In the year 1 June 1951 to 31 May 1952, 1541 newborn infants in the Obstetric Clinic at Sundsvall were examined for the presence of craniotabes; of 1417 born spontaneously with cephalic presentation, 228 had congenital craniotabes. It was possible to follow 274 of the children for 1 or 2 years; 47 of them had congenital craniotabes and 61 developed it in the first year. None of them had any sign of rickets. Analysis of factors such as sex, birthweight, birth order, presentation, and posture in *utero*, led the author to the conclusion that craniotabes is not a sign of rickets, but is induced by pressure on the skull, from the pelvic bones in *utero*, or from lying in the horizontal position after birth.—E. M. Hume.

5585

- JESSERER, H. **Ueber die Wirkungsunterschiede verschiedener Lösungen von Vitamin D₂ und D₃ bei peroraler, intravenöser und intramuskulärer Zufuhr.** [Differing activity of various solutions of vitamin D₂ and D₃ given orally and by intravenous and intramuscular injection.] *Wien. klin. Wochenschr.*, 1955, **67**, 49-53. [I. Med. Klin., Univ. Vienna.]

Available preparations of vitamin D₂, vitamin D₃ and dihydrotachysterol are listed. The author summarises his experience over 8 years of 260 patients with parathyroid insufficiency.

Given orally, the 3 substances were of equal potency for raising the blood Ca value, and the medium, whether oil, alcohol or water, was unimportant if the patient's capacity for absorption was unimpaired. A single oral dose of from 90 to 150 mg. of any of the 3 could safely be given to combat tetany, but the same amount given in smaller doses over several days was much more likely to induce hypercalcaemia. For maintenance the oral dose recommended is 2 or 3 mg. daily or from 15 to 20 mg. a week.

Given intravenously the 3 substances had a more rapid, powerful and lasting effect on the blood Ca value than when given orally, and vitamin D₂ was more active than the other 2. The dose should be only about one-third of that given orally.

Given by intramuscular injection in oil solution, the 3 substances were much less active, vitamin D₂ being relatively more active than the other 2. In a water preparation vitamin D₂ and vitamin D₃ were almost as active as when given orally. No aqueous preparation of dihydrotachysterol was available.

To test the rate of absorption of 4 different oils given by intramuscular injection, Sudan III was dissolved in them, and they were injected into groups of 3 rats, and the degree of staining of the body fat was recorded for up to 6 days. Cod liver oil was rapidly absorbed, olive oil more slowly, arachis oil very little and paraffin oil not at all.

E. M. Hume.

5586

JONKIS, J. H. P. Amino-aciduria and rickets. *Helv. paediat. Acta*, 1955, 10, 245-256 (with discussion 256-257). [Child. Clin., Univ. Groningen.]

5587

FISHMAN, W. H. Methionine-induced amino-aciduria in vitamin D resistant rickets. *Metabolism*, 1955, 4, 107-109. [Cancer Res. Unit, Med. Sch., Tufts Coll., Boston, Mass.]

Two children, 6 years of age, were admitted to hospital with a diagnosis of vitamin-D-resistant rickets. They were given daily for 10 days 4.2 g. methionine in 3 divided doses. In the urine, free amino-acids were estimated by formol titration, aliphatic hydroxyamino-acids by the periodate method, and a number of individual amino-acids microbiologically. After treatment with methionine the total amounts of hydroxyamino-acids and of free amino-acids were greatly increased compared with the amounts in control periods of 12 days before and after administration of methionine. Methionine was the only amino-acid tested of which the amount was greater in the period of treatment than in the subsequent control period. [In the Table figures are not given for individual amino-acids in the control period before treatment, and it is not clear whether no test was made or none of those amino-acids was found.]

E. M. Hume.

5588

ZETTERSTRÖM, R. Metabolic studies during treatment of vitamin D refractory rickets. *Helv. paediat. Acta*, 1955, 10, 148. [Dept. Paediat., Karolinska Sjukhuset, Stockholm.]

See Abst. 4103, Vol. 25.

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5589

RUPP, W. and SWOBODA, W. Untersuchungen des PO₄-Stoffwechsels bei vitamin-D-resistenter Rachitis ("Phosphatdiabetes"). 2. [Phosphate metabolism in vitamin-D-resistant rickets ("phosphate diabetes").] 2.] *Helv. paediat. Acta*, 1955, 10, 135-147. [Kinderklin., Univ. Vienna.] French, Italian and English summaries.

5590

FYFE, W. M. Rheumatoid arthritis in childhood. *Glasgow Med. J.*, 1955, 36, 103-110. [Dept. Child Health, Univ. Glasgow.]

In a follow-up study of some 50 children with rheumatoid arthritis it is reported that 7 were treated in the initial attack or in relapse with 100,000 "units" of vitamin D₂ daily for periods ranging for from 10 days to 5 years. In 6 of them the disease has become quiescent and 5 have recovered completely. Nevertheless, only a guarded claim is made for the treatment, in view of the variable course and prognosis of rheumatoid arthritis.—W. M. Deans.

5591

JONKIS, J. H. P. Het toevoegen van vitamine D aan voedingsmiddelen. [The addition of vitamin D to foodstuffs.] *Voeding*, 1955, 16, 518-523. [Algem. Ziekenhuis, Groningen.]

The general problem of obtaining vitamin D from food and from exposure to the sun's rays is discussed with reference to the need for its addition to children's diets in Holland. The difficulties of adding vitamin D to milk are considered too great for it to serve as vehicle. Margarine with 20 or 40 I.U. added per g. is suggested as the best way to provide vitamin D in all diets. The prophylactic administration of a single large dose to children at about 18 months of age is suggested as a precaution against rickets.—A. M. Copping.

5592

TE RIELE, J. H. Margarine en rachitisbestrijding. [Margarine and prevention of rickets.] *Voeding*, 1955, 16, 188-195. English and French summaries.

Dols and Sevenster concluded in a report, *Productie en bestemming van melk in Nederland*, Rotterdam, 1950 that it was improbable for the nutritional value of margarine in a properly varied diet to be inferior to that of butter, if the margarine contained the same amount of vitamins as butter. In the same year the Milk Utilisation Committee of the Agricultural Institute reported that proof had not yet been given of the equal nutritive value of butter and margarine. The controversy is still of importance, for consumption of margarine in the Netherlands is at present 3

times that before the war, being about 50 g. per head daily. The high price of butter is undoubtedly a contributing reason, but the margarine is of good quality, maintained in spite of competition for markets by reduction of price. Since such large quantities of margarine are eaten, the addition of vitamins could be used to prevent rickets, the only remaining deficiency disease of children in the Netherlands. The number of margarine factories in the Netherlands is small, so supervision would be easy. It is suggested that solutions of vitamins A and D in standard proportions might be made by chemical factories and delivered to the margarine factories in sealed bottles. A relatively simple test for vitamin A would then serve to show the content of vitamin D. The addition of 40 I.U. vitamin D₂ and 40 I.U. vitamin A per g. margarine is advocated.

M. Eddison.

5593

THIERS, H. De l'intérêt biologique et thérapeutique du stigmastérol. [Biological and therapeutic importance of stigmastérol.] *Presse méd.*, 1955, 63, 820-821. [Lyons.]

In this general article the work on stigmastérol as an anti-stiffness factor for guineapigs is summarised (see Abst. 1356, and Titles 826 and 1357, Vol. 21). The substance is a plant sterol, long known. Its use, especially with ascorbic acid, is strongly advocated for the treatment in human beings of scleroderma, inflammatory cellulitis after phlebitis, neuritis of vertebral or muscular origin, coxarthroses and some forms of spondylitis. It is thought to act directly and not as a precursor of vitamin D. It is transformed by ultraviolet irradiation into a form of vitamin D which is active in man when given for long periods.

L. Wills.

5594

SARTORI, E. Die klinische Bedeutung der Calciumfraktionen der Körpersäfte. [The clinical importance of the calcium fractions in the body fluids.] *Helv. paediat. Acta*, 1955, 10, 104-110. [Kinderklin., Univ. Padua.]

Ca in body fluids was estimated in 3 fractions, Caa representing the ionised fraction biologically active for frog's heart, Cab the non-ionised ultrafiltrable fraction and Cac the colloidal non-ultrafiltrable Ca. Over 1000 estimations were made, mostly in serum and cerebrospinal fluid (CSF) of healthy and sick children.

The values for total Ca and for the 3 fractions [presumably in mg. per 100 ml.] in healthy children were: for serum 9.96, 4.52 ± 0.27 , 1.13 ± 0.40 and 4.28 ± 0.58 , and for CSF 5.47, 4.73 ± 0.22 , 0.38 ± 0.25 and 0.36 ± 0.18 . The difference in Cac is highly significant.

The values for 20 healthy infants were compared with those for 20 infants with manifest rachito-

genic tetany, 6 with latent rachitogenic tetany, 2 with so-called idiopathic hypoparathyroid tetany and 2 with tetany of renal origin. In all the infants with tetany the greatest fall in serum Ca was in fraction Caa; in manifest rachitogenic tetany the Caa fraction was lower than in latent tetany, and this was accompanied by a significant fall in Cac. In hypoparathyroid tetany the Caa fraction was very low and a significant rise in Cab occurred.

Administration of vitamin D₂ with A.T. 10 to 9 infants with rickets caused in 7 an increase in serum Caa and usually a clinical improvement, but the effect on the serum Caa was less than that produced by vitamin D₂ alone in 6 normal children. In CSF the fall in Caa in tetany was less than that in serum.

Clinically the level of Caa in serum can be used to differentiate tetany from generalised convulsions (see next Abst.).—D. Duncan.

5595

SARTORI, E. Die Calciumtoxikose als klinisch-biochemischer Zustand. [Calcium poisoning as a clinical and biochemical condition.] *Helv. paediat. Acta*, 1955, 10, 123-130. [Kinderklin., Univ. Padua.]

The serum Ca was studied in 5 infants aged from 3½ to 11 months, with vitamin D intoxication. Compared with normal infants they had high total serum Ca and increases probably in all the fractions (see preceding Abst.), but especially in Caa. The mean values, in mg. per cent., for normal and affected infants, and the ranges for the latter, were: total Ca 9.62, 14.09, 10.32 to 16.75; Caa 4.31, 7.38, 5.68 to 9.46; Cab 1.06, 1.33, 1.06 to 2.18; Cac 4.25, 5.38, 2.64 to 8.17. The rise in Caa reflected the severity of the clinical condition.

The rise in Caa is the direct result of administration of vitamin D, and smaller increases were seen in children 3 to 6 years old in the 48 hr. after they received 25 mg. vitamin D.

In 2 infants there was a reduction in thiocyanate space during vitamin D intoxication. The role of the high concentration of Ca ions in the tissues in the production of the clinical syndrome is discussed. It is suggested that treatment should include slow intravenous infusion of sodium citrate in Ca-free physiological solution.—D. Duncan.

Vitamin E

5596

BECKMANN, R. and FEGELER, F. Serum-Tocopherol-Studien nach peroraler Applikation von dl- α -Tocopherolacetat. [Serum tocopherol studies after oral administration of dl- α -tocopheryl acetate.] *Klin. Wochenschr.*, 1955, 33, 76-82. [Kinderklin., Westfälische Wilhelms Univ., Münster.]

Previous reports on the tocopherol content of human serum are reviewed and summarised. When tocopherol was estimated by the $\alpha\alpha'$ -dipyridyl and ferric chloride method in 105 subjects, values ranging from 1200 to 2000, average 1500, $\mu\text{g. per } 100 \text{ ml. serum}$ were obtained. A single dose of from 100 to 600 mg. tocopheryl acetate as tablets, or as an aqueous dispersion given orally, or as an injection of pure *dl*- α -tocopherol, caused a rise in the serum tocopherol. The value reached the maximum about 4 hr. after the dose and returned to normal in 24 hr. except when very large doses of 200 mg. were given. An oily solution of tocopherol by cutaneous application had no effect on the serum value; given by mouth or injection it was absorbed equally rapidly into the bloodstream.—A. M. Copping.

5597

HORWITT, M. K., DUNCAN, G. D. and HARVEY, C. C. Hemolysis of red blood cells as a function of tocopherol concentration in blood of adult human males. *Federation Proc.*, 1955, 14, 437-438. *Proc. [Biochem. Res. Lab., Elgin State Hosp., Ill.]*

5598

RÄHÄ, N. Hemolysis of human blood caused by oxygen and its prevention with vitamin E: preliminary report. *Acta paediat.*, 1955, 44, 128-131. [Child Clin., Helsinki.] French, German and Spanish summaries.

Specimens of adult human blood were treated with heparin and incubated in bottles in which the empty space was filled with pure oxygen. The degree of haemolysis, estimated by centrifuging and measuring the red colour of the plasma, increased with the time and temperature of incubation. When different concentrations of oxygen were used the degree of haemolysis after 24 hours' incubation at 37° C. was roughly proportional to the concentration of oxygen. Haemolysis was much reduced if the subjects had been given 100 mg. vitamin E 24 hr. previously. In preliminary experiments on umbilical blood, marked haemolysis occurred even at low concentrations of oxygen, and even when the mother had been given vitamin E before delivery.—T. Moore.

5599

BISHOP, C., RAND, R. and TALBOTT, J. H. Rate of conversion of isotopic glycine to uric acid in the normal and gouty human and how this is affected by vitamin E and folic acid. *Metabolism*, 1955, 4, 174-182. [Chronic Dis. Res. Inst., Dept. Med., Buffalo, N.Y.]

One normal subject and 2 gouty subjects, one with tophi and one without, were given from 1.5 to 2 g. isotopic glycine, and uric acid excretion

was estimated by the isotope dilution technique. From the isotope concentration of the urinary uric acid after it had reached its maximum, a first-order rate constant was calculated which was considered to represent the turnover rate of a precursor of uric acid. Short term therapy with folic acid and vitamin E was given to the gouty subject without tophi; it did not affect the rate constant but after intensive and prolonged treatment with vitamin E the constant reverted to that found in the normal subject.—R. J. Ward.

5600

SIMON, E. J., EISENGART, A. and MILHORAT, A. T. A metabolite of vitamin E from human urine. *Federation Proc.*, 1955, 14, 281. *Proc. [Dept. Psychiat., Cornell Univ. Med. Coll., New York.]*

5601

BUTLER, E. B. and McKNIGHT, E. Vitamin E in the treatment of primary dysmenorrhoea. *Lancet*, 1955, 268, 844-847. [Dept. Obstet. Gynaecol., Cardiff Royal Infirmary.]

A group of 100 women with a history of painful or incapacitating dysmenorrhoea was selected from students living in university hostels. Half of them, chosen at random, were given 50 mg. α -tocopherol, three times daily for 14 days, starting 10 days before menstruation was expected. The others received a dummy. Neither the women nor the investigators knew which treatment was received. The effect of the treatment was usually studied over 3 menstruations. The number of women who reported less pain or incapacity during the 3 menstruations, compared with their previous experience, was much greater among those given tocopherol than among those given the dummy.

T. Moore.

5602

GALLETTI, F., GELLI, G. and GIUNGI, F. Azione della vitamina E sul processo di coagulazione del sangue in malati di tubercolosi polmonare. [Effect of vitamin E on blood coagulation in patients with pulmonary tuberculosis.] *Acta vitaminol.*, 1955, 9, 71-75. [Inst. Clin. Med. Gen., Univ. Bologna.] French, English, German and Spanish summaries.

Tests were made on the coagulatory factors in the blood and on vascular fragility in 10 healthy subjects and 28 patients with pulmonary tuberculosis, beforehand, and on 5 successive days 2 hr. after intramuscular injection of 100 mg. α -tocopheryl acetate. In the healthy subjects the blood tests and capillary fragility were normal, and were not affected by treatment with vitamin E. In the tuberculous subjects coagulation time, bleeding time, retraction of the clot and vascular fragility were normal or almost normal and were

not affected by treatment with vitamin E, but in 20 of the patients there was prolongation of the prothrombin time and time of Howell, both of which returned to normal after administration of vitamin E.—E. M. Hume.

Vitamin B Complex

5603

WESTENBRINK, H. G. K. La détection d'états de carence de thiamine par l'examen de l'urine et du sang. [Detection of vitamin B₁ deficiency by examination of the urine and blood.] *Rev. Méd. Liège*, 1952, 7, 730-735. [Dept. Chim. Physiol., Univ. Utrecht.]

A summary is given of two lectures reviewing the methods and the clinical importance of estimating vitamin B₁ in the urine and blood as a means of detecting mild deficiency of the vitamin. A. M. Copping.

5604

SMITH, J. M., CHEN, S. D., BERT, M. H. and DICK, E. Estimation of thiamine allowances for adolescent boys. *Federation Proc.*, 1955, 14, 450. *Proc.* [Dept. Home Econ., Univ. Illinois, Urbana.]

5605

ALPER, C., WOHL, M. G., SHUMAN, C. R. and FITTIGOLD, J. J. (Jr.). Effect of parenteral thiamine administration on pyruvic acid levels in patients with chronic heart failure. *Federation Proc.*, 1955, 14, 426. *Proc.* [Div. Biol. Chem., Hahnemann Med. Coll., Philadelphia, Pa.]

5606

CRUMP, J. and TULLY, R. The use of partial vitamin supplements in the treatment of growth failure in children. *J. Pediat.*, 1955, 46, 671-681. [Women's Med. Coll., Philadelphia, Pa.]

Fifty children with malnutrition and anorexia from chronic illness were treated at home for periods of up to 2 years with daily oral doses of 25 µg. vitamin B₁₂ and 10 mg. vitamin B₁. Clinically the children appeared to benefit; there was generally an increase in appetite with a resulting increase in rate of growth and gain of weight. Wetzel Grid charts were prepared for 32 of the children; they showed significant positive shifts in 16 of 18 children whose charts showed a previous failure of growth, but no significant change in the 14 children with no such indication. The results were confirmed in a further analysis by the Tuxford method.—L. Wills.

5607

FINZI, M. Vitamine e senescenza (Le Vitamine del gruppo B). [Vitamins and senescence: the

vitamins of the B group.] *Acta gerontol.*, 1954, 4, 188-191. [Bologna.]

A review.

5608

CAPOBIANCO, A., DE FRANCISCO, G., NEGRO, L. and RAMBALDI, M. Modificazioni della resistenza osmotica delle emazie. Ricerche in vitro. 3. Azione di alcune vitamine del complesso B. [Modification of the osmotic resistance of red blood cells. Investigation in vitro. 3. Action of certain vitamins of the B complex.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1801-1804. [Ist. Fisiol., Univ. Naples.]

For Part 1 see Title 5655, Vol. 25.

5609

HICKIS, G. W. Pellagra in an English child. *Arch. Dis. Childhood*, 1955, 30, 195-196. [Odstock Hosp., Salisbury.]

A girl aged 4 years and 9 months was admitted to hospital suffering from pellagra. Her appetite was poor and her nicotinic acid intake was estimated to have been only 1 mg. daily. She had refused to take cereals, meat or green vegetables since the age of 1 year. Some improvement resulted from treatment with nicotinamide, but stimulation of appetite with insulin was necessary for full recovery.—F. C. Aitken.

5610

GOLDSMITH, G. A., MILLER, O. N., UNGLAUB, W. G. and GIBBENS, J. Procedures for evaluation of niacin nutrition. *Federation Proc.*, 1955, 14, 434-435. *Proc.* [Dept. Med., Sch. Med., Tulane Univ., New Orleans, La.]

5611

HORWITT, M. K. Niacin-tryptophan relationships in the development of pellagra. *Amer. J. Clin. Nutr.*, 1955, 3, 244-245. [Biochem. Res. Lab., Elgin State Hosp., Ill.]

Thirty patients received for 2 years a basal diet providing daily 2300 Cal., 5.8 mg. nicotinic acid and 265 mg. tryptophan daily, some without supplement, and others with daily supplements of 10 mg. nicotinic acid or 100 mg. tryptophan. By comparing the urinary excretion of N²-methyl-nicotinamide with the intake of nicotinic acid precursors in the 3 groups, the relative values of tryptophan and nicotinic acid for producing N²-methylnicotinamide were found to be 1 and 60. If, therefore, 60 mg. tryptophan is taken as the equivalent of 1 mg. nicotinic acid, the total nicotinic acid equivalent of the basal diet, which contained little maize and produced no pellagra, was 4.43 mg. per 1000 Cal. Similar calculations for the pellagra-producing diets of Goldberger et al. (*U.S. Pub. Health Rep.*, 1915, 30, 3336) and of

N.A. and R., October 1955

Goldsmith *et al.* (Abst. 856, Vol. 23) gave values of 3.90 and 3.93 mg., and for the latters' wheat diet, on which pellagra did not develop, 4.77 mg. The results are considered to provide evidence that pellagra will develop on diets with a total nicotinic acid equivalent of 3.9 mg. per 1000 Cal., but not with one of 4.7.

It is suggested that if maize forms a "sufficiently large proportion of a diet, pellagra will not develop", as happens with the Guatemalan Indians, who consume about 500 g. maize daily (Abst. 240, Vol. 24). If, however, about half the maize in that diet was replaced by foods poor in protein and rich in carbohydrate, such as sweet potatoes or maize syrup, the diet would cause pellagra if consumed for 4 months or longer.

It is concluded that there is little justification for a belief in the existence of a toxic substance in maize.—H. Chick.

5612

CHANG, Y. O., LAURSEN, T. J. S. and KIRK, J. E.

The total nicotinic acid and pyridine nucleotide content of human aortic tissue. *J. Gerontol.*, 1955, 10, 165-169. [Div. Gerontol., Sch. Med., Washington Univ., St. Louis, Mo.]

The average value in $\mu\text{g. per g.}$ fresh tissue for total nicotinic acid is 65, and for pyridine nucleotides in 39 samples of aortic tissue from human subjects aged between 2 weeks and 82 years was, respectively, 19.2 with range from 10.2 to 33.0, and 25.8 with range from 4.9 to 51.8. Nicotinic acid content tended to decrease as age increased. Since pyridine nucleotides were destroyed rapidly during storage at 37° C. the values obtained must have been considerably lower than those prevailing *in vivo*.—A. Hepburn.

5613

IRINODA, K. and SATO, S. Contribution to the ocular manifestation of riboflavin deficiency. *Tohoku J. Exp. Med.*, 1954, 61, 93-104. [Ophthalmol. Clin., Fac. Med., Hirosaki Univ.]

Clinical observations on patients with a disease due to malnutrition, so-called "Shibi-Gattehaki" disease, which is prevalent in Japan in Aomori Province, showed the presence of degenerative and inflammatory changes in the cornea and retina associated with angular stomatitis, glossitis and proctitis, suggestive of riboflavin deficiency. Administration of riboflavin caused improvement in the eye lesions.

Rabbits given a diet deficient in riboflavin developed superficial corneal opacity, corneal vascularisation, oedema of the vacuoles in the corneal epithelium, and degeneration of the retinal ganglion cells. Ocular and other signs of deficiency were cured by riboflavin.

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The nature of the eye changes in riboflavin deficiency is discussed with particular reference to the function of the vitamin in oxidative enzyme systems.—A. M. Copping.

5614

SCHAUS, R., KIRK, J. E. and LAURSEN, T. J. S.

The riboflavin content of human aortic tissue. *J. Gerontol.*, 1955, 10, 170-177. [Div. Gerontol., Sch. Med., Washington Univ., St. Louis, Mo.]

The average values for free riboflavin together with flavin mononucleotide, for flavin adenine dinucleotide and for total riboflavin in 100 samples of aortic tissue from human subjects aged between 4 weeks and 83 years were 0.40, 0.76 and 1.16 $\mu\text{g. per g.}$ fresh tissue. The content of total riboflavin tended to fall as age increased. Corresponding values for 5 dogs were 0.26, 2.31 and 2.57. Incubation of the samples at 38° C. caused a decrease in flavin adenine dinucleotide and an increase in free riboflavin which suggested the existence of some enzyme activity.—A. Hepburn.

5615

MAENGWYN-DAVIES, G. D., BECKER, B., ROSEN, D. A. and FRIEDENWALD, J. S. A comparison of acetylating capacity of normals and diabetics with and without retinopathy. *Bull. Johns Hopkins Hosp.*, 1955, 96, 150-153. [Wilmer Ophthalmol. Inst., Sch. Med., Johns Hopkins Univ., Baltimore, Md.]

The acetylating capacity of 43 normal subjects and 33 diabetic patients was tested by measuring the urinary excretion of free and acetylated sulphamide in response to a dose of 1 g. sulphadiazine. During 24 hr. after the dose diabetic patients acetylated a significantly larger proportion of the dose than normal subjects; no difference was found between 13 diabetic patients with retinopathy and 20 with no retinal change. The rate of acetylation decreased with age and when correction for age was made between the normal and diabetic groups no significant difference in acetylating capacity was apparent. It was, therefore, concluded that deficiency of pantothenic acid or more specifically of coenzyme A was not characteristic of diabetes.—A. M. Copping.

5616

WACHSTEIN, M. and LOBEL, S. Abnormal tryptophan metabolism in various diseases particularly hyperthyroidism and its relation to vitamin B₆. *Federation Proc.*, 1955, 14, 422. *Proc.* [Div. Labs., St. Catherine's Hosp., Brooklyn, N.Y.]

5617

KOTAKE, Y. and Hotta, Y. Research on xanthurenic acid. 11. Confirmation of

xanthurenic-acid-excretion in the urine of diabetic patients. *Proc. Japan Acad.*, 1954, 30, 903-906. [Wakayama Med. Coll.]

The presence of xanthurenic acid in the urine in human diabetes, previously reported for 8 patients (Abst. 5013, Vol. 23), was confirmed in 23 more, moderately severe cases. The xanthurenic acid was isolated by paper chromatography, and identified with a Beckman spectrophotometer as having the peaks of absorption at 240 and 330 m μ . characteristic of synthetic xanthurenic acid. In 2 patients whose diabetes was being treated, xanthurenic acid disappeared from the urine when sugar ceased to be excreted.—E. M. Hume.

5618

BUCELLATO, G. Sui valori della piridossina nel siero di sangue e nell'urina di soggetti sottoposti ad una iniezione di piridossina sola od associata a manganese colloidale. [Values for pyridoxine in the blood serum and urine in subjects given an injection of pyridoxine alone or with colloidal manganese.] Possibile azione attivante sul ricambio glucidico di un composto piridossina-manganese formantesi *in vitro*. [Possible action in activating carbohydrate metabolism of a compound of pyridoxine and manganese formed *in vitro*.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1541-1542; 1542-1544. [Clin. Dermatol., Univ. Palermo.]

It has been observed (*Dermatologia*, 1953, 4, 234) that the beneficial effect on psoriasis of pyridoxine and colloidal Mn was greater when the two were given together than when either was given separately. The formation of a salt between pyridoxine and Mn was suggested. Pyridoxine was estimated by a colorimetric method, based on measuring the amount of phenol, in the blood and urine of 6 patients with psoriasis, given intravenously 200 mg. pyridoxine alone, or with intramuscular injection of 2 mg. Mn 12 hr. before, and 2 mg. at the same time as, the injection of pyridoxine. When pyridoxine was given alone its concentration in both blood and urine remained high for from 4 to 8 hr. and then declined slowly. When Mn was given as well the concentration of pyridoxine rose only slowly, being highest after from 8 to 12 hr. It was suggested that the compound with Mn was formed at once and that pyridoxine was not estimated by the method as long as it remained in combination.

The injection materials were mixed *in vitro*, and the colour gradually changed from brown to yellow. The change was accelerated by a rise of temperature to 37° and 55°C. or by addition of fragments of liver or spleen tissue. The formation of a compound is conjectured and a structural formula is given showing how it could take place.

An action on carbohydrate metabolism is suggested. E. M. Hume.

5619

CASAS CARNICERO, A. El ácido fólico como factor vitamínico para la especie humana. [Folic acid as a vitamin for man.] *Rev. española Enferm. Apar. digest. Nutricion*, 1955, 14, 83-107. [Palencia.]

A review.

5620

BLEILER, R. E., JOHNSON, D. and PARSONS, H. T. Metabolism of folic acid and citrovorum factor by human subjects. *J. Nutrition*, 1955, 56, 163-171. [Dept. Foods Nutrit., Sch. Home Econ., Univ. Wisconsin, Madison.]

Urinary excretion of folic acid and citrovorum factor was measured by microbiological methods in the urine of 15 subjects having daily in their diet 100 mg. ascorbic acid with and without a dose of 1 or 5 mg. folic acid. A similar study on 22 consecutive days was made with 4 young women having a restricted diet containing only 25 mg. ascorbic acid daily. In all the subjects the proportion of citrovorum factor to folic acid excreted was about 1 : 4 before folic acid was administered. As soon as folic acid was given there was a great increase in excretion of folic acid but not of citrovorum factor, except when an excessive dose of 750 mg. ascorbic acid was given simultaneously. The possible formation of folic acid metabolites other than citrovorum factor is discussed.

A. M. Copping.

5621

DONNER, L. Etiologie a pathogenesisa megaloblastických anemií. [Etiology and pathogenesis of megaloblastic anaemias.] *Čas. Lék. čes.*, 1955, 94, 73-78. [2. Int. Clin.] English and Russian summaries.

The physiological, biological and clinical effects of vitamin B₁₂, folic acid and leucovorin are described. The new concept of the pathogenesis of megaloblastic blood formation in the different groups of megaloblastic anaemia is discussed. (From summary.)—E. M. Hume.

5622

KIRKEBERG, P. Idiopathic refractory megaloblastic anaemia. *Acta med. scand.*, 1955, 151, 219-222. [Med. Dept., Horsens Kommune-hosp., Denmark.]

A patient with megaloblastic anaemia unresponsive to liver therapy was treated successfully with folic acid.—F. C. Aitken.

5623

BADENOCH, J., CALLENDER, S. T., EVANS, J. R. TURNBULL, A. L. and WITTS, L. J. Megaloblastic anaemia of pregnancy and the

N.A. and R., October 1955

puerperium. *Brit. Med. J.*, 1955, i, 1245-1247.
[Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

In 9 pregnant women with megaloblastic anaemia the diagnosis was made from 1 to 4 weeks before term in 4, and from 1 to 6 weeks after delivery in 5. The incidence of complications of the pregnancy or puerperium was high. Secretion of intrinsic factor, judged by absorption of radioactive vitamin B₁₂, was normal. Absorption of fat also was normal and values for vitamin B₁₂ in the serum were within the normal range. Some of the women responded to treatment with folic acid, some to vitamin B₁₂.—F. C. Aitken.

5624

HEŘMANSKÝ, F. K morfologii megaloblastických anemií. [Morphology of megaloblastic anaemias.] *Čas. Lék. čes.*, 1955, 94, 78-83. English and Russian summaries.

From the results of 185 sternal punctures in patients with megaloblastic anaemia, it was concluded that the megaloblastic and normoblastic series have a common stem cell, from which develop normoblasts, transitional forms and megaloblasts according to the degree of deficiency. Transformation from one series to another can occur, it is held, as long as the cells can divide. (From summary.)—E. M. Hume.

5625

MAKAROVA, N. A. [The treatment of Addison-Biermer's disease with vitamin B₁₂.] *Terap. Arkh.*, 1954, No. 5, 54.

5626

VILTER, R. W. Treatment of macrocytic anemias. *Arch. Int. Med.*, 1955, 95, 482-492. [Dept. Int. Med., Coll. Med., Univ. Cincinnati, Ohio.] A review.

5627

PURNEY, W. R. and BEARD, M. F. Vitamin B₁₂ deficiency following total gastrectomy. *Arch. Int. Med.*, 1955, 95, 591-593. [Sect. Haematol., Dept. Med., Univ. Louisville, Ky.] A case report.

5628

SUURALA, M. Gastric lesion in some megaloblastic anaemias: with special reference to the mucosal lesion in pernicious tapeworm anaemia. *Acta med. scand.*, 1955, 151, Suppl. 299, pp. 47. [2. Med. Clin., Univ. Helsinki.]

A study was made of 88 cases of megaloblastic anaemia, including 58 untreated cases of pernicious tapeworm anaemia and 17 untreated and 5 relapsed cases of Addisonian pernicious anaemia; 66 tapeworm carriers and 45 cases of idiopathic

atrophic gastritis served as controls. The cases were classified according to age; the pernicious tapeworm anaemia cases and the worm carriers were comparable for each age group. The majority were over 40 years of age. Gastroscopic examination of the body of the stomach showed atrophic changes, partial or total, in the mucosa of all the patients with Addisonian pernicious anaemia and of 50 out of 54 of those with pernicious tapeworm anaemia, but of only 23 of 63 tapeworm carriers, in whom the atrophy was never total. In all age groups the incidence of atrophy was significantly less in the worm carriers. The type of atrophy was similar in all cases.

There was no correlation between the gastroscopic appearance and the blood findings or the response to treatment or the neurological findings, but there was some correlation between the degree of atrophy and the lingual changes. Histological examination of biopsy material showed that atrophy, generally partial, was present in specimens from 30 out of 35 cases of pernicious tapeworm anaemia and in 11 out of 50 specimens from worm carriers; in 22 cases of pernicious anaemia atrophy was total in 18 and partial in 4. In pernicious tapeworm anaemia there was no correlation between the histological changes and the blood and neurological findings. Moderate or severe inflammatory cell infiltration of the mucosa was present in 25 per cent. of the patients with Addisonian pernicious anaemia, in 60 per cent. of those with pernicious tapeworm anaemia and in 75 per cent. of those with atrophic gastritis. Superficial inflammation also was most frequent in the gastritis patients; in pernicious tapeworm anaemia it occurred most frequently in patients with only a slight degree of atrophy, which suggested that the initial lesion was often inflammatory. In pernicious tapeworm anaemia there was a fair degree of correlation between the presence of atrophic changes and the presence of achlorhydria, but in atrophic gastritis with a comparable degree of mucosal atrophy the incidence of achlorhydria was significantly lower than in pernicious tapeworm anaemia, and the correlation was not so good. Achlorhydria was found in some cases of pernicious tapeworm anaemia with normal gastric mucosa; it is suggested that some factor other than mucosal atrophy plays a part in the production of achlorhydria in these cases.

In an interesting discussion it is suggested that in some if not all cases of pernicious tapeworm anaemia the mucosal atrophy results from a deficiency state produced by the infestation, and may develop as the disease progresses; follow-up studies are in progress to investigate whether the atrophic changes can be reversed by deworming and cure of the anaemia and the hypothetical deficiency state.—L. Wills.

5629

GOLDBLATT, S. On the intravenous administration of cyanocobalamin. *Amer. J. Clin. Nutr.*, 1955, **3**, 129-131. [Dept. Dermatol. Syphilol., Med. Sch., Univ. Cincinnati, Ohio.]

Intravenous injection of from 15 to 3000 μ g. vitamin B₁₂ as crystalline cobalamin produced no toxic or allergic side reactions in the course of 3297 injections in 150 patients with widely differing diseases. Addition of benzyl alcohol as a bacteriostatic preservative did not cause any side reaction. A. M. Copping.

5630

MOLLIN, D. L. and BAKER, S. J. The absorption and excretion of vitamin B₁₂. *Biochem. J.*, 1955, **59**, xxviii. [Dept. Haematol., Postgrad. Med. Sch., London.]

5631

MONTO, R. W. and HOWELL, J. T. Urinary vitamin B₁₂ activity following intranasal administration. *J. Lab. Clin. Med.*, 1955, **45**, 474-477. [Div. Haematol., Henry Ford Hosp., Detroit 2, Mich.]

Two normal subjects were given, by nasal instillation, 200, 100 and 50 μ g. crystalline vitamin B₁₂ in 0.5 ml. saline, each dose on a separate day; 200 or 150 μ g. crystalline vitamin B₁₂ was placed directly on the nasal mucosa of 2 patients with pernicious anaemia in relapse. Significant vitamin B₁₂ activity was detected in the urine of all. The 2 anaemic patients responded well to the treatment and chronic disease of the nasal mucous membrane in one of them did not apparently impede absorption. (See also Title 3497, Vol. 23; Abst. 5215, Vol. 24).—F. C. Aitken.

5632

The use of intrinsic factor-B₁₂ combinations in the treatment of pernicious anaemia. *Blood, J. Hematol.*, 1955, **10**, 377-379.

The views expressed by a panel of medical men are reported.

5633

CALLENDER, S. T. and EVANS, J. R. The urinary excretion of labelled vitamin B₁₂. *Clin. Sci.*, 1955, **14**, 295-302. [Nuffield Dept. Clin. Med., Radcliffe Infirmary, Oxford.]

The reliability of Schilling's test, which measures the excretion of radio-active vitamin B₁₂ when a small oral dose of it is followed by a large parenteral dose of unlabelled vitamin B₁₂ (Abst. 3675, Vol. 24), was assessed by comparing urinary and faecal excretion of the radio-active vitamin B₁₂. Tests were made on 26 normal subjects, 38 patients with pernicious anaemia and 33 others with infections, steatorrhoea, and other diseases, and after gastrectomy. About one-third of an

oral dose of radio-active vitamin B₁₂ was excreted in the urine by normal subjects in response to an injection of 1000 μ g. of unlabelled vitamin and very small amounts by patients with pernicious anaemia. Administration of intrinsic factor to patients with pernicious anaemia increased the amount of radio-active vitamin B₁₂ appearing in the urine. In the faeces, the same normal subjects excreted about one-third of the radio-active dose given orally, but patients with pernicious anaemia excreted about 90 per cent. of it. The results agreed well with those for excretion in the urine. Of the other groups, only patients with steatorrhoea behaved like those with pernicious anaemia in the amount of vitamin B₁₂ excreted in the faeces after an oral dose. The advantages and simplicity of the urinary excretion test are emphasised.—A. M. Copping.

5634

GLASS, G. B. J., STEPHANSON, L., ROSEN, S. and LAUGHTON, R. Hepatic uptake and urinary excretion of radioactive B₁₂ in assay of intrinsic factor. *Federation Proc.*, 1955, **14**, 57-58. *Proc.* [Gastroenterol. Res. Lab., New York Med. Coll.]

5635

TOPOREK, M., BISHIP, R. C., NELSON, N. A. and BETHELL, F. H. Urinary excretion of Co⁶⁰-labeled vitamin B₁₂ as test for intrinsic factor activity. *Federation Proc.*, 1955, **14**, 421. *Proc.* [Simpson Mem. Inst., Univ. Michigan, Ann Arbor.]

5636

CHOW, B. F. and OKUDA, K. Urinary excretion test for vitamin B₁₂. *Federation Proc.*, 1955, **14**, 430. *Proc.* [Dept. Biochem., Sch. Hyg. Pub. Health, Johns Hopkins Univ., Baltimore, Md.]

5637

GLASS, G. B. J., BOYD, L. J., GOLDBLOOM, A. A. and ROSEN, S. Effect of intrinsic factor on intestinal absorption of B₁₂ in aged people. *Federation Proc.*, 1955, **14**, 57. *Proc.* [Dept. Med., New York Med. Coll.]

5638

SWENDSEID, M. E., HYVOLL, E. E., LEWIS, P. M. and HALSTED, J. A. Vitamin B₁₂ liver content in old age. *Federation Proc.*, 1955, **14**, 290. *Proc.* [Dept. Home Econ., Univ. California, Los Angeles.]

5639

RALLI, E. P., BARBOSA, X., BECK, E. M. and LAKEN, B. Blood sugar and sulphhydryl levels in diabetic patients before and during vitamin

B₁₂ therapy. *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 646-649. [Dept. Med., Coll. Med., New York Univ.-Bellevue Med. Centre.]

Plasma values for sulphhydryl were estimated by an amperometric method, blood sugar by Somogyi's method, and serum protein by paper electrophoresis, in blood from 27 patients with diabetes mellitus, 21 normal subjects and 10 patients with cirrhosis of the liver. Intramuscular injections of 1 mg. vitamin B₁₂ were given daily to 16 of the diabetic patients for 6 to 18 months. Values for sulphhydryl compounds were low in patients with cirrhosis of the liver, but no differences were observed in the other patients, and no relation was established between the sulphhydryl and blood sugar values. Treatment with vitamin B₁₂ had no effect on the concentration of sulphhydryl compounds in diabetic patients.—A. M. Copping.

5640

JANOUSEK, S., KROULÍKOVÁ, J. and MALÍŠ, F. Polarografická studie o autoproteolytické trávicí schopnosti okyseleného sera a její změně u perniciosní anemie. [Polarographic study of the autoproteolytic, digestive capacity of acidified human serum and its modification in pernicious anaemia.] *Čas. Lék. čes.*, 1955, **94**, 83-89. [Prague.] Russian and English summaries.

A simple polarographic method for estimating autoproteolytic enzymic activity in blood serum is described. Serum from 36 patients with pernicious anaemia had lower activity than that from 97 other patients. Analysis was made of the activity curves of serum from a healthy individual and a patient with pernicious anaemia. The normal serum had 3 optimum pH ranges for proteolytic activity, between 2.0 and 3.0, between 3.0 and 4.0, and between 5.0 and 7.0. In the serum of the patient with pernicious anaemia, the first was lacking, the second was present and the activity was greater than in the normal serum, and the third was present and maintained. The activity lacking was that of pepsin quality. (From summary).—E. M. Hume.

5641

WILD, C., REYMOND, C. and VANNOTTI, A. Vitamine B₁₂ et métabolisme protidique. [Vitamin B₁₂ and protein metabolism.] *Schweiz. med. Wochenschr.*, 1955, **85**, 145-151. [Clin. Méd., Univ. Lausanne.]

The effect of vitamin B₁₂ on the absorption and utilisation of amino-acids was studied by following the amino-acid N values in the blood at half-hour intervals after an oral dose of 10 g. of a hydrolysate of casein and lactalbumin. In 14 adult subjects of both sexes with no recognisable lesion

of the digestive tract, the blood amino-acid N values after the test dose rose steeply by a mean maximum amount of 1.61 mg. per 100 ml. after half an hour, and fell gradually to a value 0.37 above the initial value after 2 hr. When, in another test, 1000 µg. vitamin B₁₂ were given intravenously immediately before the test dose, the initial mean rise of 0.81 mg. per 100 ml. was significantly lower than in the first test and the later values were significantly lower than the initial value.

To investigate the mode of action of the vitamin, the blood amino-acid N value was estimated in 11 subjects after 1 ml. of normal saline or 1000 µg. vitamin B₁₂ had been given intravenously; after the saline the blood value did not alter significantly, but 2 hr. after the vitamin the value had fallen significantly compared with the value after saline. From the results it was concluded that the effect of vitamin B₁₂ on the amino-acid N value was due not to slowing of absorption but to improvement in utilisation.

Since the liver is considered to be the principal site of polypeptide formation, further studies were made on 14 patients suffering from cirrhosis or infective hepatitis with proven liver failure. The mean blood values after the test dose of protein hydrolysate were slightly but significantly higher than in normal subjects, and vitamin B₁₂ had no effect on the height of the rise. As alternative explanations of the results, it is suggested that the vitamin must be changed in the liver before its enzymic action can manifest itself, or that in a diseased liver there is failure in polypeptide synthesis at the point where it is stimulated by vitamin B₁₂. The effect of vitamin B₁₂ on the amino-acid N curve is suggested as a test of liver function; the suggestion is made because in a patient with hypoproteinaemia of unknown origin the diagnosis of liver disease was made on that ground and later confirmed, though at the time all the usual tests of liver function were negative.

In pernicious anaemia the test curve was very flat; vitamin B₁₂ given by mouth with intrinsic factor caused a marked increase in absorption, and the vitamin given alone intravenously produced a further marked increase in utilisation. In patients with *anorexia nervosa* the test showed that absorption of amino-acids was normal but utilisation delayed; with vitamin B₁₂ there was a slow stimulation of utilisation.

In conclusion it is pointed out that previous work showed that in patients with poor absorption of the amino-acids the vitamin B complex alone stimulates absorption and restores the curve to normal. Vitamin B₁₂, on the other hand, stimulates utilisation of amino-acid N so that the normal curve is depressed. The literature is reviewed.

L. Wills.

5642

LEVIN, M. B. **Vitamin B-12 in neuro-metabolism.** (Preliminary clinical report.) *Amer. J. Digest. Dis.*, 1955, **22**, 96-97. [Baltimore 18, Md.]

A preliminary account is given of the good results obtained in treating nerve disorders with large amounts of vitamin B₁₂, from 5000 to 10,000 µg., given by intramuscular injection 2 or 3 times a week.—F. C. Aitken.

5643

MARTE, K. and MARTE, E. 1000 γ Vitamin B₁₂ bei Poliomyelitis. [Vitamin B₁₂, 1000 µg., in poliomyelitis.] *Wien. klin. Wochenschr.*, 1954, **66**, 995. [Höchst, Vorarlberg.]

A patient with poliomyelitis showing slight loss of power in one leg was given 1000 µg. vitamin B₁₂ by intramuscular injection; all signs and symptoms disappeared in 24 hr.—L. Wills.

5644

POKORNY, A. D. **Massive doses of vitamin B₁₂ in treatment of schizophrenia.** *Arch. Neurol. Psychiat.*, Chicago, 1955, **73**, 345-346. [Veterans Admin. Hosp., Houston, Tex.]

Administration of 1000 µg. vitamin B₁₂ daily for 30 days did not change the course of the illness in 10 patients with schizophrenia compared with 10 other patients given dummy treatment.

F. C. Aitken.

5645

MONTGOMERY, H. J., KUICK, D., ROBBINS, P. and ROSENBERGER, W. **Effect of vitamin B₁₂ on work capacity.** *Internat. Ztschr. angew. Physiol. Arbeitsphysiol.*, 1955, **16**, 20-24. [Michigan State Coll., East Lansing.]

The subjects were 3 healthy young men whose work capacity had been improved by 4 weeks' training. Oral doses of 50 µg. daily of vitamin B₁₂ for 2 periods of a week had no demonstrable effect on grip strength, pulse rate recovery after standard exercise, or maximum work on a bicycle ergometer.—A. M. Copping.

5646

KARLIN, R. **Influence de l'administration de la vitamine B₁₂ par voie buccale ou parentérale, sur la teneur en cette vitamine du lait humain.** [Effect of oral or parenteral administration of vitamin B₁₂ on the amount in human milk.] *Bull. Soc. Chim. biol.*, 1954, **36**, 1665-1669. [Inst. Pasteur, Lyons.]

An oral dose of 100 µg. vitamin B₁₂ given for 6 days to 5 lactating women caused a small increase in the vitamin B₁₂ content of the milk within 24 hr. of the first dose. The rise disappeared in a day or two after the dose was withdrawn. The

same dose combined with 20 mg. cobalt had a greater effect on the vitamin B₁₂ content of the milk, but there was no prolongation of the effect after withdrawal. A single intramuscular injection of 100 or 400 µg. vitamin B₁₂ produced a great increase in the vitamin B₁₂ content of the milk; the value reached a maximum in about 12 hr. and remained high for from 48 to 72 hr.

A. M. Copping.

5647

PERITI, P. **Azione delle forti dosi di vitamina B₁₂ per via orale nella dispepsia da grassi in bambini allattati al seno materno.** [Action of large doses of vitamin B₁₂ given orally in the fat dyspepsia of breast-fed babies.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1391-1392. [Ambulatorio Pediat., Sez. Pontassieve Ist. Naz. Assicurazioni Malattie, Florence.]

Breast-fed infants aged from 20 to 100 days, suffering from fat dyspepsia with a cutaneous eruption, were given orally from 50 to 100 µg. vitamin B₁₂ daily, from which, in conjunction with wider spacing of the feeds, they derived great benefit. The vitamin was given in amounts of from 12.5 to 25 µg. in a spoonful of skimmed milk just before the feeds. The treatment was continued until a cereal was included in the diet.

E. M. Hume.

5648

AGUIRRE, F. and SCRIMSHAW, N. S. (with Muñoz, J. A. and CABEZAS, A.) **The effect of supplements of animal and vegetable protein, vitamin B₁₂, and aureomycin on hematological values in Central American school children.** *Amer. J. Clin. Nutr.*, 1955, **3**, 225-229. [Inst. Nutrit. Central America and Panama, Guatemala.]

Haematological studies were made on 426 children in 2 urban and 3 rural schools in El Salvador and 4 rural schools in Guatemala. The average values in the respective groups of schools were 4.31, 4.05 and 4.40 million red cells per c.mm., and 12.0, 11.4 and 13.3 g. Hb per 100 ml. The incidence of anaemia assessed by these criteria was high and all the cases were of macrocytic type. The quality of the protein in most diets was poor but provision for 5 months in El Salvador of a school lunch rich in animal protein produced no improvement in the blood picture. Other lunch programmes providing increases in animal and vegetable protein for periods up to two years had no effect on the red cell count or Hb value. Oral administration of 20 µg. vitamin B₁₂ or 50 mg. aureomycin in addition to a high-protein lunch had no significant effect. The incidence of hookworm infestation was high and was little improved by treatment, opportunities for re-infestation being very numerous.—A. M. Copping.

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Vitamin C

5649

MORGAN, A. F., GILLUM, H. L. and WILLIAMS, R. I.
Nutritional status of the aging. 3. Serum ascorbic acid and intake. *J. Nutrition*, 1955, 55, 431-448. [California Agric. Exp. Stat., Univ. California, Berkeley.]

For other parts see Absts. 3986, 5444, 5576, Vol. 25.

Ascorbic acid was estimated in the serum from 569 healthy men and women who were over 50 years of age and living in their own homes, except for 44 men who were over 60 years and living in a county home. At all ages women had higher values than the men, the mean values being 1.07 and 0.83 mg. per cent. The maximum for both sexes was in the age group for 60 to 64 years with 1.21 and 0.94 mg. per cent. The women had a smaller daily intake of ascorbic acid at all ages than the men with mean values of 86 and 99 mg.; the maximum intake was in the age group from 60 to 64 years, the values being 91 and 136 mg. Expressed as mg. per kg. bodyweight the intakes of 1.28 and 1.36 mg. did not differ significantly. Vitamin supplements which might have contained ascorbic acid were taken more or less regularly by 15 per cent. of the men and 18 per cent. of the women; the supplements were not included in calculating intake. The mean value for the men in the county home was 0.27 mg. per cent. in the serum, and the mean total daily intake was 40 mg.

A direct correlation was found between the serum value and the intake of ascorbic acid. When the subjects were divided into 4 income groups the mean serum ascorbic acid value increased progressively from the lowest to the highest.

Of 551 subjects examined, 219 had no teeth, 94 had some degree of gingivitis, and 238 had teeth and healthy gums. The mouths were healthier in those with the higher serum values.

A. Hepburn.

5650

KALT, F. Der Vitamin-C-Gehalt von Blut und Liquor nach intravenösen Redoxgaben. [The vitamin C content of blood and cerebrospinal fluid after intravenous administration of Redoxon.] *Schweiz. med. Wochenschr.*, 1955, 85, 127-128. [Med. Poliklin., Univ. Basle.]

Ascorbic acid was estimated by the method of Roc and Knether (Abst. 261, Vol. 13) in the blood and cerebrospinal fluid of 21 patients with polymyelitis, 1, 3, 6 and 24 hr. after intravenous injection of from 3.5 to 14.0 g. ascorbic acid. The values in the serum, in mg. per cent., were, after 1 hr. between 10 and 24, after 3 hr. between 6 and 17, and after 6 hr. between 3.6 and 5.1. No value for the cerebrospinal fluid after 1 and 6 hr. was above 6 mg. per cent. Both sets of values fell slowly to about 4 after 24 hr.—E. M. Hume.

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5651

HELLMAN, L. and BURNS, J. J. Metabolism of L-ascorbic-1-C₁₄ acid in man. *Federation Proc.*, 1955, 14, 225. *Proc. [Div. Phys., Sloan-Kettering Inst. Cancer Res., New York.]*

5652

BECK, J. C., BROWNE, J. S. L. and MACKENZIE, K. R. Effect of adrenocorticotrophic hormone and cortisone acetate on the urinary and blood levels of ascorbic acid in man. *J. Clin. Endocrinol.*, 1954, 14, 1006-1022. [McGill Univ. Clin., Royal Victoria Hosp., Montreal.]

Of 32 patients with 17 different diseases including rheumatoid arthritis, the majority, but not all, responded to treatment with cortisone acetate or adrenocorticotrophic hormone by an increase in the amount of ascorbic acid in the urine, whether the intake of ascorbic acid was small or large.

E. M. Hume.

5653

CHAKRABARTI, B. and BANERJEE, S. Dehydroascorbic acid level in blood of patients suffering from various infectious diseases. *Proc. Soc. Exp. Biol. Med.*, 1955, 88, 581-583. [Dept. Physiol., Presidency Coll., Calcutta.]

The concentration of dehydroascorbic acid in the blood of patients with meningococcal and tubercular meningitis, tetanus, acute lobar pneumonia and typhoid fever was greater than normal; values were highest in those who ultimately died. Ascorbic acid values were correspondingly low. During convalescence dehydroascorbic acid decreased and ascorbic acid increased. It is suggested that for prognostic purposes dehydroascorbic acids should be estimated in all patients with acute infection.—A. Hepburn.

5654

ASENJO, C. F., ALVAREZ, O. G. and KING, R. R. (Jr.) Human availability studies of the vitamin C in the acerola (*Malpighia punicifolia* L.) *Federation Proc.*, 1955, 14, 427. *Proc. [Dept. Biochem., Sch. Med., Univ. Puerto Rico, San Juan.]*

5655

CAPOBIANCO, A., DE FRANCISCS, G. and POLOSA, P. Modificazioni della resistenza osmotica delle emazie. Ricerche *in vitro*. 1. Azione delle vitamine C e K₁. [Modification of the osmotic resistance of red blood cells. Investigation *in vitro*. 1. Action of vitamins C and K₁.] *Bol. Soc. ital. Biol. sper.*, 1953, 29, 1796-1798. [Ist. Fisiol., Univ. Naples.]

See also Title 5608, Vol. 25.

Other Vitamins

5656

MARTIN, G. J. (Ed.) **Hesperidin and ascorbic acid. Naturally occurring synergists.**

AVAKIAN, S. 1. Chemistry of bioflavonoids and related molecules.

KESSLER, S. 2. Physiology of capillaries as it relates to ascorbic acid and the bioflavonoids.

BEILER, J. M. 3. Biochemistry of the synergists; ascorbic acid and hesperidin.

HOROSCHAK, S. 4. Clinical applications of the synergists; ascorbic acid and hesperidin.

MARTIN, G. J. 5. Conclusions. *Exp. Med. Surg.*, 1954, **12**, 535-544; 545-563; 563-569; 570-597; 597-598. [National Drug Co. Philadelphia, Pa.]

1. An account is given of the structure of flavones, chalcones and flavonoids which have been isolated or synthesised and shown to have biological importance.

2. The present knowledge of capillary permeability and capillary flow is reviewed, and theories of the transcapillary transfer of crystalloids and colloids, and problems of haemostasis and oedema are discussed.

3. Possible mechanisms for the action of vitamin P substances and their interaction with ascorbic acid are discussed with reference to their effect on the permeability and fragility of the vascular system as well as on tissues in general.

4. The wide range of the clinical applications of ascorbic acid and hesperidin is briefly reviewed in relation to vascular purpura, habitual abortion, eczema, rheumatic fever, psoriasis, diabetic retinopathy, haematuria, haemorrhagic nephritis and hypertension. Numerous single reports of treatment in other diseases are mentioned.

5. The editor of the series of reviews summarises the material with emphasis on the enormous extent of the capillary system and the significance of the intercellular substance. He considers that there is no disease in which benefit may not be expected by assuring capillary strength and integrity, and that ascorbic acid and flavonoids are fundamentally concerned in preserving them.

A. M. Copping.

5657

MIYAKE, T. and KOJIMA, Y. **Eye diseases and capillary fragility. 1. Incidence of increased capillary fragility in eye diseases: rutin therapy.** *Nagoya Med. J.*, 1954, **2**, 125-137. [Dept. Ophthalmol., Nagoya City Univ. Med. Sch.]

Capillary resistance was measured by 2 positive-pressure methods; in one the pressure applied was fixed at 35 mm. Hg. and in the other it was that previously ascertained as midway between the subject's systolic and diastolic pressure. They are referred to as the fixed-pressure and blood-pressure methods. Of 220 persons, normal and

otherwise, 150 were tested by both methods, 28 by the fixed-pressure method only, and 42 by the blood-pressure method only. The number of normal subjects tested was between 50 and 60; the percentage with increased capillary fragility was 5.5 by the fixed-pressure method and 20.7 by the blood-pressure method. In all the subjects, normal and abnormal together, the corresponding percentages were 11.2 and 48.5. The results in the various disease groups fell roughly into the same order by the two methods, but the blood-pressure method appeared more sensitive and gave a wider range of results. Increased capillary fragility was most frequent in vascular hypertension and glaucoma; in retinal haemorrhage of undifferentiated origin and in diabetes it was less.

A preliminary report is made on treatment with rutin in a minimum daily dose of 100 mg. given orally. Capillary resistance usually returned to normal but did not always remain so unless the dose was increased, and deteriorated rapidly if treatment was withdrawn. In a few patients with retinal haemorrhage no unequivocal evidence of benefit from therapy with rutin could be obtained.

E. M. Hume.

5658

BARILLI, L. **Ricerca orientativa sui rapporti fra vitamine della permeabilità e barriera emato-encefalica in corso di meningite tubercolare. [Preliminary experiments on the relation of vitamins to permeability and to the blood-cerebrospinal fluid barrier in tuberculous meningitis.]** *Riv. Clin. pediat.*, 1954, **54**, 56-61. [Clin. Pediat., Univ. Florence.]

5659

KAPPELER, R. and KOLLER, F. **Über die intravenöse Verabreichung von Vitamin K₁ (Konakion) als Antidot der Antikoagulantien vom Typus des Dicumarol. [Intravenous administration of vitamin K₁ (Konakion) to counteract the effect of anticoagulants of the dicoumarol type.]** *Schweiz. med. Wochenschr.*, 1955, **85**, 62-64. [Med. Klin., Univ. Zürich.] English summary.

Konakion (Hoffmann-La Roche, Basle) is a preparation of vitamin K₁ so finely dispersed with an emulsifier that it can be injected intravenously. A very rapid result is thereby obtained where it is desired to reverse the excessive effect of dicoumarol. It was tested on 40 patients having dicoumarol preparations, and within 2 hr. after injection of from 5 to 10 mg. Konakion, there was an increase in the concentration of prothrombin and factor VII.—E. M. Hume.

5660

BONIVER, G., GAVINI, R. and DRAGO, E. **La funzionalità epatica nel lattante in rapporto**

N.A. and R., October 1955

all'alimentazione: prova da carico di Tromexan e quadro elettroforetico delle proteine sieriche. [Liver function of the infant in relation to diet: test with Tromexan and electrophoretic picture of the serum proteins.] *Lattante*, 1954, 25, 678-682. *Proc. [Clin. Pediat., Padua.]*

5661

KOCH, F., SCHULTZE, H. E., SCHWICK, G. and BELLER, F. K. Beobachtungen bei angeborenem Faktor VII-Mangel (Hypoconvertinämie). [Observations on congenital deficiency of factor VII (hypoconvertinaemia).] *Ztschr. Kinderheilk.*, 1955, 76, 208-233. [Kinderklin., Justus Liebig Hochschule, Giessen.]

The occurrence of congenital haemorrhagic diathesis in a child of 5 and a girl of 19 years is described. The satisfactory effects are reported in detail of giving vitamin K and a concentrate prepared from human serum and rich in factor VII.—L. Wills.

DENTAL DISEASES

5662

TOVERUD, G., COX, G. J., FINN, S. B., BODECKER, C. F. and SHAW, J. H. A survey of the literature of dental caries. *Nat. Acad. Sci., Nat. Res. Council, Washington, D.C., Publ. No. 225*, 1952. pp. ix + 567.

5663

REID, D. B. W. and GRAINGER, R. M. Variations in the caries susceptibility of children's teeth. *Human Biol.*, 1955, 27, 1-11. [Connaught Med. Res. Labs., Univ. Toronto.]

5664

KING, J. D., MELLANBY, M., STONES, H. H. and GREEN, H. N. The effect of sugar supplements on dental caries in children. *Med. Res. Council. Spec. Rep. Ser. No. 288*, 1955, pp. viii + 55. H.M.S.O., London. Price 4s. net.

Investigations were made at 3 separate centres. In London there were 3 groups of young children who were between 2 and 4 years of age when the work began. They resided in a number of institutions and the numbers under observation in the control, white-sugar and brown-sugar groups were, respectively, for 1 year 126, 151 and 114; for 1½ years 69, 90 and 65; for 2 years 30, 32 and 20. The pattern of their diets was examined and the estimated total sugar contents in the same order were 11, 22½, 21½ oz. weekly per child, these average amounts being roughly comparable with the low war-time and the higher pre-war consumption in Britain. Data are tabulated to show the number of caries-free children, the incidence,

extent and spread of caries among the children and the numbers of teeth affected. There was no evidence that the higher intake of sugar affected either the initiation or the spread of caries in deciduous teeth.

In Liverpool the children were between 4 and 14 years of age and were inmates of one institution. The numbers under observation for 1, 1½ and 2 years in control and sugar groups, respectively, were 112, 113; 91, 90; 83, 78. The estimated total weekly intakes of sugar were 15 and 37 oz. per child, the added sugar being refined white. Data are presented for deciduous molars in children of 4 to 10 years and for permanent first molars in those of 4 to 14 years to show incidence, extent and spread of caries. The findings for the age groups were conflicting, but there was again no positive evidence that sugar was decisive in favouring caries development.

In Sheffield the children were also between 4 and 14 years of age and were living in cottage homes. The numbers studied in control and sugar groups, respectively, were for 1 year 57, 89 and for 1½ years, 36, 57. Their average weekly consumption in winter was 19½ and 41½ oz. per child, the extra being white refined sugar. In summer these amounts were increased by 4 oz. for some weeks when sugar was made available for jam-making. Data are given which are comparable with those for Liverpool. Numbers were small and results, like those for Liverpool, sometimes conflicting, but again no adverse effect of extra sugar was demonstrated.

It is concluded that, if the diets of children attain the standards of those provided in these institutions, then relatively great increases in the intake of sugar, either white or unrefined, may occur without resulting increases in the incidence or rate of spread of caries.

Subsidiary investigations were made in Liverpool. Additional sugar had no effect on lactobacillus counts or on acid production in saliva. Buffering capacity of saliva increased with age to an extent greater in the control than in the sugar group, but the difference between the groups in rates of increase was not significant.—D. Harvey.

5665

LENNON, D. F. and SULLIVAN, H. R. The relative rates of acid production from "refined" and "natural sugars". *Dent. J. Austral.*, 1955, 27, 67-71. [Dept. Prev. Dent., United Dent. Hosp., Sydney.]

Acid production by lactobacillus cultures under standard conditions with the forms of sugar and its products which are in common use was measured *in vitro* by titration at intervals of 24 hr. Fermentation was more rapid with the group consisting mainly of monosaccharides, golden syrup,

honey and treacle, but total production of acid was greatest with a dissaccharide, white sugar. In experiments with shorter intervals the process was continuous during the first 5 hr. of incubation with those of the first group; in that time no acid was produced with sugars of the second type. Changes during incubation in the pH of sugar solutions and of mixtures of these with a concentrate prepared by centrifuging saliva were also studied. The fall in pH began at once with monosaccharides but was delayed for nearly 30 min. with the disaccharides; with the concentrate the rate of change in pH was similar with both forms.

The conclusions were that the selective action of lactobacilli may limit their importance as producers of acid in the mouth and that there was no evidence that so-called natural sugars like honey were of less consequence than refined sugar in initiating caries.—D. Harvey.

5666

GOLDSWORTHY, N. E., SULLIVAN, H. R. and HARRIS, R. **Practical caries control.** *Dent. J. Austral.*, 1955, **27**, 45-59. [Inst. Dent. Res., United Dent. Hosp., Sydney.]

5667

DIRKS, O. B. Fluorootoediening als cariesprophylacticum. [Administration of fluorine as a preventive of caries.] *Voeding*, 1955, **16**, 315-326. [Hyg. Lab., Rijksuniv., Utrecht.] English and French summaries.

An experiment on the fluoridation of drinking water was begun in 1953 in Holland at Tiel, with the population of Culemborg as a control group receiving no additional F. The extra F is supplied as 1.1 mg. NaF per litre water and the incidence of caries will be studied in alternate years in the child population between 11 and 15 years of age. M. Eddison.

5668

NATIONAL RESEARCH COUNCIL, U.S.A., FOOD AND NUTRITION BOARD. **The problem of providing optimum fluoride intake for prevention of dental caries.** Publ. No. 294, November 1953, pp. 15. Price \$0.50.

The optimum level of F intake is defined as "that which in epidemiological and clinical observations has been found to combine the highest degree of caries protection with the lowest degree of mottled enamel". The magnitude of the caries problem is indicated and the efficacy and safety of fluoridation of water are taken as proved. The advantages of supplying F in water are balanced against the disadvantages of other vehicles such as milk, flour, babies' canned foods or bottled fluoridated water. Vehicles other than water would require further study in adequately controlled experiments before they could be accepted as better.—D. Harvey.

5669

HILL, I. N. **Evanston dental caries study. 12. A survey of lactobacillus counts with reference to untreated carious surfaces before and after exposure to fluoridated water.** *J. Dent. Res.*, 1955, **34**, 178-187. [Zoller Mem. Dent. Clin., Univ. Chicago, Ill.]

For a preliminary report see Abst. 999, Vol. 20. The present paper is based on specimens of saliva collected during the period 1946 to 1953 from over 2200 children aged from 6 to 8 and from 12 to 14 years. When these were grouped according to lactobacillus count (low, including negative; moderate; high), there was found not only the usual association between lactobacillus count and incidence of caries, but also a reduction of caries within the low and moderate lactobacillus count groups in the years subsequent to the addition of fluorine to the drinking water (begun in 1947). Shifts of distribution of lactobacillus counts indicated a reduction of lactobacillus activity in the younger children; the evidence for the older children was less clear.—W. M. Deans.

POISONS: PATHOGENIC ORGANISMS: FOOD LAWS

5670

MAHADEVAN, V. **Selenium poisoning in men and animals.** *Indian Vet. J.*, 1954, **31**, 210-213. [Dept. Animal Nutrit., Madras Vet. Coll.]

A review.

See also Abst. 5524.

THERAPEUTIC AND PREVENTIVE DIETETICS

GENERAL

5671

TALBOT, N. B., KERRIGAN, G. A., CRAWFORD, J. D., COCHRAN, W. and TERRY, M. **Application of homeostatic principles to the practice of**

parenteral fluid therapy. *New Engl. J. Med.*, 1955, **252**, 856-861; 898-906. [Dept. Paediat., Harvard Med. Sch., Boston, Mass.]

The first part is a guide to the parenteral administration of glucose and electrolytes; the

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second gives metabolic data obtained during treatment of 5 children with multiple electrolyte solutions.—F. C. Aitken.

5672

PUTTAIYA, M. **Replacement fluid therapy—recent trends.** *J. Indian Med. Assoc.*, 1955, **24**, 549–553. [Chickmagalur P.O., Mysore State.]

5673

SCRIBNER, B. H., LUCAS, J. E. and OSTERBERG, A. E. **Fluids for parenteral administration: a simple method of modification to fill the requirements of the individual patient.** *New Engl. J. Med.*, 1955, **252**, 443–445. [Veterans Admin. Hosp., Seattle, Wash.]

5674

RAJASURIYA, K., HAMZA, M. H. M. and SELVARATNAM, S. **The use of young coconut water for intravenous therapy.** *Ceylon Med. J.*, 1954, **2**, 251–261. [Gen. Hosp., Kurunegala.]

Patients, of whom most had severe diarrhoea with secondary dehydration, some had specific fevers and several were children with gastroenteritis, were treated with coconut water. Of the 26, 19 had 1, 6 had 2 and 1 had 4 transfusions; in only 1 patient were there signs of reaction, which may have arisen from faulty technique. A method of collection of the water from the nut is described, and the value of the product for outlying hospitals in the tropics is emphasised.

D. Harvey.

5675

CRANDON, J. H. **Nutrition in surgical patients.** *J. Amer. Med. Assoc.*, 1955, **158**, 264–268. [Boston, Mass.]

A review, with 148 references not printed but included in the author's reprints.

5676

TAYLOR, W. H. **Clinical aspects of the metabolic response to trauma.** *Amer. J. Clin. Nutr.*, 1955, **3**, 181–197. [Dept. Biochem., Radcliffe Infirmary, Univ. Oxford.]

A review.

5677

REVERS, F. E. **Toediening van eiwitten en aminozuren aan chirurgische patiënten. [Administration of proteins and amino-acids to surgical patients.]** *Nederl. Tijdschr. Geneesk.*, 1955, **99**, 1656–1664. [Chirurg. Klin., Rijksuniv., Utrecht.]

A review.

5678

WADDELL, W. R., GEYER, R. P., OLSEN, F. R., ANDRUS, S. B. and STARE, F. J. **Clinical ex-**

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perience with intravenous infusion of emulsified fat. *J. Lab. Clin. Med.*, 1955, **45**, 697–710. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Data are presented on the incidence of pyrogen and colloid effects, chills, vasomotor changes and other reactions during the infusion of emulsified fat.

In all 1466 infusions were given to 426 patients. Emulsions containing 10 to 15 per cent. coconut, olive, groundnut or cottonseed oil or synthetic triolein were used. The percentages of infusions causing no pyrogen reaction were for cottonseed oil 91, coconut 86, olive 82, groundnut 83 and triolein 76.—F. C. Aitken.

DIABETES

5679

CONDE GARGOLLO, E. **Clínica y terapéutica de la diabetes infantil. [Course and treatment of infantile diabetes.]** *Rev. clín. española*, 1955, **96**, 197–203. [Beneficencia Municip., Madrid.]

A review.

5680

FANCONI, G. **Die sogenannte freie Kost (besser Normalkost) in der Behandlung des kindlichen Diabetes. [The so-called free diet (better, normal diet) for treating diabetes in childhood.]** *Schweiz. med. Wochenschr.*, 1955, **85**, 75–77. [Kinderklin., Univ. Zürich.] French summary.

5681

BARTA, L. and GÁTHY, E. **Über den Einfluss der Glukose-, Fructose- und Galaktose-Belastungen auf den Stoffwechsel der kindlichen Diabetiker. [Effect of tests doses of glucose, fructose and galactose on metabolism of juvenile diabetics.]** *Ann. paediat., 1955*, **184**, 287–293. [I. Kinderklin., Med. Univ., Budapest.] English and French summaries.

Single and double blood sugar tolerance tests were made in 14 diabetic children given test doses of glucose, fructose or galactose. Glucose produced the greatest rise in blood sugar, more than 100 mg. per cent. in half the tests, and galactose the least, with the rise exceeding 50 mg. in only 4 tests. After glucose there was a fall in blood ketones only when the blood sugar was extremely high, and usually there was some increase in ketones. The ketogenic effect of fructose was less than that of glucose in 9 out of 10 tests, but galactose and glucose were similar in effect.

It is suggested that those diabetic children who have low blood sugar at night and ketosis in the morning should be given fructose at night.

D. Duncan.

5682

BARTA, L. and NÉMETH, E. Eigentümlichkeiten des Diabetes mellitus in Kindesalter. [Peculiarities of diabetes mellitus in childhood.] *Ann. paediat.*, 1955, 184, 165-178. [I. Kinderklin., Med. Univ., Budapest.] English and French summaries.

5683

CONSTAM, G. R., HOCHSTRASSER, P. and SINNER, F. v. Lohnt sich eine Diätbehandlung des Diabetes mellitus? [Does diabetic treatment of diabetes mellitus pay?] *Deutsch. med. Wochenschr.*, 1955, 80, 787-791. [Med. Univ.-Poliklin., Zürich.]

Among 54 men and 45 women with diabetes of different degrees of severity who were under observation for 20 years, the incidence of late vascular disorders was less among those with good control. The results are discussed in conjunction with the literature and the conclusions are that prompt and lasting control is important and that the best results are generally achieved by a combination of insulin and a reasonable diet.—W. M. Deans.

5684

STADIE, W. C. The problem of the action of insulin. *Amer. J. Med. Sci.*, 1955, 229, 233-251. [John Herr Musser Dept. Res. Med., Univ. Pennsylvania, Philadelphia.]

A lecture report.

5685

JOHN, H. J. Overtreatment with insulin in the management of diabetes. *Metabolism*, 1955, 4, 204-213.

5686

VOTT, K. and KNICK, B. Insulin-Zink-Suspensionen ("Lente"-insuline) in der klinischen Diabetesbehandlung. [Insulin zinc suspensions (Lente insulins) in the clinical treatment of diabetes.] *Deutsch. med. Wochenschr.*, 1955, 80, 622-628. [Med. Klin., Univ. Mainz.]

A review.

5687

GOODMAN, J. I. Causes of labile diabetes: its treatment. *Amer. J. Med.*, 1955, 18, 448-453. [Cleveland Heights, Ohio.]

See also Absts. 5200, 5615, 5617, 5639, 5706.

GASTRO-INTESTINAL CONDITIONS

5688

LAUDA, E. Die Diätetik der Darmkrankheiten. [Dietary treatment of intestinal illnesses.] *Wien. klin. Wochenschr.*, 1955, 67, 3-6. [I. Med. Klin., Univ. Vienna.]

A general article.

5689

DÜR, A. Beitrag zur Diättherapie akuter Ernährungsstörungen beim Säugling. [Dietary treatment of acute nutritional upsets in infants.] *Öst. Ztschr. Kinderheilk.*, 1955, 11, 112-116. [Gottfried von Preyersches Kinderspital, Vienna.]

The combined use of two proprietary foods in infantile dyspepsia is described. Aröbon, a preparation of carob bean meal, and Pelargon, a milk and orange juice concentrate, were given in increasing amounts to infants with severe diarrhoea. The results were highly satisfactory; an infant aged 2 months which was losing weight improved in appetite and began to gain weight on the new treatment. The dietary therapy was successful in more than 20 patients with dyspepsia.

A. M. Copping.

5690

WILLS, V. G. and JELLIFFE, D. B. The management of gastro-enteritis in Jamaican infants. *West Indian Med. J.*, 1954, 3, 213-230.

During the last 2 years over 150 infants have been treated for gastro-enteritis in the University College Hospital, Jamaica. Most of them were malnourished and some had kwashiorkor or nutritional marasmus; parenteral infection was rare.

Two schemes of treatment are described in detail, for hospitals with or without laboratory facilities. They follow the usual lines, with antibiotics to combat infection, and oral and parenteral fluids to correct water and electrolyte imbalance, and subsequently with graduated milk feeds over a period of 7 to 10 days. Vitamins are not given till then, unless signs of deficiency, especially of riboflavin, have already appeared; if so, 10 mg. riboflavin daily may be given by injection. For persistent vomiting, 5 mg. vitamin B₁ daily by injection may be tried. Since nearly all the infants with gastro-enteritis are anaemic, Fe is given in liquid form, either sulphate or ammonium citrate, during convalescence. Suggestions for the treatment of persistent mild diarrhoea without fever but with failure to gain weight despite apparently adequate food intake include the local foods ripe bananas, from 3 to 6 daily according to age of infant, beaten into a pulp with skimmed milk, and carob bean, 5 teaspoonfuls of the powdered beans mixed with 5 oz. skimmed milk and filtered. Another local suggestion is coconut water, by mouth only, as a source of potassium; according to a small series of estimations on Jamaican coconuts, it contains on the average 68.4 m. equiv. K per litre.—W. M. Deans.

5691

SCHLESINGER, B., PAYNE, W. and BLACK, J. Potassium metabolism in gastroenteritis. *Quart. J. Med.*, 1955, 24, 33-48. [Hosp. Sick Child., Gt. Ormond St., London.]

Of 653 infants with gastro-enteritis 67 had low levels of K in serum at some stage of their illness. In 37 infants the condition was associated with abdominal distension. Distension occurred in 8 others. High levels of K in serum were found at some stage of the disease, usually during the dehydration phase, in 29 infants, but many of them subsequently had low levels.

In gastro-enteritis, treatment with K should be delayed until dehydration has been corrected.

F. C. Aitken.

5692

ROYER, P. Potassium et vomissements du nourrisson et de l'enfant. [Potassium and vomiting in the infant and child.] *Helv. paediat. Acta*, 1955, 10, 81-88 (with discussion 88-89). [Clin. Méd. Infant., Hôp. Enfants-Malades, Paris.]

5693

HOLT, L. E. (Jr.) Celiac disease—what is it? *J. Pediat.*, 1955, 46, 369-379. [Dept. Paediat., Coll. Med., Univ. New York.]

5694

ROSS, C. A. C., FRAZER, A. C., FRENCH, J. M., GERRARD, J. W., SAMMONS, H. G. and SMELLIE, J. M. Coeliac disease. The relative importance of wheat gluten. *Lancet*, 1955, 268, 1087-1091. [Dept. Pharmacol., Univ. Birmingham.]

Treatment with a diet free from wheat gluten was successful in 28 of 30 children with chronic steatorrhoea and normal pancreatic function. When wheat gluten was restored to the diet of 12 of the 28 steatorrhoea recurred. Of the 2 remaining children one appeared to have a deficiency of bile salts and the other showed fat intolerance dating from an attack of gastro-enteritis in infancy.

The term gluten-induced coeliac disease is suggested for the disorder in those children who recover on diets free from wheat gluten.

F. C. Aitken.

5695

GERRARD, J. W., ROSS, C. A. C., ASTLEY, R., FRENCH, J. M. and SMELLIE, J. M. Coeliac disease: is there a natural recovery? *Quart. J. Med.*, 1955, 24, 23-32. [Dept. Paediat., Univ. Birmingham.]

Thirty-two patients aged from 4 to 19 years in whom coeliac disease had been diagnosed were re-examined. None had been treated with a diet free from wheat gluten. Clinical, biochemical and radiological findings showed that none had completely recovered.—F. C. Aitken.

5696

ANDERSEN, D. H. and MIKE, E. M. Diet therapy in the celiac syndrome. *J. Amer. Dietetic*

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Assoc., 1955, 31, 340-346. [Dept. Pathol., Coll. Phys. Surg., New York.]

5697

RAE, J. W. and ALLISON, R. S. The effect of diet and regular living conditions on the natural history of peptic ulcer. *Quart. J. Med.*, 1953, 22, 439-455.

Sixty-three men were under observation for over 12 months in an experimental scheme for the rehabilitation and employment of men of the Royal Navy suffering from peptic ulcer. Diet was strictly controlled and there was constant medical care. Observations made during the experiment and data obtained in replies to a questionnaire issued 5 years later suggest that in this series of patients the natural history of the disease was not materially influenced by the prolonged medical treatment.—F. C. Aitken.

5698

OGLE, J. C. and HARVEY, C. M. (Jr.) Hypercalcemia and renal impairment following milk and alkali therapy for peptic ulcer. *Southern Med. J.*, 1955, 48, 126-129. [Veterans Admin. Hosp., McKinney, Tex.]

A case is described. On admission to hospital the diet was of milk and cream, CaCO_3 1.0 g. every hour and MgO 2.5 g. once daily. After 3 weeks the patient was drowsy and inclined to vomit. Serum Ca values of 15.6 and 16.0 mg. per 100 ml. were found, with raised values for blood urea and creatinine. Band keratopathy was present in the left cornea. Before admission to hospital the patient had taken about 250 g. baking soda every 3 days and from 4 to 8 oz. cheese daily. When given a diet with less than 200 mg. Ca daily and with a supplement of NaCl and KCl the patient quickly improved. The clinical features agreed with those in 12 other cases reported in the literature.—E. M. Hume.

5699

BLAKE, J. and RECHNITZER, P. A. The haematological and nutritional effects of gastric operations. *Quart. J. Med.*, 1953, 22, 419-437. [Dept. Med., Univ. Edinburgh.]

Three groups of patients were studied: 104 cases of partial gastrectomy, 65 of gastro-enterostomy and 10 of total gastrectomy. In the first group Fe-deficiency anaemia occurred in 40 per cent. of male and in 45 per cent. of female patients. There was no evidence of anaemia in the second group. In the last group there were 6 cases of macrocytic anaemia and 2 of Fe-deficiency anaemia. Signs of vitamin B deficiency occurred in 4 per cent. of the men and 5.5 per cent. of the women in the first group, in 3 of the 10 patients in the last group and in none of the second group. Assessment of

sub-nutrition on the bases of weight loss and diminished working capacity depended on the patients' statements on their capacity for work and on their evidence of previous weight. Only in the last group was the incidence of sub-nutrition high.—F. C. Aitken.

5700

Discussion on toxic and nutritional disturbances in the small intestine associated with surgery of the gastro-intestinal tract. *Proc. Roy. Soc. Med.*, 1955, 48, 245-252.

Disorders of the small intestine after gastro-intestinal surgery are classified and discussed. Vitamin B₁₂ deficiency and anaemia are dealt with by L. J. Wills.—F. C. Aitken.

5701

HAYES, M. A. The dietary control of the post-gastrectomy "dumping syndrome". *Surgery*, 1955, 37, 785-793. [Samuel C. Harvey Metabol. Unit, Dept. Surg., Sch. Med., Yale Univ., New Haven, Conn.]

Seven patients showing the dumping syndrome and failure to gain weight responded satisfactorily to treatment with diets high in fat and protein and low in carbohydrate. Weight curves for 6 of the patients and detailed energy and N balance data for the seventh are presented. A satisfactory diet for such patients is one in which energy from carbohydrate, protein and fat is in the ratio 1:1.5:5.—F. C. Aitken.

5702

MONTGOMERY, T. L. and PINCUS, I. J. A nutritional problem in pregnancy resulting from extensive resection of the small bowel. *Amer. J. Obstet. Gynecol.*, 1955, 69, 865-868. [Dept. Obstet. Gynaecol., Jefferson Med. Coll., Philadelphia, Pa.]

In a patient with nutritional problems after extensive resection of the small intestine a remarkable improvement in digestive tract function occurred during pregnancy.—F. C. Aitken.

5703

ANDRÉ, L. M., LAMY, L. and AGBOTON, D. Alimentation supplémentaire par le lait écrémé. Ankylostomose et gains pondéraux chez l'enfant africain. [Supplementary feeding with skimmed milk. Ankylostomiasis and weight increase in the African child.] *Bull. Soc. Pathol. exot.*, 1954, 47, 535-539. [Hôp. Gén., Brazzaville.]

During their stay in hospital 92 children were given daily supplements of milk, 40 g. to children under 5 years of age and 80 g. to the older children. Carbon tetrachloride and an extract of chenopodium were given for the ankylostomiasis and the results

of treatment were based on the laboratory examination of the stools. Removal of parasites led to some gain in weight but gains were commoner and greater when a milk supplement was given as well. L. Wills.

See also Absts. 5052, 5709.

THYROID DISEASE

5704

GREENWALD, I. Goiter in Ceylon and Nigeria. *Federation Proc.*, 1955, 14, 435. *Proc. [Coll. Med., Univ. New York.]*

5705

KRISS, J. P., CARNES, W. H. and GROSS, R. T. Hypothyroidism and thyroid hyperplasia in patients treated with cobalt. *J. Amer. Med. Assoc.*, 1955, 157, 117-121. [Dept. Med., Stanford Univ. Sch. Med., San Francisco, Calif.]

Five patients were given coated pills of CoCl₂ with amounts varying from 2.8 to 3.9 mg. per kg. bodyweight daily for from 3 to 7½ months. Hyperplasia and hypofunction of the thyroid gland developed. In 3 of the patients goitre developed gradually, enlargement of the thyroid increasing during Co therapy and disappearing within several weeks after Co was withheld. There was evidence of decreased uptake of radio-active I and 1 case of serious clinical myxoedema. It is suggested that Co must be regarded as a goitrogenic agent which ought not to be used indiscriminately, especially for infants and children. Several hypotheses of the mechanism of the antithyroid effect of cobalt are advanced and discussed.

B. W. Simpson.

5706

NORMAN, N. The incidence of hyperthyroidism, hypothyroidism and diabetes in Northern and Southern Norway, a comparative study. *Acta med. scand.*, 1955, 151, 185-190. [Troms and Tromsøe Hosp.]

Complete records of all patients with hyperthyroidism, hypothyroidism and diabetes at Troms and Vestfold Hospitals in Norway from 1942 to 1951 are the basis of this study. Troms County is north of the Arctic circle and Vestfold is in the most southern part of Norway. The amount of sunshine available in Troms is only a fraction of that in Vestfold. In Troms there are Finns and Lapps as well as Norwegians; in Vestfold the population is mostly Norwegian.

There were 839 patients in all, 628 from Vestfold and 211 from Troms. The distribution of the different diseases, their annual incidence and other data are tabulated. The incidence of hyperthyroidism in Vestfold was many times that in Troms; that of hypothyroidism was greater. in

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Troms than in Vestfold. Diabetes was more frequent in Troms than in Vestfold.

B. W. Simpson.

See also Abst. 5616.

ANAEMIA

5707

ARMAS CRUZ, R. Clasificación y fisiopatología de las anemias. [Classification and physiopathology of anaemias.] *Rev. méd. Chile*, 1955, **83**, 73-82. [Cát. Med., Univ. Chile.]

5708

COLLES, B. L. The use of cobalt in some common anaemias of childhood. *Arch. Dis. Childhood*, 1955, **30**, 121-126. [Dept. Paediat., Elizabeth Garrett Anderson Hosp. (Royal Free Hosp. Group), London.]

Fifty children with anaemia refractory to treatment with Fe were given Co. All but one, a case of *erythrogenesis imperfecta*, responded in Hb and red cell count. Most of the cases were of anaemia secondary to infection or anaemia of prematurity. Further examination of 12 in whom marrow was studied before and after treatment showed erythroid hyperplasia in 9. The mode of action of Co is discussed.—F. C. Aitken.

5709

STEWART, (I. T. Environmental factors in anaemia and infection in Pakistan. *Proc. Roy. Soc. Med.*, 1955, **48**, 291-295 [with discussion 295]. [Dow Med. Coll., Karachi.]

Hb levels were estimated in a representative sample of over 1000 Karachi women and the results were classified according to the subject's social status. Anaemia was prevalent and increased in incidence from the group of highest to that of fourth highest social status and then decreased in the fifth group of lowest social status. Anaemia was most prevalent in the age group 15 to 30 years. Most of it was of simple nutritional type.

A study of intestinal parasitic infection in a group of over 1000 men and women showed it to be widespread, but incidence was not related to income, community or type of home.

F. C. Aitken.

5710

CHAUDHURI, S. Hydrolysed protein and milk powder in the treatment of anaemia in India. *J. Trop. Med. Hyg.*, 1955, **58**, 56-63. [Haematol. Res. Lab., Safadr Jang Annexe Hosp., New Delhi.]

Sixty patients with macrocytic, normocytic or microcytic, normochromic or hypochromic anaemia were treated in groups with milk powder, milk or meat protein hydrolysates, hydrolysates of mixed animal and vegetable protein or a groundnut

protein preparation. Treatment with the animal protein preparations caused significant improvement in values for plasma protein, Hb, red cell count and packed cell volume and in clinical condition.—F. C. Aitken.

5711

WOODBUFF, A. W. The natural history of anaemia associated with protein malnutrition. *Brit. Med. J.*, 1955, **i**, 1297-1307. [London Sch. Hyg. Trop. Med., Univ. London.]

In these Goulstonian Lectures data from Nigeria, additional to those dealt with in Abst. 5418, Vol. 21, are presented. In studies of 45 pregnant women in whom, late in their pregnancy, anaemia was often severe, treatment with Fe, folic acid, liver extract or vitamin B₁₂ was ineffective. Of the possible causes considered, presence of intestinal or malarial parasites or deficiency of dietary protein, the last was concluded to be the operative one and to give rise to histological changes in liver and chemical and electrophoretic changes in blood proteins. From cytological examination of liver tissue the cells were found to be thinner than normal. These findings in pregnant women, in a high proportion of whom pregnancies were twin, prompted similar studies in other subjects on whose supplies of protein demands were also likely to be heavy. Similar results were obtained in groups of 9 children with kwashiorkor and of 21 older children and young adults who were anaemic.

Treatment was by providing a well balanced diet with a daily supplement of casein, about 2 oz. for the children and from 2 to 4 oz. for the pregnant women. Results were poorest for the third group of patients, in whom the disease appeared to have reached an irreversible stage. The occurrence of nutritional macrocytic anaemia associated with liver damage as it may affect the subject at different stages of his life history is summarised in schematic form.—D. Harvey.

5712

GATENBY, P. B. B. and LILLIE, E. W. Iron-deficiency anaemia in pregnancy. *Lancet*, 1955, **268**, 740-743. [Rotunda Hosp., Dublin.]

Blood samples taken from 4314 patients on first attendance at the antenatal clinic showed Hb values below 10 g. per 100 ml. in 1027. The incidence of anaemia rose in winter. A special study of 397 of the women with anaemia showed that 34 per cent. were without symptoms of the disease. Only in those with Hb values below 6 g. were symptoms constantly present. From case history data it was concluded that deficiency of Fe in the diet was the most important cause of this anaemia; very few patients did not respond to Fe therapy in some form.—F. C. Aitken.

5713

Discussion on anaemia in general practice. *Proc. Roy. Soc. Med.*, 1955, **48**, 347-354.

The diagnosis and treatment of iron-deficiency and hypochromic anaemias of pregnancy are described by Dr. D. G. French and the management in practice of other forms by Dr. M. C. G. Israels.—F. C. Aitken.

5714

JANDL, J. H. **The anemia of liver disease: observations on its mechanism.** *J. Clin. Invest.*, 1955, **34**, 390-404. [Thorndike Mem. Lab., Second and Fourth Med. Serv. (Harvard), Boston City Hosp., Mass.]

This detailed study of the blood and bone marrow of 20 alcoholics with cirrhosis and anaemia included some nutritional tests which will be published separately. In 4 of the patients folic acid deficiency complicated liver cirrhosis and morphologically these were in a group apart from the remaining 16. The mechanism of the anaemia of uncomplicated liver disease is discussed at length.—F. C. Aitken.

5715

O'BRIEN, J. R. P., TAYLOR, W. H., TURNBULL, A. L. and WITTS, L. J. **An apparently homogeneous substance with intrinsic-factor activity associated with cell particles from human stomach.** *Lancet*, 1955, **268**, 847-848. [Dept. Biochem., Radcliffe Infirmary, Univ. Oxford.]

The preparation of the active substance E is described. In tests on patients with pernicious anaemia substance E promoted absorption of 32 per cent. of radio-active vitamin B₁₂ in a dose of 10 mg.—F. C. Aitken.

See also Absts. 5052, 5365, 5621, 5622, 5624.

OTHER CONDITIONS

5716

HAGEDORN, H. C. **Anorexia nervosa.** *Acta med. scand.*, 1955, **151**, 201-208. [Niels Steensen's Hosp., Gentofte, Denmark.]

Of 17 suspected cases of *anorexia nervosa* referred to the hospital for treatment the diagnosis was confirmed in only 8.—F. C. Aitken.

5717

MARQUEZY, R. A. and DEBRAY, P. **La rehidratación en la toxicosis del lactante. [Rehydration in infantile toxicosis.]** *Rev. española Pediatr.*, 1955, **11**, 99-107. [Paris.] French, English and German summaries.

Extracellular dehydration characterised by hypotonic plasma and cell hyperhydration results from excessive loss of electrolytes and is relatively rare; it is controlled by injection of hypertonic

saline. More common is primary extracellular dehydration with hypertonic plasma and secondary cell dehydration; it occurs when loss of water is greater than that of electrolytes, as seen in neurotoxicosis.

In this condition it is important to recognise the urgent need for rehydration when the loss of weight is 10 or 15 per cent., whether or not other clinical signs are present. The mental state is also an important guide to the need for rehydration. Depression of the freezing point of plasma or cerebrospinal fluid is of confirmatory value.

Isotonic glucose serum [not defined] is the treatment preferred. When the loss of weight is less than 10 per cent., glucose in saline or water may be given by mouth; this is possible when the infant can swallow easily. In more advanced dehydration the subcutaneous route is used, but when the infant is comatose immediate intravenous perfusion is called for. Satisfactory responses to rapid intravenous perfusion with plasma or glucose solution are obtained even in vascular collapse. Combination of rehydration with antibiotics is advisable in neurotoxicosis.—D. Duncan.

5718

BERRYMAN, G. H. **"Simple" obesity: a current review.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 347-358. [Clin. Invest., Abbott Labs., N. Chicago, Ill.]

5719

MAYER, J. **An experimentalist's approach to the problem of obesity.** *J. Amer. Dietetic Assoc.*, 1955, **31**, 230-235. [Dept. Nutrit., Harvard Sch. Pub. Health, Boston, Mass.]

Little is known of the causes and mechanism of obesity in man and a review of experimental animal studies suggests that the problem is more complex than is often supposed. (See also Review Article, pp. 596 and 871, Vol. 25.)

F. C. Aitken.

5720

WERNER, S. C. (with BARBER, S., MOEN, I., ILES, M. and KERR, A.). **Comparison between weight reduction on a high-calorie, high-fat diet and on an isocaloric regimen high in carbohydrate.** *New Engl. J. Med.*, 1955, **252**, 661-665. [Dept. Med., Coll. Phys. Surg., Columbia Univ., New York.]

A high-fat diet was not superior to a high-carbohydrate diet in inducing weight loss in 6 obese subjects when the intake from either diet was about 2870 Cal. daily.—F. C. Aitken.

5721

La resistenza dell'obeso alla diminuzione di peso. [The resistance of the obese to loss of weight.] *Acta gerontol.*, 1954, **4**, 192-194.

N.A. and R., October 1955

A discussion of literature about the psychogenic causes of obesity.—D. Duncan.

5722

ØSTRGAARD, L. On psychogenic obesity in childhood. 5. *Acta paediat.*, 1954, 43, 507-521. [Gersonsvej, Hellerup, Denmark.] German, Spanish and French summaries.

For previous parts see Absts. 5116, Vol. 23; 2437, Vol. 24. This part relates to 20 boys and 38 girls between 4 and 14 years treated for obesity in Queen Louise's Children's Hospital, Copenhagen during 11 months in 1949 and is based on interviews and mental tests; less precise information for comparison was also collected about 46 normal children matched for age.

The appetite of 44 of the obese children was considered by their parents to be large and there was evidence that most of the other children were large eaters also; unless prevented, 49 habitually ate between meals. Some were gourmets, others gluttons. Favourite foods were potatoes and thick gravy, bread and butter and jam, pancakes, puddings and mashed potatoes. Forty-five were inactive, but there was no direct relation between activity and degree of obesity.

Intelligence quotients were normally distributed, but 49 showed signs of emotional difficulty, e.g., failure to adapt to other children. Abnormal family relationships were found, in 14 the typical Bruch set-up (see Abst. 5116, Vol. 23 for references) but in others direct rejection or over-exaction by parents, or difficulties arising from death or separation of parents or the arrival of a new baby. For some children eating seemed to be a consolation, for others an outlet for aggressiveness. Rorschach testing indicated that they were unusually impulsive and receptive.

W. M. Deans.

5723

GUTMAN, A. B. and Yü, T. F. Prevention and treatment of chronic gouty arthritis. *J. Amer. Med. Assoc.*, 1955, 157, 1096-1102. [Dept. Med., Mount Sinai Hosp., New York.]

Treatment of gout has hitherto consisted more in measures to control acute attacks rather than to check gradual accumulation of uric acid in the tissues. For the latter purpose, a combination of diet regulation and treatment with Probenecid and small amounts of colchicine daily is described, which reduced serum uric acid values to below 7 mg. per 100 ml. in all but 3 of 30 patients. Joint stiffness or pain disappeared or was reduced in most, and tophi became smaller, though associated bone lesions persisted. Five case histories are given, with photographs of hands or feet.

For diet regulation, uric acid in serum and 24-hr. excretion in urine are estimated before and after 10 to 14 days on a basal diet low in purines and

fat and containing 60 to 70 g. protein exclusively from cereals, grain products, eggs, cheese, milk, non-leguminous vegetables and fruit and supplying about 2000 Cal. In 96 of 114 patients serum uric acid fell, in 22 by from 2 to 4 mg. per 100 ml., but on the average by only 1.1 mg. Though the effect of diet is modest, it is considered valuable. The studies are repeated after adding 4 oz. (60 g.) [as in text] meat, fish or fowl; from the results, together with the effect of Probenecid, the permissible quota of flesh protein is arrived at, generally 2 to 4 oz. (60 to 120 g.) several days a week, daily in some.—W. M. Deans.

5724

SCHOLZ, D. A. and KEATING, F. R. (Jr.) Milk-alkali syndrome. Review of eight cases. *Arch. Int. Med.*, 1955, 95, 460-468. [Sect. Med., Mayo Clin., Rochester, Minn.]

Case histories are given of patients who had raised blood Ca, renal insufficiency with retention of N and, sometimes, alkalosis. As treatment for gastric ulcers they had taken, with their milk diet, large quantities of absorbable alkali; when this was replaced by aluminium hydroxide gel, recovery was rapid and uneventful.—D. Harvey.

5725

HOLTEN, C. and LUNDBÆK, K. Renal insufficiency and severe calcinosis due to excessive alkali-intake. *Acta med. scand.*, 1955, 151, 177-183. [1. and 2. Univ. Clin. Int. Med., Kommunehosp., Aarhus.]

The case history and post-mortem findings are given for a man who was addicted to bicarbonate and habitually drank large quantities of milk.

F. C. Aitken.

5726

KEYS, A. Atherosclerosis and the diet. *S. African Med. J.*, 1955, 29, 332-335. [Dept. Physiol. Hyg., Univ. Minnesota.]

5727

FURMAN, R. H. Atherosclerosis and lipoproteins. *Southern Med. J.*, 1955, 48, 6-11 (with discussion 11). [Dept. Int. Med., Sch. Med., Univ. Oklahoma, Oklahoma City.]

A review.

5728

ALTSCHUL, R. Lowering of serum cholesterol by ultraviolet irradiation. *Geriatrics*, 1955, 10, 208-212. [Univ. Saskatchewan, Saskatoon.]

Seventy-eight hospital patients, most of whom had vascular diseases, were treated with ultraviolet light for varying times and estimations of cholesterol in serum were made before, after and sometimes during treatment; a small group of

healthy young adults served as controls. Ultra-violet light reduced serum cholesterol in 61 of the 78 patients, the mean reduction being 8.9 per cent. with standard deviation ± 15.9 per cent. In 16 of 24 patients with hypertension, repeated treatment was followed by reduction of the blood pressure.—G. A. Garton.

5729

SELDIN, D. W. Management of congestive heart failure. Management designed to avoid serious disturbances of electrolyte and water balance. *Arch. Int. Med.*, 1955, **95**, 385-399. [Dept. Int. Med., Southwestern Med. Sch. Univ. Texas, Dallas.]

5730

WESTON, R. E., SACHS, B. A., GROSSMAN, J., HOROWITZ, H. B., RUBLER, S. and LEITER, L. Metabolic response of malnourished cardiac patients to acute nutritional depletion. *Federation Proc.*, 1955, **14**, 162-163. *Proc. [Med. Div., Montefiore Hosp., New York.]*

5731

LACHNIT, V. Die Ernährung der Nierenkranken. [Feeding patients with kidney disease.] *Wien. klin. Wochenschr.*, 1955, **67**, 113-114. [2. Med. Klin., Univ. Vienna.]

In a lecture the essentials of diet treatment are outlined for acute glomerulonephritis, nephrosis, chronic kidney disease, pyelitis and kidney stone.

A. M. Copping.

5732

PASSARO, G. La terapia della nefrosi lipoidea nel bambino. (Revista sintetica). [Treatment of lipid nephrosis in children: a review. *Arch. ital. Pediat. Puericoll.*, 1955, **17**, 125-156. [Ist. Clin. Paediat., Univ. Rome.] French, English and German summaries.

5733

ZWEYMÜLLER, E. Elektrolythaushalt beim Nephrosensyndrom unter Kationenaustauscher- und ACTH-Verabreichung. [Electrolyte metabolism in the nephrotic syndrome during treatment with cation exchangers and ACTH.] *Helv. paediat. Acta*, 1955, **10**, 237-244. [Kinderklinik., Univ. Vienna.]

5734

NISENSEN, A. Hypoproteinemia and edema in eczema. *J. Pediat.*, 1955, **46**, 554-551. [Los Angeles Child. Hosp., Calif.]

A table is presented showing levels of total protein, albumin, globulin and N.P.N. in the blood, the incidence of infections, the degree of oedema and weeping of the skin and the sources of protein in the diets of 24 infants with eczema. There was

clinical oedema in 8; levels of albumin were low in 18 and of globulin low in 5. It appeared that the conditions predisposing to oedema were extensive weeping of the skin, a diet poor in animal protein, and infection. The oedema responded to treatment with meat or amino-acids by mouth or with blood or amino-acids by vein.—F. C. Aitken.

5735

ARMSTRONG, M. D. and TYLER, F. H. Studies on phenylketonuria. 1. Restricted phenylalanine intake in phenylketonuria. *J. Clin. Invest.*, 1955, **34**, 565-580. [Lab. Study Hereditary and Metabol. Disorders, Coll. Med., Univ. Utah, Salt Lake City.]

In 5 children correction of the biochemical abnormalities by restriction of phenylalanine intake was accompanied by some clinical improvement, notably control of convulsions, but no consistent effect on mental condition was seen.—F. C. Aitken.

5736

MARCOS LANZAROT, M. Estudios sobre la jaqueca. Revisión de observaciones realizadas durante veintisiete años. [Studies on migraine. Review of observations covering twenty-seven years.] *Rev. clín. española*, 1955, **56**, 302-312. English, German and French summaries.

In a general discussion on migraine the following data are given, for a patient considered to be typical. The oculo-cardiac reflex was normal on days when there was no migraine attack, but was reversed during an attack. The white blood cell count fluctuated irregularly. During an attack blood Ca rose from a normal value of 10 mg. per 100 ml. to 16. The B.M.R. [standard not stated] varied considerably, from +3 per cent. on a normal day to -12 per cent. on a day of moderate migraine. There was oliguria before an attack and polyuria later. Acetonuria was common. Blood sugar was normal, but when the patient was given a ketogenic diet there was an intense attack of migraine with low blood sugar. Sugar tolerance tests on a normal day produced a final drop in blood sugar. The alkali reserve was very high during an attack. Vomitus contained no free HCl, and the sediment contained eosinophils, suggesting angioneurotic oedema of the gastric mucosa. The electrocardiogram is described.

The etiology of migraine is discussed with reference to these findings and to the literature.

D. Duncan.

5737

GŁOGOWSKI, G. Die Bedeutung von Ernährungsschäden für den Verlauf extrapulmonaler Tuberkulosen und die Wirksamkeit der anti-biotisch-chemotherapeutischen Behandlung. [The significance of nutritional disorders for the course of non-pulmonary tuberculosis and

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for the efficacy of chemotherapy and treatment with antibiotics.] *Münch. med. Wochenschr.*, 1955, 97, 11-13. [Staatl. Versorgungskrankenhäus, Bad Tölz.]

In patients with tubercular lesions of the intestine or bones the general nutritional condition was often poor and treatment was ineffective until better nutrition was instituted. Vitamins were found to be of primary importance and a multi-vitamin preparation is recommended. It was necessary to give large doses of vitamins for several months to some patients before healing began in response to chemotherapeutic or antibiotic treatment.—A. M. Copping.

5738

MICKELSEN, O. Nutrition and alcoholism. A review. *J. Amer. Dietetic Assoc.*, 1955, 31, 570-575. [Lab. Biochem. Nutrit., Nat. Inst. Arthritis Metabol. Dis., Nat. Inst. Health, Bethesda, Md.]

5739

GUBAR, V. L. O vrednom deistvii alkogolya na zheludok. [The harmful influence of alcohol on the stomach.] *Vop. Pitani.*, 1955, 14, No. 2, 3-8. [Inst. Pitani, Akad. Med. Nauk SSSR, Moscow.]

See also Absts. 5151, 5558, 5590, 5599, 5602, 5643, 5644.

6. FEEDING OF ANIMALS

GENERAL, INCLUDING DIGESTIBILITY TRIALS

5740

BREHUM, K. Die Nettoenergie als Grundlage der Bewertung der Futtermittel. [Net energy as a basis for evaluation of feedingstuffs.] *Wiss. Abh. Deutsch. Akad. Landwirtschaft. Berlin*, 1954, 5, 91-116; *Repr.* No. 130, *Norges Landbruks-hogsk.*, 1953. [Inst. Haustierernährung, Landwirtschaft. Hochschule, Vollebakk, Norway.]

A paper celebrating the centenary of the research institute at Möckern, at which much of the work of Kellner, Fingerling and others on the evaluation of feedingstuffs on the basis of net energy was done. It is a historical review concluding with a re-statement of the author's view (see Abst. 863, Vol. 15) that net energy is a more satisfactory basis than metabolisable energy or total digestible nutrients.

W. M. Deans.

5741

NEHRING, K. Internationale Futtermass-stäbe. [International measures of feeding value.] *Ztschr. Tierernährung Futtermittelk.*, 1955, 10, 60. *Proc.* [Rostock.]

5742

WÖHLBIER, W. Kritische Betrachtung der Grundlagen des Stärkewertes. [Critical remarks on the basis of starch value.] *Ztschr. Tierernährung Futtermittelk.*, 1955, 10, 59. *Proc.* [Hohenheim.]

5743

KIRSCH, W. Futterwertbeurteilung in der Futterberatung der landwirtschaftlichen Praxis. [Feed evaluation in the advisory work on feeding in agricultural practice.] *Ztschr. Tierernährung Futtermittelk.*, 1955, 10, 61. *Proc.* [Hohenheim.]

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5744

LENNERTS, L. Der Einfluss verschieden hoher Rauhfuttermengen und Eiweisszulagen auf die Verdaulichkeit des Futters, nach Versuchen an Schafen. [Effect of different amounts of roughage and protein supplements on digestibility of the fodder in experiments with sheep.] *Arch. Tierernährung*, 1954, 4, 79-132. [Inst. Tierernährungslehre, Humboldt Univ., Berlin.]

The first series of experiments was on 2 Merino mutton type wethers 2 to 3 years old and weighing 62 to 72 kg. They were fed on chaffed hay twice daily and water was always available. Each study consisted of a pre-period of 8 days and a balance trial lasting 10 days. The quantities of hay were varied and 3 different hays were used. Digestibility results are fully tabulated and statistically analysed.

Intakes of between 600 and 1400 g. of hay did not significantly affect the percentage digestibility of crude protein, fibre or fat; digestibility of N-free extract did not differ at intakes of 800 and 1200 g. hay, but between 600 and 1400 g. there was a decrease.

With the same 2 sheep the effect of a protein supplement of soya bean meal was studied; the intakes were 600 or 1000 g. hay and 250, 400 or 550 g. soya bean meal, and in one experiment 1400 g. hay and 550 g. meal. With increasing protein intake digestibility of hay protein fell, especially when the hay intake was low. With 1000 g. hay the protein supplement increased the digestibility of the crude fat of the hay. There was no effect on digestibility of fibre or N-free extract.

It is concluded that a medium amount of roughage is necessary for the best utilisation of feed by sheep.—D. Duncan.

5745

RAYMOND, W. F., HARRIS, C. E. and KEMP, C. D. **Studies in the digestibility of herbage. 6. The effect of level of herbage intake on the digestibility of herbage by sheep.** *J. Brit. Grassland Soc.*, 1955, 10, 19-26. [Grassland Res. Inst., Hurley, Berks.]

For methods see Absts. 3834, 5320, Vol. 24.

Six experiments with 6 or more animals all showed an increase in the percentage of dry matter digested when sheep were given frozen herbage at a level of from 70 to 83 per cent. of that of their full-fed mates. The increase in digestibility ranged from 0.3 to 2.7 per cent., the weighted mean being 1.06 per cent.

J. L. Corbett.

5746

BAILEY, G. L., BALCH, C. C. and MURDOCH, J. C. **The digestibility and feeding value of lucerne/timothy sward ensiled in four ways.** *J. Brit. Grassland Soc.*, 1955, 10, 27-34. [Nat. Inst. Res. Dairying, Univ. Reading.]

A lucerne and timothy sward was ensiled with the addition of either glycolic acid, molasses or barley meal, or after wilting without additions. Gross chemical composition and digestibility of the silages were similar except that wilting raised the dry matter percentage of the product from approximately 22 to 36, and reduced digestibility of the protein by 10 per cent., probably a result of overheating. A total of 24 Shorthorn, Guernsey and Friesian yearling heifers were fed individually on hay and the silages in different proportions, the relative feeding values of the silages for growth being calculated from equations based on the weights of feeds consumed, liveweight and growth rate. This technique was shown to provide a measure of the nutritive value of individual feeds in mixed rations.—J. L. Corbett.

5747

COOK, C. W., STODDART, L. A. and HARRIS, L. E. **The nutritive value of winter range plants in the Great Basin as determined with digestion trials with sheep.** *Utah Agric. Exp. Stat. Bull.* No. 372, September, 1954, pp. 56.

The winter forage of the range of the Great Basin region of Utah consists mainly of browse of the saltbush and sagebush types with some grasses and a few forbs. In some areas grass predominates. Sheep are usually wintered on the range without supplement. Feeding and digestibility trials from 1946 to 1953 showed that the range provided keep borderline or low in digestible protein and metabolisable energy and nearly always deficient in P. When only moderate grazing was allowed utilisation and digestibility were good, but heavy grazing decreased both. Browse supplied abundant carotene. On areas with a majority of

browse, supplements supplying energy were necessary, and in areas where there was more grass than browse a protein supplement was necessary. Where the browse was mainly of the saltbush type an intermediate supplement was best. The forage plants are described and illustrated.—T. D. Bell.

5748

SCHNEIDER, W. **Verdauungsversuche mit Sepa-Patent-Schnitzel. [Digestion experiments with Sepa-patent slices.]** *Ztschr. Tierernährung Futtermittelk.*, 1955, 10, 56-59. [Inst. Tierernährungslehre, Landw. Hochschule, Stuttgart, Hohenheim.]

In digestibility trials with wethers ordinary dried beet pulp was compared with 2 samples mineralised with molasses waste [*Vorscheideschlamm*]. There was little difference in digestibility, but the mineralised slices had a Ca : P ratio of 17 : 1 and it is considered desirable that P should be added before the Sepa slices could be recommended.

D. Duncan.

5749

NORDFELDT, S. (with RUUDVERE, A., TOIGER, E. and LAGERWALL, P.) **Digestibility experiments with pigs.** *Kgl. Landbrukshögsk. Ann.*, 1954, 21, 1-29. [Nat. Animal Exp. Stat., Uppsala.]

The results of 120 original experiments and 1400 experiments reported between 1900 and 1951 on digestibility of different feeds by pigs were examined. The pigs used were considered in groups by weight, under 100 kg., 100 to 180 kg. and over 180 kg. It was shown that the percentage digestibility of organic matter, N-free extract, protein and crude fibre increased directly with the liveweight of the pig. Ether extract was digested less efficiently as liveweight increased. The percentage of crude fibre affected the digestibility of the other components of the feed. This effect depended on the composition of the fibre and varied from feed to feed. Some feeds vary greatly in the chemical composition of the fibre, and some are relatively stable, a fact which must be kept in mind when calculating digestibilities from formulae. The effect of crude fibre on the digestibility of the feed also varies to some extent with the liveweight of the pig.—T. D. Bell.

5750

BOLTON, W. **The digestibility of the carbohydrate complex of barley, wheat and maize by adult fowls.** *J. Agric. Sci.*, 1955, 46, 119-122. [Poultry Res. Centre, W. Mains Rd., Edinburgh 9.]

Five samples of bran, oats, barley, wheat and maize contained 51, 57, 69, 65 and 69 per cent. of N-free extractives. Digestibility trials with adult Brown Leghorn cocks showed that these materials contained 28, 42, 64, 54 and 66 per cent. of

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digestible carbohydrates, so that the ratio N-free extractives to digestible carbohydrate varied widely. Further analysis showed that the materials contained 22, 35, 59, 51 and 62 per cent. of "available" carbohydrate (defined as starch and sugar, expressed as starch) all of which was digestible; and these figures represented 81, 83, 92, 93, and 95 per cent., respectively, of those obtained for total digestible carbohydrate in the digestibility trials. Some of the difference was accounted for by digestible pentosans, which formed from 2 to 4 per cent. of each sample.—K. J. Carpenter.

5751

DYMSZA, H., BOUCHER, R. V. and McCARTNEY, M. G. Investigation of crude fiber digestion in 12-week-old turkeys. *Poultry Sci.*, 1955, 34, 240-242. [Dept. Agric. Biol. Chem., Pennsylvania State Univ., University Park.]

Turkeys, 12 weeks old, were caged individually and fed on rations containing 5, 10 or 15 per cent. of crude fibre. These levels were obtained by varying the proportions of oat hulls, maize meal and soya bean oilmeal in the 3 rations, which contained the same levels of animal protein and vitamin supplements.

In a 5-day digestibility trial the percentage of the crude fibre in the 3 rations that appeared to be digested were 1.0, 2.1 and 2.7 per cent., respectively. These are considered to show a negligible digestion of crude fibre by turkeys of this age.

K. J. Carpenter.

5752

DOWE, T. W., MATSUSHIMA, J. and ARTHAUD, V. The effects of the corn-alfalfa hay ratio on the digestibility of the different nutrients by cattle. *J. Animal Sci.*, 1955, 14, 340-349. [Univ. Nebraska.]

The digestibility of the dry matter, crude protein, crude fibre, ether extract and N-free extract of rations in which the ratios of maize to alfalfa hay were 1:1; 2:1; 3:1; 4:1 and 5:1 was estimated in a series of digestibility trials with yearling Aberdeen-Angus or Hereford bulls and Hereford steer calves. As the amount of maize in the rations increased the amounts of dry matter, crude protein and N-free extract in the faeces also increased. Statistical analysis of the data showed that the apparent digestibilities of the nutrients did not differ significantly between one ration and another.—J. N. Aitken.

5753

MACINTYRE, T. M. The digestibility of dried ground seaweed meal by the laying hen. *Canad. J. Agric. Sci.*, 1955, 35, 168-174. [Exp. Farm, Nappan, N.S.]

The digestibility of *Fucus vesiculosus* and *Ascophyllum nodosum*, the species of seaweed most

commonly found on the coast of Nova Scotia, was investigated in trials in 1952, 1953 and 1954. Six 1-year-old Barred Plymouth Rock laying hens were used in each trial, and the trials lasted for 4 to 8 days, preceded by a preliminary period of 4 days. Since the birds would not accept seaweed meal alone it had to be mixed, at a level of 10 to 50 per cent., with a basal ration. In the first year it was given dry, and subsequently as a wet mash. In all the trials the addition of seaweed meal depressed the digestibility of all constituents of the ration except ether extract in 2 cases. The digestibility of the seaweeds, calculated by difference, was also low, and sometimes, for some constituents, negative.—T. D. Bell.

5754

BLACK, W. A. P. Seaweed in animal footstuffs. 1. Availability and composition. 2. Feeding and digestibility trials. *Agriculture, J. Minist. Agric. Engl.*, 1955, 62, 12-15; 57-62. [Inst. Seaweed Res., Inveresk, Midlothian.]

A review.

5755

RICE, E. E., MONE, P. E., GRAY, R. E., HOLLEMAN, R. G. (Jr.) and BEUK, J. F. Use of fats in animal feeds. The value of fat as a feedstuff. *J. Amer. Oil Chem. Soc.*, 1954, 31, 56-59. [Nutrit. Biochem. Res. Div., Res. Labs., Swift and Co., Chicago, Ill.]

The results of trials with poultry and pigs are presented. They show that when 3 to 14 per cent. of fat was added to a control ration less feed per lb. liveweight increase was required. Other improvements due to the addition of fat, such as easier handling of dusty feeds, better appearance and palatability, and easier pelleting, and possible difficulties in commercial practice are discussed.

T. D. Bell.

5756

DIJKSTRA, N. D. De voederwaarde van snijrogge. [Feeding value of green rye.] *Landbouwk. Tijdschr.*, 1955, 67, 201-206. [Rijkslandbouwproefstat., Hoorn.] English summary.

Green rye is a traditional crop on sand in the Netherlands, for either spring or autumn feeding. Digestibility was estimated in 1888 by Frear *et al.* (*Pennsylvania Agric. Exp. Annu. Rep.*) and possibly by other, unidentified, workers. The tests reported here were made on 3 wethers, fed on green rye alone, 0.77 to 0.79 kg. per head daily. There were 4 experiments in April and May 1954, a dry spring. Protein and its digestibility decreased; fibre, which was much less than reported in the literature, roughly 17 to 23 per cent. of dry matter as compared with 30 to 36 per cent., also was slightly less digestible from the first to the last test. Digestible true protein and starch

equivalent for the 4 tests were on the average, per 100 g. dry matter, 9.80, 8.17, 5.34 and 3.54 and 72.2, 73.4, 71.1 and 68.7. Digestible true protein was equivalent to digestible crude protein less 0.91, the amides present.—I. Leitch.

5757

ROGERSON, A. **Nutritive value of sunflower heads.** *E. African Agric. J.*, 1955, 20, 189-190. [Joint Animal Indust. Div., E. African Agric. Forest. Res. Organiz.]

Ground sunflower heads which had lost about 30 per cent. of their seeds before grinding had the following percentage composition and, in brackets, digestibility coefficients: crude protein 14.63 (74.3); ether extract 7.19 (90.2); crude fibre 24.07 (43.0); N-free extract 45.54 (65.5); true protein 12.58 (83.5). The calculated starch equivalent was 52.1 and the protein equivalent 10.7. The digestibility trials were made on sheep.

J. S. Thomson.

5758

ROGERSON, A. **Nutritive value of green *Indigofera subulata* herbage.** *East African Agric. J.*, 1955, 20, 240. [Animal Indust. Div., E. African Agric. Forest. Res. Organiz.]

Some species of the genus *Indigofera* (legume) are poisonous to livestock and an experiment with sheep was made to find out whether *Indigofera subulata*, a promising species in Kenya and Southern Rhodesia, was poisonous. Two sheep were fed for 20 days on this legume as sole diet; apart from some scouring, no ill effect was noted. The composition, on a dry matter basis, was crude protein 16.78, ether extract 1.06, crude fibre 31.81, N-free extract 40.85 and true protein 13.47 per cent. Composition and digestibility data showed that this species compared favourably with the temperate legumes vetch and sainfoin.

J. S. Thomson.

5759

FRENCH, M. H. **Earth-eating and the mineral needs of livestock.** *E. African Agric. J.*, 1955, 20, 168-175. [Joint Animal Indust. Div., E. African Agric. Forest. Res. Organiz.]

The history of the development of knowledge about the mineral requirements of livestock and feeding habits which may be connected with them is described. No theory about the reasons for geophagia or other forms of depraved appetite fits all the facts, since none explains the ingestion of excesses, or of poisonous elements, or the refusal of one form of an essential element and acceptance of another. It is also hard to accept the belief that animals are capable of knowing their requirements and of satisfying them when man is not. The functions of minerals and the results of deficiencies or excesses are described.

T. D. Bell.

5760

ROGERSON, A. **Nutritive values of locally prepared cottonseed and linseed cakes.** *East African Agric. J.*, 1955, 20, 245-246. [Animal Indust. Div., E. African Agric. Forest. Res. Organiz.]

Samples of locally prepared cottonseed and linseed cakes were analysed and digestibility trials were made with sheep. The cottonseed cake had a high crude fibre content, 17.58 per cent. in the dry matter, about twice the normal amount, showing that the hulls had not been completely removed during decortication. Digestibility data were similar to those quoted by Woodman except for crude fibre, where a value of 100 per cent. was obtained, a figure differing widely from that of 28 per cent. quoted by Woodman.

Data for linseed cake were similar to quoted values for British samples except for a somewhat higher oil content and higher starch equivalent.

It is concluded that both the locally prepared products are valuable concentrates for stock.

J. S. Thomson.

5761

ROGERSON, A. **Nutritive value of coffee hulls.** *East African Agric. J.*, 1955, 20, 254-255. [Animal Indust. Div., E. African Agric. Forest. Res. Organiz.]

The chemical composition of 2 samples of coffee hulls was: crude protein 10.17, 9.25; ether extract 1.58, 2.02; crude fibre 35.46, 29.74; N-free extract 45.68, 51.46; true protein 7.29, 7.72. Digestibility values, obtained with sheep, were all low, that of crude protein being only 13.5 and 7.0 per cent. for the 2 samples. The calculated protein equivalent was 0.7 per cent. The coffee hulls were palatable, but cannot be regarded as a concentrate.—J. S. Thomson.

5762

MAHADEVAN, V. and SATYANARAYANA RAO, K. **Nutritive value of green manure crops. 1. *Sesbania speciosa*.** *Indian Vet. J.*, 1954-55, 31, 83-87. [Dept. Animal Nutrit., Madras Vet. Coll.]

Leaves and stalks of *Sesbania speciosa*, a leguminous plant used for green manure in the United States and more recently in India, had the following percentage composition on a dry matter basis when cut at 5 months: crude protein 24.7, 10.9; ether extract 9.0, 6.9; crude fibre 16.2, 29.75; N-free extract 43.1, 43.9; total ash 7.1, 8.5; silica 0.8, 3.8; Ca 0.8, 1.25; P 0.3, 0.2. These figures suggested that it might be a useful fodder if the Ca:P ratio was corrected; but cattle would not eat it, nor would guineapigs when it was mixed with other greens, and when other greens were not given they consumed little *Sesbania speciosa* or

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S. grandiflora and lost weight. It is concluded that *S. speciosa* is unlikely to be useful for fodder.

W. M. Deans.

5763

MAHADDEVAN, V. The composition and nutritive value of tobacco (*Nicotina tabacum* L.) seed cake or meal. *Indian Vet. J.*, 1954-55, 31, 280-282. [Dept. Animal Nutrit., Madras Vet. Coll.]

A sample of tobacco seed cake had the following percentage composition : moisture 7.1, crude protein 31.5, ether extract 12.3, crude fibre 21.5, N-free extract 17.7, total ash 9.9, silica 4.4, Ca 0.33, P 0.87. The oil content was several times that reported from Italy by Maymone and Tiberio (Abst. 5057, Vol. 18). With their results for digestibility coefficients, the total digestible nutrient content was calculated to be about 56. Tobacco seed cake is considered likely to be a useful feedingstuff.—W. M. Deans.

5764

WELLS, F. B. A note on jojoba bean meal—a potential feed. *Cereal Chem.*, 1955, 32, 157-159. [Labs., Bloomfield Coll. and Seminary, Bloomfield, N.J.]

Jojoba (*Simmondsia californica*) is an evergreen shrub growing wild in southern California, Arizona and western Mexico. The seed is eaten by rodents. It contains about 45 per cent. oils, and after extraction the meal had 31 per cent. protein and 28 per cent. carbohydrates. Small quantities ingested by the author did not have any harmful effect, though the taste is bitter. In view of the favourable chemical analysis, trials using the meal as a feed for stock seem desirable.—T. D. Bell.

5765

DLEKSTRA, N. D. De voederwaarde van natte pulp, afkomstig van continue diffusie. [Feeding value of wet pulp from the continuous diffusion process.] *Landbouwk. Tijdschr.*, 1955, 67, 207-215. [Rijkslandbouwraproefstat., Hoorn.] English summary.

In continuation of a study by the author (Abst. 5150, Vol. 23) in which beet pulp obtained by a discontinuous diffusion process after pre-treatment with SO_2 was compared with that from the normal warm diffusion, these types were tested again with a third from a continuous warm process. Analysis are reported in full for the pulp as produced and for silage made from it and digestibility data for 3 wethers for the silage.

The silage from the cold process was the only one without butyric acid. The structure of the beet was better preserved and so the dry matter content was higher and the losses less. The digestibility also was much higher, 82 per cent. of organic

matter as compared with 54 and 52 for the warm-process silages. Cold-process silage had more than twice as much digestible protein and a starch equivalent half as high again as the others.

I. Leitch.

5766

PARINI, V. P. Belkogo-Vitaminayna pasta. [Protein and vitamin paste.] *Nauka i Zhizn'*, 1953, No. 11, 35.

The pressed filtered juice of green plants is heated to 80° to 100° [C.] The protein coagulates and floats to the surface; excess moisture is then squeezed out, producing a green curd-like mass with 60 per cent. protein and more than 10 per cent. fat, and a carotene content 50 to 100 times that of hay. This paste can be used either fresh or preserved in barrels with 10 to 15 per cent. minced sugar beet. In this form it can be kept for years. For calves it can replace 50 per cent. of the milk and can be given from birth. Egg laying is increased when poultry are given the paste.—H. Scherbatoff.

5767

PRESTHEGGE, K. Ensilert fiskeavfall i fôringen. [Ensiled fish waste in livestock feeding.] *Ny Jord*, 1954, 40, No. 4, 97-102.

The composition of fish waste, including fish not usually marketed as food, is discussed. Ensiling with formic acid is recommended and quantities of silage suitable for milk cows, pigs and other farm animals are discussed.—I. Leitch.

5768

D'YAKOV, A. B. Shire ispol'zovat' rybnye ot-khody. [The wider use of fish waste.] *Karakul. Zverovodstvo*, 1954, 7, No. 5, 42-47. [Moscow Fur Inst.]

Better use of fish waste is recommended.

Feeding pigs on "graks" (boiled cod liver with partial removal of fat) and stearin instead of fish oil gave good results. When seal flesh formed 80 per cent. of the rations of polar foxes and mink, production was higher than ever before both in healthy cubs and in fur; seal flesh was considerably cheaper than horse flesh. If fresh fish is given, yeast and liver should be added to the ration, since fresh fish, except cod and certain other species, inactivates the vitamin B_1 in other foods.

"Graks" contains 400 to 600 I.U. vitamin A, moisture 54 to 75, fat 14.2 to 31.7, protein 8.4 to 12.1, ash 0.8 to 0.9 per cent.—H. Scherbatoff.

5769

LOVERN, J. A. Recent developments in the fish by-products industry. *J. Sci. Food Agric.*, 1955, 6, 233-239. [Torry Res. Stat., Aberdeen.]

5770

DUCKWORTH, J. The value of certain agricultural, marine and industrial products and by-products in livestock feeding. *J. Sci. Food Agric.*, 1955, 6, 177-185; 240-250. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

5771

VOISIN, A. Die vier Grundgesetze einer rationellen Weidewirtschaft. [The four basic laws of rational pasture management.] *Mitt. Deutsch. Landwirtschaft.-Gesellsch.*, 1955, No. 1, 2, 3, pp. 5. [Dieppe.]

An article on the advantages of rotational grazing. The author's 4 basic laws are: (1) the cattle that need the best feed should get grass when it is from 10 to 15 cm. high; (2) the same group of beasts should not be on the same ground for more than 3 days, and only 1 day is better; (3) the grass should be used at the time of maximum reserves in the roots; (4) the same ground should not be in use for more than 4 or at most 6 days at a time, so that the grass does not grow long enough to be grazed twice in rapid succession. Supplying green fodder does not prevent cows cropping the young grass. In Normandy the necessary resting period ranges from 14 to 18 days in May to 40 to 60 in autumn.—W. M. Deans.

5772

KULAEV, V. B. and YAKHONTOV, N. S. Sudan-skaya trave—tsennaya kormovaya kul'tura. [Sudan grasses, a valuable fodder crop.] *Konevodstvo*, 1955, 25, No. 1, 27-28. [VNIIEK.]

Sudan grass, a new crop for the experimental stud farm of the VNIIEK, did well on the local grey podzolic soils and recovered quickly after being used as pasture. The yield of hay was 135 to 146 tseentners per ha. (2733 to 2955 kg. per acre), being almost 6 times greater than that of vetches and oats. Both cattle and horses preferred Sudan grass to vetches and oats. The chemical composition of Sudan grass was: protein 10 to 14, fat 2 to 4, carbohydrate 40 to 45, fibre 28 to 29, ash 8 per cent.—H. Scherbatoff.

5773

MARCHENKO, I. Novaya kormovaya kul'tura. [A new feed crop.] *Nauka i Zhizn'*, 1954, 21, No. 12, 41.

A hybrid of Jerusalem artichoke and sunflower is described. The tops, which are used for silage, contain 12 to 15 per cent. sugar and up to 3 per cent. digestible protein. The tubers contain 2.85 per cent. ash with a high Fe content. One hundred kg. of tubers yields 22.8 feed units. The stems contain 106.8 mg. carotene per kg., which is 2 to 3 times higher than in either sunflowers or Jerusalem

artichokes. Yields were for the hybrid 23,190 feed units per ha., for sunflowers 5720 units and for maize and potatoes 6550 and 7030 units per ha. Both the tubers and silage made from the stems were eaten readily by pigs. The tubers are recommended as a succulent fodder for early spring feeding.—H. Scherbatoff.

5774

PRENDERGAST, J. J. and BRADY, J. J. Animal output of reseeded grassland. 1. The effects of strain of seed on the total output of grassland over a four-year period, and the effects of strain of seed and nitrogen treatment on annual output. *J. Brit. Grassland Soc.*, 1955, 10, 169-176. [Dept. Agric., Dublin.]

Trials were made from 1949 to 1953 to compare plots sown with Aberystwyth and commercial strains of grasses and clovers in a Cocker Park mixture. In the last year half of each received 4 dressings of Nitro-Chalk, totalling 7 cwt. per acre, and the other half got no nitrogen dressing. The plots were rotationally grazed by sheep and bullocks and cut for silage.

Liveweight gains per acre in the 4 years were 2138 lb. for Aberystwyth and 2219 lb. for commercial pastures, with 3.75 and 3.33 tons of cut grass, and estimated starch equivalent outputs were 146.01 and 146.57 cwt. The application of Nitro-Chalk in the last year increased liveweight gain per acre from 565 to 701 lb. on the Aberystwyth and from 548 to 700 lb. on the commercial pasture.—T. D. Bell.

5775

BRITISH GRASSLAND SOCIETY. The assessment and recording of the utilized output of grassland. *J. Brit. Grassland Soc.*, 1955, 10, 67-79.

This is a report by a sub-committee of the British Grassland Society. The different species and categories of grazing animals are classified according to their energy requirements. Suggestions are made for the evaluation of conserved grass products. It is stressed that grassland output estimated from these figures by using the record forms devised are of value primarily for management comparisons, rather than for estimates of the absolute scale of production achieved.

J. L. Corlett.

5776

CURASSON, M. G. Études sur les pâturages tropicaux et subtropicaux. [Studies on tropical and subtropical pastures.] *Rev. Élevage Méd. vét. Pays trop.*, 1955, 8, 35-57.

A review.

5777

GERI, G. La produzione foraggera nell'agro romano. [Forage production in the Agro

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Romano.] *Riv. Zootec.*, 1955, 28, 110-112.
[*Ist. Zootec.*, Univ. Florence.]

5778

STRANDE, K. Beitebruk og beiteforskning i Storbritannia. Inntrykk og erfaringer fra et studieopphold sammenholdt med aktuelle beiteproblemer hos oss. [Use of pasture and pasture research in Great Britain. Impressions and results of a course compared with our own pasture problems.] *Tidsskr. norske Landbruk*, 1955, 62, 85-118.

5779

BAILEY, G. L. and BROSTER, W. H. The fragmentation losses of lucerne hay due to handling. *J. Brit. Grassland Soc.*, 1955, 10, 191-192. [Nat. Inst. Res. Dairying, Univ. Reading, Shinfield.]

During the handling of baled lucerne hay there is liable to be a loss of brittle leaf fragments amounting to about 8 per cent. of the remaining stalky hay. This fraction is much richer in crude protein (20.9 per cent.) than the stalky hay (10.4 per cent.), and much lower in fibre, 19.8 per cent. as against 36.3 per cent. This might affect the results of feeding trials according to the amount of each fraction fed.—J. S. Thomson.

5780

NOVIKOVA, A. E. Ultraioletovoe obluhenie zhivotnykh. [Ultraviolet irradiation of livestock.] *Nauka i Zhizn'*, 1954, 21, No. 3, 36.

By the use of specially constructed equipment [not described] it was possible to treat piglets with ultraviolet light under ordinary conditions on a pig breeding farm. Each of 1100 piglets showed an increase of 9 kg. more over a period of 4 months than the piglets in the untreated group. Exposure was for 8 to 10 min. daily.

Treatment of hens during the autumn and winter increased egg production by more than 30 per cent. Young animals not only made rapid growth but also acquired immunity to disease.

H. Scherbatoff.

5781

DUCKWORTH, J. The feeding of livestock. *J. Roy. Agric. Soc. Engl.*, 1954, 115, 174-183. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

5782

MCUTCHEON, G. K. Green feeding of livestock. *Agric. Eng.*, 1955, 36, 321-323. [New Holland Machine Div., The Sperry Corp.]

5783

KIRBY, G. D. Kitchen waste: the need for a further review. *Roy. Sanit. Inst. J.*, 1955, 75, 266-271 (with discussion 272-273). [Norwich.]

5784

TALLARICO, G. Nuove idee sui pannelli oleaginosi. [New views on oilcakes.] *Riv. Zootec.*, 1955, 28, 86-87.

HORSES

5785

KRÜGER, L. and SEEFFELDT, G. Untersuchungen zur Bestimmung des Arbeitswertes von Gross- und Kleinpferden. [Studies to estimate the value for work of large and small horses.] *Ztschr. Tierzucht. Züchtungsbiol.*, 1955, 64, 175-190. [Inst. Tierzucht., Justus Liebig Hochschule., Giessen.]

Techniques of studying working capacity in draught animals are discussed. Loads were pulled over a distance of 200 m. There were considerable

differences between animals of one strain in the greatest load pulled. Heavy horses pulled extreme loads of from 180 to 440 kg. resistance, trotters 150 to 260 kg., 4-year-old "Kleinpferde" up to 230 kg. and ponies 60 to 135 kg.—D. Duncan.

5786

SMIRNOV, O. K. [Pasturing horses in the north.] *Konevodstvo*, 1955, 25, No. 1, 22.

See also Abst. 4763.

CATTLE

GROWTH AND FATTENING

5787

DAVIS, H. P. Relazione fra il peso vivo e sette altre misurazioni del corpo di bovine Holstein Friesian alla nascita e all'età di 6, 12, 18 e

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24 mesi. [Relations between liveweight and seven other body measurements in Holstein Friesian cattle at birth and at the age of 6, 12, 18 and 24 months.] *Zootec. Vet.*, 1955, 10, 72-73. [Univ. Nebraska, Lincoln.]

Liveweight at birth and at 6, 12, 18 and 24 months of age of 150 Holstein Friesian heifers was measured. The correlations between these weights and length of body, length of rump, height at shoulder, height at hips, chest girth, depth of chest and width of pin bones were calculated. Significant positive correlations of from 0.39 to 0.84 were found for all measurements tested.—T. D. Bell.

5788

DE FRANCISCIS, G. Il fosfato bicalcico quale integrante dell'alimentazione del bestiame. [Dicalcium phosphate as supplement in the feeding of cattle.] *Bol. Soc. ital. Biol. sper.*, 1953, **29**, 1794-1796. [Ist. Fisiol. Vet., Univ. Naples.]

Of 4 calves fed on a normal diet, 2 were given in addition daily for 4 months 15 g. dicalcium phosphate. They were weighed and measured every 2 weeks. In the 4 months the untreated calves gained 68.5 and 72 kg.; those given phosphate gained 76 and 76.5 kg., and all their other measurements also were slightly superior.—E. M. Hume.

5789

HAWKINS, G. E. (Jr.), WISE, G. H., MATRONE, G., WATUGH, R. K. and LOTT, W. L. Manganese in the nutrition of young dairy cattle fed different levels of calcium and phosphorus. *J. Dairy Sci.*, 1955, **38**, 536-547. [Dept. Animal Indust., N. Carolina Agric. Exp. Stat., Raleigh.]

Fifteen Holstein, Jersey and Guernsey calves were divided into 5 groups. The control group was given rations normally used for young calves. After being suckled for 3 days the experimental groups got a synthetic diet with only 1 p.p.m. Mn, the same diet supplemented with 50 p.p.m. Mn, 5 per cent. monocalcium phosphate or both. Weight gains were recorded, and blood samples were analysed for Mn in whole blood and Ca, inorganic P, alkaline phosphatase and Mg in serum. Post-mortem examinations were made of all the experimental calves.

The growth rate of control calves was superior to that of all experimental calves. The Mn supplement did not affect serum Ca, inorganic P or alkaline phosphatase activity, but serum Mg was depressed, more when Ca and P were given also. Mn values in whole blood were increased by the supplement of this element, and this was partly counteracted by the Ca and P supplement. All the experimental calves died within 382 days, showing non-specific clinical signs which are described. Mn prolonged the life span, and the signs were not observed till later in these calves. Signs appeared first in the calves getting Ca and P only, and these animals died earliest. Death was thought to be due to general undernutrition, not to a specific deficiency. At post-mortem exam-

ination calcified lesions were found in the pulmonary and cardio-vascular systems of all the calves which had been given supplements.

T. D. Bell.

5790

WING, J. M. Effect of orotic acid and methionine supplementation on feed consumption and growth of young dairy calves. *J. Dairy Sci.*, 1955, **38**, 504-507. [Dept. Dairy Sci., Florida Agric. Exp. Stat., Gainesville.]

A pilot investigation with 40 newborn Jersey calves showed that supplementation with equal amounts of methionine and orotic acid dispersed in milk at the rate of 440 mg. per 100 lb. bodyweight significantly increased liveweight gain compared with controls. In a second experiment with 2 groups of 6 calves the supplements were administered in a gelatine capsule directly into the reticulo-rumen cavity. Highly significant differences in favour of the supplemented group were obtained in rate of liveweight gain and in efficiency of feed utilisation.—J. N. Aitken.

5791

PRITCHARD, G. I., NEWLANDER, J. A. and RIDDELL, W. H. Aureomycin effects—growth and digestibility studies with identical twin calves. *J. Animal Sci.*, 1955, **14**, 336-339. [Vermont Agric. Exp. Stat.]

Four pairs of 1-week-old identical twin male calves were used in an experiment of 7 weeks' duration. One calf of each pair served as a control; the other was given aureomycin in milk, 30 mg. per 100 lb. bodyweight daily. All calves received hay to appetite and up to 4 lb. of a concentrated mixture daily. Treatment significantly increased rate of gain and efficiency of feed utilisation. A digestibility trial was made when the feeding trial ended. There was no significant within-set difference in the digestibility of dry matter, ash, protein, crude fibre, N-free extract or fat.—J. N. Aitken.

5792

LASSITER, C. A., DENTON, T. W. and BASTIN, G. M. The value of certain surfactants and other growth stimulants in the rations of young dairy calves. *J. Dairy Sci.*, 1955, **38**, 407-415. [Kentucky Agric. Exp. Stat., Lexington.]

In the first experiment 6 groups of 6 Jersey and Holstein calves were used. They were allowed colostrum for the first 2 days and were then fed for 84 days on a calf starter and hay and grain to appetite. The calf starter contained linseed oil-meal and had 18 per cent. protein. Whole milk was given for the first 7 weeks. Group 1 got no supplement. Group 2 had aureomycin, group 3 Ethomid C/15, group 4 Arquad HT, group 5 Ethomid C/15 and Arquad HT and group 6 Ethomid C/15 and aureomycin. Ethomid C/15 is

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a preparation of polyoxyethylene cocoamide, a non-ionic surface-active substance; Arquad HT is trimethyl octadecyl ammonium chloride, a cationic surface-active substance. Increases in growth rate over control, group 1, significant at the 5 per cent. level, were produced by all the supplements. There were also increases in chest girth and height at withers, but these were not analysed statistically. Efficiency of feed utilisation was improved, but not significantly so. Serious scouring occurred in group 4.

The second experiment was similar to the first, but there were 8 calves in each group, and the calf starter had soya bean oilmeal instead of linseed oilmeal, raising the protein content to 21 per cent. Groups 1 to 3 and 6 were treated as in the first experiment; group 4 was given a cationic surface-acting substance, trimethylalkylammonium stearate, and group 5 had Arquad HT at a lower level than previously. There was no significant difference in growth rates between groups in this experiments. The surface-active substances did not stimulate growth or improve efficiency, and group 6 was no better than group 2, contrary to the findings in the first experiment. Scouring was a problem only in group 4. Representative carcasses from each group showed no abnormality. The results of these 2 experiments would not seem to justify the use of surface-active substances to stimulate growth in young calves.—T. D. Bell.

5793

HOMB, T. and BREIERM K. (with NYGAARD, J., EVJU, R. and HENRICHSEN, TH.) Føring av kalver uten flytende skummet melk. [Feeding calves without liquid skimmed milk.] *Samvirke*, 1954, 49, 548-555.

Fifteen calves bought in the market were used, in 3 groups of 5, to compare the results of rearing with skimmed milk, with dried reconstituted skimmed milk and with a calf starter [not further described]. All groups did equally well but fresh skimmed milk was the cheapest.—I. Leitch.

5794

HAWKINS, G. E. (JR.) Consumption and digestibility of *Lespedeza sericea* hay and alfalfa hay plus gallotannin. *J. Dairy Sci.*, 1955, 38, 237-243. [Dept. Dairy Husb., Alabama Polytech. Inst., Auburn.]

Dairy calves, 6 months old, were used in palatability and digestibility trials with hays of sericea lespedeza (*Lespedeza cuneata*) and alfalfa with added gallotannin. Alfalfa hay alone was used as the control ration. Chemical analysis showed the lespedeza hay to have much less crude protein and more lignin than the alfalfa hay. The experimental rations were equal in tannin, and had more than the control ration, but the lespedeza tannin

was of the catechol type and the alfalfa tannin of the gallo type.

In the palatability trial less total dry matter and water were consumed on the lespedeza hay, and the calves lost weight. Digestibility of dry matter and of crude protein of lespedeza hay was less than that of either control or experimental alfalfa hay.

Tannin affects palatability by its astringent taste and digestibility by precipitation of protein as insoluble tannates, properties possessed by both forms of tannin found in the analysis, and the low values found for lespedeza hay were not, therefore, thought to be due to its high tannin content, since this was the same in the experimental alfalfa ration. It may be that some of the tannin in the lespedeza is already combined with some of the protein in the plant as insoluble tannate, or that tannin added to the alfalfa ration was inactivated in the upper part of the gut before it could affect the protein. The more likely reason for the low values was the higher lignin content. The calves' loss of weight could be ascribed to the low feed intake.—T. D. Bell.

5795

MUSGRAVE, S. D., WILLIAMS, J. B., NORTON, C. L. and GALLOP, W. D. Alfalfa vs. prairie hay for dairy calves. *J. Dairy Sci.*, 1955, 38, 416-419. [Dept. Dairying, Oklahoma Agric. and Mech. Coll., Stillwater.]

Two trials, one in summer, one in winter, were made to compare alfalfa and prairie hays, given from 2 days or from 8 weeks of age to dairy calves. All calves were given a calf starter and whole milk after suckling for 2 days. The trials lasted 16 weeks. In each trial both groups getting alfalfa required less total digestible nutrients per lb. live-weight gain than those getting prairie hay. Calves in the winter trial ate more starter, required less total digestible nutrients per lb. increase in weight, gained more and weighed more at 16 weeks of age than those in the summer trial. The carotene intake of the calves in the summer trial was greater than that of the calves in the winter trial and was greater for the alfalfa than for the prairie hay groups, but there was no relation between vitamin A and carotene in plasma and treatment or season. T. D. Bell.

5796

PRESTON, T. R. The artificial rearing of calves on pasture grass. *J. King's Coll. Agric. Soc., Univ. Durham*, 1953/54, 9, 24-28.

Indoor rearing of young calves was compared with outdoor rearing in a pilot experiment with 2 groups of 3 calves each. Both groups received 35 gal. whole milk up to weaning. The indoor calves were reared in the normal way and received up to 3 lb. concentrates per head daily and hay to

appetite. From a few days after birth the outdoor calves strip-grazed a poor quality pasture which had not previously been grazed by cattle. Grazing was continued throughout the summer. During the subsequent winter both groups were housed and given normal rations. By the end of the second summer the bodyweights of the outdoor calves were substantially greater than those of the calves reared indoors. Rate of gain up to weaning was the same for both groups.

A similar trial was made in the wet summer of 1954; 7 pairs of dizygous twins and 3 pairs of half-sibs were divided between the 2 treatments. In this experiment the outdoor calves were folded round 6 permanent grass paddocks instead of being grazed exclusively on clean ground. Bodyweights of the outdoor calves declined after weaning. It was concluded that the poor performance of the outdoor calves in the 1954 trial was due largely to weather and worm burden.

J. N. Aitken.

5797

POLYAKOV, N. F. Silosnyi sok. [Silage juice.] *Nauka i Zhizn'*, 1954, 21, No. 3, 34. [Altai Reg. Sci. Res. Vet. Exp. Stat.]

To avoid vitamin deficiency in newborn calves in winter they were given silage juice from birth as a vitamin supplement to colostrum or milk. Silage of maize, sugar beet tops, Sudan grass or sunflower with green oats was used. The calves were given 100 to 300 g. 3 to 4 times daily. All signs of vitamin deficiency in calves disappeared in 3 to 5 days and there was a sharp drop in fresh cases. In 2 weeks the average daily gain of weight was 100 to 175 g. more in the calves getting silage juice than in the controls.

Over a litre of juice was obtained from 1 kg. silage. A litre of sunflower and green oats silage juice contained 18 to 34 mg. carotene and 35 per cent. lactic acid as well as other substances essential for the organism.

To obtain satisfactory silage juice, the silage should contain not less than 20 mg. carotene per kg. and have a moisture content of not less than 65 to 75 per cent. After the silage has been cut up it is heated at a temperature of 70° to 80° [C.], for 30 to 40 min. and the juice is squeezed out in a press. The residue is given to cattle.

H. Scherbatoff.

5798

ANGUS, R. C. and BARR, W. L. An appraisal of research literature dealing with loose and conventional dairy cattle housing. A review. *J. Dairy Sci.*, 1955, 38, 391-406. [Dept. Agric. Econ., Pennsylvania State Univ., University Park.]

5799

NATIONAL RESEARCH COUNCIL, U.S.A., COMMITTEE ON ANIMAL NUTRITION. *Recom-*

mended nutrient allowances for domestic animals. 4. Recommended nutrient allowances for beef cattle. Revised December 1950, pp. 37.

Recommended allowances of digestible protein, total digestible nutrients, Ca, P and carotene are set out for growth, fattening, reproduction, pregnancy and nursing of beef cattle. The recommendations are based on the literature, to which there are 113 references, mostly American. Vitamin and trace mineral requirements are discussed and signs of nutritional deficiencies described. Tables of average digestible proteins and total digestible nutrients of common feeds are presented, and suitable rations are suggested. The need for supplements for cattle on the range is discussed.—T. D. Bell.

5800

MACDONALD, M. A. and BOGART, R. Relationship between rate and efficiency of gain and type in breeding beef cattle. *N.Z. J. Sci. Technol.*, [A], 1955, 36, 460-469. [Dept. Animal Husbandry, Oregon State Coll., Corvallis.]

Birthweight, weaning weight, rate and efficiency of liveweight increase (the latter from weaning to 800 lb. only) and type score by visual appraisal at 500 lb. and 800 lb. liveweight of 42 purebred Hereford and Aberdeen-Angus bulls and heifers were studied. All animals were reared with their dams on irrigated pasture till weaning at about 450 lb. liveweight, and were then fed to appetite in stalls. The type scores were higher at the heavier weight, but repeatability was low and the earlier appraisal could not be used to predict the later. Neither type score was related to any other features studied. There was a positive correlation between birthweight and rate of gain from weaning to slaughter, but no correlation between the latter and the earlier rate of gain from birth to weaning. It was concluded that information on production as well as visual appraisal is necessary for the selection of beef bulls.—T. D. Bell.

5801

HITCHCOCK, G. H., SAWYER, W. A., BOGART, R. and CALVIN, L. Rate and efficiency of gains in beef cattle. 3. Factors affecting weight and effectiveness of selection for gains in weight. *Oregon Agric. Exp. Stat. Tech. Bull.* No. 34, March 1955, pp. 22.

Data for this study were collected from a Hereford herd reared under range conditions. The herd was maintained on poor-quality pasture throughout the 13-year-period during which records were taken. Weaning weights based on the records of 722 calves and yearling weights based on the records of 157 cows and their 376 offspring

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provided data for statistical analysis. The results showed that mass selection for yearling weight would be effective in the environment in which the cattle were reared. The age of the dam when the offspring was born had little effect on the yearling weight of the offspring. Selection of dams on the basis of corrected yearling weight resulted in differences in birthweights, corrected weaning weights and corrected yearling weights of the offspring. There was no relation between corrected yearling weight of the dam and either the condition or the grade of the offspring. Maximum progress in selection would be obtained either by comparing the performance of animals born in the same year or by ensuring a uniform environment from year to year. The following equation was used in making the corrections:

$$CW = W - bA + bK,$$

where CW was the corrected weight, W the actual weight, A the actual age, K the constant age and b the slope of the regression line. The method of statistical analysis is described in detail.

J. N. Aitken.

5802

MERRIGALLI, A. Ulteriori ricerche su l'alimentazione di vitelle di razza lattifera con limitate quantità di latte e miscela bilanciata asciutta. [Feeding dairy calves with limited amounts of milk and a dry balanced ration.] *Riv. Zootec.*, 1955, 28, 143-148. [Ist. Zootec., Univ. Florence.]

The method is to give as much colostrum as possible for 3 days, then whole milk for 70 days. After the third week a concentrate with 18 to 20 per cent. protein, good quality hay and fresh water to appetite are offered, and the whole milk is systematically reduced, so that none is given after 70 days. Two dairy calves were reared on this system. Owing to circumstances the experiment could not be started until one of the calves was 7 and the other 4 weeks old, but the system of feeding was applied at the appropriate stage. The calves grew and developed normally, and there was a saving of almost half the milk usually given, and a consequent saving in money.—T. D. Bell.

5803

GROVES, N., STRATTON, P. O., HILSTON, N. W. and PAULES, L. Comparative value of soybean meal, urea, and trace minerals for fattening steers. *Wyoming Agric. Exp. Stat. Memo Circular* No. 49, September 1954, pp. 5.

In a feeding trial lasting 190 days, 5 groups of 10 bullocks of initial liveweight 640 lb. each were used to compare the value of supplements of urea and soya bean meal for fattening. All animals got the same roughage of alfalfa hay and maize silage. The concentrate consisted of ground maize and rolled barley for all groups, and group 1 had 1.12

lb. soya bean meal, group 2, 0.52 lb. soya bean meal and 0.082 lb. urea, group 3 the same with a trace mineral mixture, group 4, 0.249 lb. soya bean meal and 0.118 lb. urea and group 5 the same with a trace-mineral mixture. The average crude protein and total digestible nutrient intakes of all groups were the same.

There was no significant difference between groups in daily liveweight increase, efficiency, cost per lb. liveweight increase calculated on current local prices, dressing percentage or carcass grade. Group 4 showed a slight advantage in liveweight increase and cost per lb. gain, and group 1 had a slightly higher dressing percentage. It was concluded that urea may satisfactorily be used to replace half the soya bean meal on an equivalent crude protein basis in a concentrate for fattening bullocks.—T. D. Bell.

5804

PERRY, T. W., BEESON, W. M., ANDREWS, F. N. and STOB, M. The effect of oral administration of hormones on growth rate and deposition in the carcass of fattening steers. *J. Animal Sci.*, 1955, 14, 329-335. [Dept. Animal Husb., Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Four groups of 10 Hereford steers of 870 lb. liveweight were used. Group 1, control, had no supplement to the basal ration, and the experimental groups, 2, 3 and 4, 10 mg. per head daily of stilboestrol, dienoestrol or hexoestrol, respectively, mixed with the feed. The trial lasted for 123 days. For 5 animals of each experimental group the hormone was discontinued 7 days before slaughter. Daily liveweight increases were 2.33, 2.64, 2.55 and 2.65 lb. for groups 1 to 4, respectively. The experimental groups were also more efficient in feed conversion. Dienoestrol was not as good as the other hormones. The greater part of the improvement due to supplements was in the first 28 days. Carcase grades of group 2 were lower than those of the other groups, but not significantly so. Trials with mice showed that there was no residual hormone in the flesh of the steers. Some enlargement of the teats and raising of the tail head occurred.—T. D. Bell.

5805

MATSUSHIMA, J. and DOWE, T. W. Use of fats in animal feeds. Use of animal fats in rations for beef cattle. *J. Amer. Oil Chem. Soc.*, 1954, 31, 54-55. [Dept. Animal Husb., Univ. Nebraska, Lincoln.]

Three rations were compared in a trial with 3 groups of yearling Hereford steers. Group 1 was given a standard ration consisting of ground shelled maize 17.1, soya bean meal 0.9, brome hay 2.8 lb. and a vitamin A supplement. Group 2

received beef tallow pellets 12.2, ground maize 9.4, and brome hay 2.0 lb. and a vitamin A supplement. The third group was given maize oil pellets 11.9, ground ear maize 9.2, and brome hay 1.8 lb. and a vitamin A supplement. All animals made satisfactory liveweight gains but the gains of the group given maize oil pellets were slightly less than those of the 2 other groups. No digestive disturbance was seen in the steers given beef tallow. Signs of vitamin A deficiency appeared in groups 2 and 3 during the early weeks of the trial but were alleviated when the supplement was increased by 30,000 I.U. to 60,000 I.U. daily. The maximum daily intake of beef tallow reached 3/4 lb.

J. N. Aitken.

5806

WILLIAMS, T. E. and DAVIES, W. **Cattle fattening on permanent grass and leys.** *J. Roy. Agric. Soc. Engl.*, 1954, **115**, 98-111. [Grassland Res. Inst., Hurley, Berkshire.]

5807

ALDER, F. E. **Grassland management for meat production.** *J. Brit. Grassland Soc.*, 1955, **10**, 115-125. [Grassland Res. Inst., Hurley, Berks.]

A trial is in progress in which 35.5 acres have been sown in blocks of 3 to 4 acres with 10 different seeds mixtures. The seeds mixtures, the fertilising, and the first 3 years of the trial are described. Bullocks are brought to slaughter at 2 years 9 months old, breeding ewes are maintained and fat lambs produced. Strip and rotational grazing are used, and the plots are cut for silage and hay. No other feed is given. The aim is to extend the grazing season as long as possible and winter grazing, keeping bullocks in store condition, has been attained. Average liveweight increases produced per acre in 1951-52, 1952-53, and 1953-54 were 345, 345 and 313 lb., and average utilised starch equivalents 2770, 2910 and 2720 lb. Average cattle grazing days were 248, 256 and 208, the last figure excluding the use of hay and silage still in hand. A small quantity of concentrates with added minerals is now being given to the ewes immediately before and after lambing, to avoid possible deficiencies.—T. D. Bell.

5808

FAGIOLI, A. **Primo contributo alla soluzione dei problemi tecnici ed economici della produzione di carni bovine pregiate in Umbria con la razza Chianina-Perugina. [Technical and economic problems of high-class beef production in Umbria with Chiana-Perugia cattle.]** *Riv. Zootec.*, 1955, **28**, 114-121.

A series of field trials, started in 1953 and planned to finish in 1956, is being made to find the best age for slaughtering Chiana-Perugia cattle for beef

and to compare heifers with bulls and castrated with entire males. The techniques at the different farms on which the trials are made are being compared, and the economics of the enterprise is being investigated.

One of these trials, with 10 bulls fattened from about 13 months of age for 5 months is described. The beasts were weighed fortnightly and all feeds consumed were accurately recorded, and feed requirements for growth and fattening were calculated. No conclusions can be drawn till the trials are finished, but the results reported show that Chiana-Perugia bulls make good gains at this age, and are more economical than breeds investigated by other workers. They have a high dressing percentage and give first-class carcasses. The high efficiency of feed conversion is probably due to the fact that the bulls put on flesh rather than fat during the trial. The best age for slaughter would probably be between 14 and 18 months, depending on the rate at which individuals mature.

T. D. Bell.

5809

BADRELDIN, A. L. **Dressing out percentage in suckling buffalo veals.** *Indian J. Vet. Sci.*, 1955, **25**, 61-64. [Dept. Animal Breeding, Fac. Agric., Univ. Cairo.]

The average birthweight of 16 male buffalo calves was 90 lb. They were slaughtered after being reared on their mothers' milk, at 30 days of age, when the average liveweight was 134 lb. They required 6 lb. milk per lb. liveweight increase. Another group of 25 calves was slaughtered at 30 to 40 days of age, when the average liveweight was 136 lb. The dressing percentage of all the calves was 66 per cent., and the hide was 8 per cent. of the liveweight. Though it is not profitable to feed veal calves, they must be kept for a month before they can be sold.—T. D. Bell.

5810

KOCH, R. M. and CLARK, R. T. **Influence of sex, season of birth and age of dam on economic traits in range beef cattle.** *J. Animal Sci.*, 1955, **14**, 386-397. [Dept. Animal Husb., Univ. Nebraska.]

5811

KELLY, C. F., BOND, T. E. and ITTNER, N. R. **Water cooling for livestock in hot climates.** *Agric. Eng.*, 1955, **36**, 173-180. [California Agric. Exp. Stat., Davis.]

Trials were made from 1947 to 1954 to show the value of different systems of cooling for beef cattle in a hot climate. Cooling by spraying the animals, by cooling the air by evaporation in shelters enclosed on 3 sides, by cooling the roofs of open shades by evaporation, and by cooling the drinking water were tried. All methods gave better weight

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gains and efficiency of feed conversion than were obtained in uncooled controls. The economics of cooling by evaporation in enclosed shelters, showing a small profit, is discussed, but the economics of the other systems needs further investigation.

T. D. Bell.

See also Absts. 5847, 5875.

MILK PRODUCTION

5812

SANCHO, J., F. Principios científicos en la alimentación del ganado de leche. [Scientific principles in the feeding of dairy cattle.] *Rev. Agric., Costa Rica*, 1955, 27, 25-29; 94-104. [San José.]

5813

BRUMBY, P. J. and HANCOCK, J. The galactopoietic role of growth hormone in dairy cattle. *N.Z. J. Sci. Technol.* [A], 1955, 36, 417-436. [Ruakura Animal Res. Stat., Dept. Agric., Hamilton.]

In the first 2 experiments 9 sets of Jersey type identical twins were used. The twins were divided to form 3 replications of a balanced incomplete block. Thus, within-set comparisons of galactopoietic activity were made between growth hormone and thyrotropic hormone; growth hormone and controls, and thyrotropic hormone and controls. The treated groups received daily subcutaneous injections of 50 mg. of growth hormone or 15 T.S.H. (U.S.P. standard) units of thyrotropic hormone. Treatment was given during a 12-week period throughout the peak phase of lactation. The rations of all animals were of grain and good quality pasture to appetite.

Growth hormone treatment resulted in a significant increase in daily milk yield during the first 6 weeks. During the remaining 6 weeks the yields of all 3 groups tended to decline in a parallel manner. The yields of the animals receiving growth hormone fell to the level of the controls once treatment ceased. There was a slight increase in the daily milk yields of the animals receiving thyrotropin but the yields fell below those of the controls when treatment stopped. The butterfat content of the milk of the animals treated with thyrotropin increased slightly. Milk protein, lactose and solids-not-fat were not affected by treatment. Treatment with growth hormone and thyrotropic hormone significantly increased heart rate. Growth rate was depressed by thyrotropic hormone therapy. Blood sugar and total acetone bodies rose in both treated groups. There was no alteration in the level of blood N.P.N. Treated animals showed increased efficiency of feed utilisation.

In the second experiment the response to growth hormone during the declining phase of lactation

was measured on 4 sets of identical twins. The amount used was the same as in the first experiment. The animals were fed on pasture alone. Treated animals again showed a significant increase in milk yield accompanied by an increase in efficiency of milk production.

The physiological mechanisms involved in these responses are discussed.—J. N. Aitken.

5814

HANCOCK, J., BRUMBY, P. and TURNER, C. W. The influence of L-thyroxin upon the growth and subsequent production of identical-twin dairy heifers. *N.Z. J. Sci. Technol.* [A], 1955, 36, 571-585. [Ruakura Animal Res. Stat., Dept. Agric., Hamilton.]

Six pairs of identical twin dairy heifers were used. After mating one member of each set was given subcutaneous injections of L-thyroxine at daily rates per 100 lb. liveweight of 0.5 mg. for the first 3 weeks, 0.45 mg. for the next month and 0.4 mg. for the remainder of a 6-month period. Heart rate, bodyweight and body measurements were recorded. Grazing habits were recorded during the second month of treatment and after parturition milk yield was recorded.

Rate of weight gain was reduced, particularly during the last 3 months of treatment. Recovery was rapid after treatment stopped and consequently at calving there was no significant within-set difference. Any difference remaining tended to disappear by the end of lactation.

Chest girths increased at a smaller rate in treated than in control animals. There was a sudden fall in middle girth measurements when injections were begun. Differences in this measurement tended to disappear as parturition approached. The treated animals showed also an increase in rate of gain in height at withers, in width of hip bones and in hip to pin bone measurement. The differences become smaller during the pre-calving and lactation periods. During treatment heart rate increased significantly. Although treated animals spent less time in grazing it was estimated that their feed intake was greater than that of control animals. Milk and butterfat production was reduced, especially in the first 3 months of lactation.—J. N. Aitken.

5815

VAN KOETSVELD, E. E. Welke betekenis moeten wij toekennen aan zwavel voor plant en dier, in het bijzonder voor het rund? [What significance should we attach to sulphur for plants and animals, particularly for cattle?] *Tijdschr. Diergeneesk.*, 1955, 80, 525-550. [Inst. Moderne Veevoeding "De Schothorst", Hoogland.] English, French and German summaries.

Literature is reviewed. Original data are presented for dry matter, crude protein, true protein, total S as SO_4 and sulphate SO_4 and Cu in grass samples, from May to September, from experimental plots. Values for S, organic and inorganic, were approximately the same in spring and autumn, with a minimum in July. Cu and protein varied together. As protein fell, inorganic S sometimes rose. Analyses of hay showed that the more rapid the drying the less was the loss of sulphur amino-acids and the less the sulphate S. S is less readily leached from grass than is Cl.

Analyses of soil samples showed that sand contained only traces of S. The substitution of Thomas meal for superphosphate, as is common at present, will increase the danger of deficiency. With peat-clay soils the results of t'Hart were supported, but those of Grashuis, who found more S in the top-soil than in the next layer, were not confirmed. There was sometimes no difference between the top 5 cm. and the layer 5 to 20 cm., but the top had much more S when there was a difference.

The sulphate of drinking water varies widely in the Netherlands, between 17 and 114 mg. SO_4 per litre in 10 samples. On 4 farms where the water contained 81, 93, 94 and 114 mg. SO_4 per litre there was diarrhoea or Cu deficiency or both; the condition of the cattle in general was poor.

If a cow eats 15 kg. dry matter of grass with a sulphate content of about 0.5 per cent., the intake will be about 75 g. SO_4 . If she drinks 10 litres water, she will get at least 100 mg. SO_4 and may get much more, up to 2 g. Total intake may vary between 75 and 150 g. An excess of the order of 75 g., with excess of protein in the spring, is thought possibly to cause formation of H_2S and histamine. In the autumn the excess of inorganic SO_4 may be responsible for the diarrhoea and interference with absorption of trace elements, or may form H_2S which may enter into insoluble compounds with Cu.

Data are presented for the SO_4 content of cow's milk, from cows fed in the same way in the same herd: 4 morning and 4 evening samples (same day), 4 samples on 2 consecutive days and 2 samples of pooled milk. Per cent., SO_4 varied from 7.0 to 14.6 mg.; total output in milk from 780 to 2774 mg. daily.

SO_4 in blood of 9 normal cows, 5 normal calves 2 months old, and 8 cows with grass tetany showed, in that order, the following ranges in mg. per cent., 12.0 to 13.9, except for a preparturient cow, 16.6, and one in heat, 16.9; 9.1 to 14.2; 15.2 to 19.0. Mg in the blood of the cows with tetany had a range from 0.3 to 0.5 and later, when the Mg range was 0.8 to 1.6, the SO_4 range was 14.1 to 18.6. In this investigation no value higher than 21 mg. was found, and it is suggested that SO_4 is a threshold substance.—I. Leitch.

5816

GABELE, A. and SCHMITTMANN, E. Fütterungsversuche an Milchkühen zur Steigerung des Jodgehaltes der Milch durch Jodzulagen. [Feeding experiments on milk cows to raise the iodine content of milk by iodine supplements.] *Ztschr. Tierernährung Futtermittelk.*, 1955, 10, 32-39. [Inst. Tierernährungslehre, Landw. Hochschule, Stuttgart, Hohenheim.]

In 2 cows given ordinary winter rations supplemented with 15 mg. iodine daily as KI the milk contained from 98 to 250, average 130, μg . I per litre. The 5.1 mg. I provided by 19 g. seaweed meal given to one cow daily sufficed for as high an I content in the milk as did the larger quantity from KI. The carotene and vitamin A contents of the milk were not increased when the carotene intake was increased.—D. Duncan.

5817

MILLER, W. J. and ALLEN, N. N. The effect of sodium acetate feeding on milk and fat yield, blood sugar, and blood ketones of dairy cows. *J. Dairy Sci.*, 1955, 38, 310-312. [Dept. Dairy Husb., Univ. Wisconsin, Madison.]

Milk yield, butterfat yield and percentage, and blood sugar and ketone values of 18 dairy cows of 4 breeds were estimated during a period of 6 days. Half of the cows were given a supplement of 1 lb. Na acetate daily in addition to the normal ration. Before the test period there was a preliminary period of 4 days. No significant difference between control animals and those getting Na acetate was observed in any of the characteristics investigated.

T. D. Bell.

5818

KRÜGER, L. and MÜLLER, W. Untersuchungen zur Frage Fresspsyche (Fresslust), Futterabnahme, Futterverwertung und Milchleistung beim Rind. [Appetite, feed intake, feed utilisation and milk yield in cattle.] *Ztschr. Tierzücht. Züchtungsbiol.*, 1955, 64, 313-332. [Inst. Tierzucht, Justus Liebig Hochschule, Giessen.]

For a general account of the work, part of which is here reported in detail, see Abst. 2898, Vol. 25. Appetite, measured as g. dry matter eaten per min., increased with the amount of feed. The extremes were 42, with a feed intake of 1.1 to 3.0 kg. dry matter, to 198, with a feed intake of 5.1 to 7.0 kg. In the 4 weeks commencing 10 days after calving, the highest total daily feed intake was roughly 24 and the least 16 kg. dry matter and these as percentages of feed offered [*Futterabnahme*] were 98 and 89. In all cows tested, appetite increased with milk yield over the interval studied and milk yield was related also to daily feed intake at the peak of lactation. The 300-day yields also were

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related to appetite and to total intake when feed was offered to appetite.—I. Leitch.

5819

VOISIN, A. Verhalten und Sättigung der Kuh auf der Weide und im Stall. [Behaviour and satiety of cattle on pasture and in the stall.] Reprinted from Lecture Reports, 8th Meeting Landwirtsch. Fak., Bonn-Poppelsdorf, 13-14 September 1954, pp. 42. [Gruchet-Sur-Arques, Dieppe.] French summary.

Kellner's theory was that the quantity of food which a cow can eat can be measured in terms of dry matter, but different authors have estimated it, for a cow of 500 kg. liveweight, as from 10 to 17 kg. dry matter daily. According to German tables, the quantity varies with production, from as little as 8 kg. for dry cows to as much as 20 kg. for a cow giving 30 kg. milk daily. The theory of Lehmann was that a cow of 500 kg. liveweight can eat about 4.3 kg. of indigestible "ballast" before being satiated, and that the quantity remains the same whatever her milk yield. The role of appetite has scarcely been considered.

Observations on the cow at pasture suggest that on poor pasture eating may stop before a sufficient quantity of digestible matter has been taken, the cow appearing to be fatigued with the effort of eating. It is concluded that when feed is succulent enough to need little mastication the amount consumed is limited by the "ballast" content, and with feeds high in fibre the work of chewing limits the amount consumed.

A new interpretation is placed on Kellner's "Wertigkeitskoeffizient". The work of mastication of a feed is involved in it. The maximum daily energy expenditure of a cow of 500 to 600 kg. liveweight in mastication is estimated to be about 1680 Cal.

From a practical viewpoint the limitation of fatigue is best accomplished at pasture by rotational grazing, so that the cow is confined to a small area of grass 12 to 15 cm. high, which provides the best nutritive value (cf. Abst. 5771, Vol. 25). In the stall it is best to use early-cut hays which are low in ballast value and to chop coarse fodders so that they are more easily eaten.

D. Duncan.

5820

MAHADEVAN, V. The role of "bulk" or "roughage" in the ration of dairy cows and buffaloes. *Indian Vet. J.*, 1954, 30, 359-363. [Dept. Animal Nutrit., Madras Vet. Coll.]

5821

WARD, G. M., HUFFMAN, C. F. and DUNCAN, C. W. Urea as a protein extender for lactating cows. *J. Dairy Sci.*, 1955, 38, 298-302. [Dept. Dairy Chem., Michigan State Coll., East Lansing.]

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The value for milk production of a low-protein roughage ration supplemented with either maize and urea or soya bean oilmeal was tested in an experiment of Latin square design with 10 cows. The effectiveness of the N supplement when the concentrates were mixed with the roughage or placed on top of the roughage was also determined. There was no significant difference in production of fat-corrected milk. Observations of the eating habits of the cows showed that when the concentrates were mixed with the roughage the cows promptly separated them and consumed them before eating the roughage. No benefit resulted from this method of feeding.—J. N. Aitken.

5822

ROLLINSON, D. H. L., HARKER, K. W. and TAYLOR, J. I. Studies on the habits of Zebu cattle. 3. Water consumption of Zebu cattle. *J. Agric. Sci.*, 1955, 46, 123-129. [Animal Health Res. Centre, Entebbe, Uganda.]

For previous parts see Absts. 5400, Vol. 24; 4335, Vol. 25.

The drinking habits of the cattle in the previously reported investigations were recorded. Water was taken mostly within 8 hr. of the day falling between 7 a.m. and 7 p.m., and very little was taken during darkness. The daily consumption of 2 of the cattle kept in stalls for 36 days was 4.19 and 5.68 kg., but the average of the 10 grazing animals was 9.04 kg. Sometimes drinking was confined to periods of less than 6 hr., sometimes spread over 12 hr., but intake during the 24 hr. was about the same in each case. When drinking was confined to a few hours there was a significant negative correlation of -0.715 with the number of times grazing occurred: when drinking was spread over 7 to 12 hr., the correlation was -0.555 , which was also significant. In this experiment there did not appear to be any relation between the liveweight of the animals and their water consumption.—T. D. Bell.

5823

BERGE, S. Kroppsvekt og mjølkeavdræt. [Body-weight and milk yield.] *Tidsskr. norske Landbruk*, 1955, 62, 59-70. English summary.

Estimates of the relation of milk yield to body-weight in dairy cows by Brody (Abst. 3813, Vol. 15), Axelsson (SRB, 1940, No. 4, p. 5), Lauprecht and Döring (Abst. 6039, Vol. 20) and Hansen-Larsen (SRB, 1953, 25, 100) are discussed. The relation is of the form $M = kW^a$ and the power and constant depend on breed, yield, age of cow and, except within one breed, fat content of milk. For example, the constant varied in the German data for Holstein cows from 54.5 in the district of lowest yield to 62.5 in that with the highest

yield. Fat percentage in the Danish data, where the effect of age was eliminated, was not related to weight of cow. The power of weight was 0.5, but this may be too small for cows in general, since the data refer to elite herds. In the German data, a power of $2/3$ is probably too high because the cows were of all ages.

Norwegian milk records, grouped by area and according to weight of cows estimated from measurements, give the equation $M = 32W^{0.75}$ for Norwegian cows in general. Those with the highest milk fat had a constant about 59. The maintenance feed requirement of large cows is relatively less than that of small cows and the requirement per kg. milk is independent of size. The cost of work or of housing does not differ greatly with size. Where pastures are poor or difficult of grazing, the small cow has the advantage as more agile. On the other hand, Sisson, "Anatomy of the Domestic Mammals", 3rd ed., 1940, Philadelphia) says that capacity of the gastro-intestinal tract is related linearly to body-weight. This being so, the big cow is at an advantage in relation to feed capacity.

The quickest way to increase milk production is to select cows for size, so long as it is not forgotten that, within herds, size and milk yield may be inversely related.—I. Leitch.

5824

FLUX, D. S. and PATCHELL, M. R. A comparison of the milk production of cows on different systems of break feeding. *N.Z. J. Sci. Technol.* [4], 1955, 36, 557-559. [Dairy Res. Inst., Palmerston North.]

Two groups of 6 cows each were used in a double reversal trial covering 3 periods each of 3 weeks' duration. There was no significant difference in the milk production of cows given 2 fresh breaks of grass daily in comparison with those given only one.—J. N. Aitken.

5825

BURT, A. W. A. Some effects of season of the year and herd management upon the Dairy Short-horn cow. 1. The effects of seasonal changes in climate, feeding and management upon the milk yields of four herds. *J. Agric. Sci.*, 1955, 45, 389-400. [Dept. Agric., Univ. Coll. Wales, Aberystwyth.]

Milk records and records of farm and herd management collected over a 2-year period were used. Differences between herds in mean lactation yield were attributable to differences in weather conditions and management. A weekly yield index was calculated for each herd after making allowances for mean stage of lactation and changes in potential productivity. Variations in the yield index were used to measure the effects of changes

in climate, feeding and management. The results varied from herd to herd but were fairly consistent within herds from year to year. In 3 of the herds which were housed during the winter, the start of the winter feeding was associated with an increase in the yield index. Changes in the winter roughage ration resulted in a decline in the yield index. In the fourth herd, which was out-wintered, there was a serious decline in the yield index between September and December. Subsequent recovery was associated with seasonal weather changes. It was concluded that most of the changes observed were related to roughage feeding and management.

J. N. Aitken.

5826

PRESTEGG, K. Lønner det seg å bruke kraftfôr i mjølkeproduksjonen i dag? [Does it pay to use concentrates in milk production to-day?] *Buskap og Avdrått*, 1953, No. 3, pp. 7.

It pays to use concentrates up to the feeding standards in common use, provided that they are rationed according to milk yield and provided that no more cows are kept than are required to eat the home-produced roughage. To use more concentrates simply to increase the size of the herd is uneconomic. Improved roughage with controlled concentrates pays best.—I. Leitch.

5827

TURNER, C. Self-fed silage. The effect on management and policy. *Agriculture, J. Minist. Agric. Engl.*, 1955, 62, 118-122. [Nat. Agric. Advisory Serv., Bucks.]

The system of self-feeding silage to dairy cows has already been described (Abst. 2507, Vol. 24). It necessitated some reorganisation of the farm, and this is described. No increase in labour has been necessary and 300 tons of silage have been produced at a cost of £5 per ton. For the past year no concentrates have been used, while milk yield has been maintained at a high level. In future it is proposed to give 2 to 3 lb. cereals per cow daily, with added minerals, since there have been signs of magnesium deficiency recently.

T. D. Bell.

5828

WENIGER, J. H., FUNK, K. and HARTWIG, W. Der Futterwert der Kakaoschalen und ihre Wirkung auf die Milchproduktion. [Feed value of cocoa shell and its effect on milk production.] *Arch. Tierernährung*, 1955, 4, 337-348. [Inst. Tierzucht, Univ. Halle.]

The roasted and crushed cocoa shell was divided mechanically into coarse and fine fractions, the former, A, containing only the outer shell, and the latter, B, some of the kernel and thus more protein and fat and less fibre. In digestibility trials with 3 wethers the digestibility of the organic matter was 42.2 and 47.3 per cent. for types A and B, the

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starch values in 90 per cent. dry matter were 36.6 and 42.5 kg. and the digestible crude protein 4.9 and 5.5 per cent., comparable to meadow hay or dried beet slices.

In tests with dairy cows from 0.5 to 2 kg. daily was given without ill effect and the fat content of the milk was increased, though the milk yield fell slightly. This is ascribed to theobromine. Cocoa shells can safely be given as bulk food to cows, in quantities up to 2 or 3 kg. daily.—D. Duncan.

5829

SPRAGUE, V. G., WILLIAMS, P. S., KNOTT, C. B., KESLER, E. M. and HASKINS, A. L. **Seasonal distribution and production of forage and milk from orchard grass-ladino and blue grass pastures.** *Pennsylvania Agric. Exp. Stat. Bull.* No. 592, December 1954, pp. 13.

Over 5 years paddocks of a pasture sown with cocksfoot and ladino clover in the first year were subjected to 5 different grazing treatments: (1) early spring grazing, then rotational grazing; (2) deferred spring grazing, then rotational grazing; (3) early spring grazing, cutting of the first aftermath for silage, then rotational grazing; (4) spring growth cut for silage, then rotational grazing, and (5) continual grazing from spring to autumn. A pasture sown to Poa and white clover was grazed rotationally throughout the season. Dry matter of forage, number of cow-grazing days, and milk produced per acre, excluding silage, were estimated. The cattle were dairy cows about 4 years old, receiving in addition to the grazing 2.3 lb. concentrates.

There was a close correlation between dry matter of forage, excluding silage, cow-grazing days and milk produced per acre from grazing. Paddock 2 was the most productive, followed by 5, and the Poa pasture was equal to two-thirds of these. On different paddocks production was maximum at different times: usually at least half of the forage was produced over a short spell of one season. A combination of the types of management should be used in practice. The proportion of ladino clover was best maintained

in paddock 1, and protein as a percentage of the total dry matter was highest where there was most ladino clover. It was also higher in all pastures in spring and autumn than in summer. In the last 2 years of the trial all the pastures were declining in productivity.—T. D. Bell.

5830

WITT, M. **Ausfall einer Melkzeit bei Kühen.** [Omission of one daily milking in cows.] *Züchtungskunde*, 1955, 26, 285-297. [Max Planck Inst. Tierzucht, Mariensee, Trent-horst.]

Twenty cows accustomed to being milked twice a day, when milked only once gave 20 per cent. less milk, of normal fat content, on that day and 10 per cent. less, with a high fat content, on the next day when they were milked twice. The repetition of once-a-day milking accelerated the decline of lactation.—I. Leitch.

See also Absts. 4740, 4794, 5185.

REPRODUCTION

5831

DURRELL, W. B. **Anoestrus in heifers associated with plane of nutrition.** *Canad. J. Comp. Med.*, 1955, 19, 144-152. [Dept. Animal Pathol., Macdonald Coll., Que.]

This investigation was suggested by observation that anoestrus in heifers occurred annually from January to May on certain farms in Western Quebec. The condition was associated with a low plane of nutrition. A study was made on 36 heifers on 12 farms. Data on health and disease were noted for each animal and for 21 selected controls which were showing oestrus regularly. The condition was corrected in 61 per cent. of the animals when a balanced grain mixture was given at the rate of 5 lb. daily. Non-recovery in some cases was attributed to inadequate lighting and the very poor condition of the animals at the start of the trial. It is suggested that in this disorder improvement in nutritional status should be considered before hormone therapy is attempted.

J. N. Aitken.

SHEEP

5832

NATIONAL RESEARCH COUNCIL, U.S.A., COMMITTEE ON ANIMAL NUTRITION. **Recommended nutrient allowances for domestic animals. 5. Recommended nutrient allowances for sheep.** Revised August 1949, pp. 24.

The report collates all available reliable experimental work on the nutrition and feeding of sheep and presents it in a form suitable for practical use.

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In calculating allowances, maintenance, growth, lactation, wool growth, feed quality and climatic conditions have been taken into consideration. The recommended daily nutrient allowances per animal of total feed, total digestible protein, total digestible nutrients, calcium, phosphorus, salt and carotene are given in tabular form for ewes in different stages of pregnancy and lactation, and growing and fattening lambs and rams. Vitamins,

effects and signs of nutritional deficiencies, toxicity of excess minerals and other nutritional disturbances are discussed. Further tables give the composition of feeds and provide examples of dry-lot rations for pregnant and lactating ewes and for fattening lambs.—J. C. Gill.

5833

OWEN, J. B. **Milk production in sheep.** *Agriculture, J. Minist. Agric. Engl.*, 1955, **62**, 110-114. [Univ. Coll. N. Wales, Bangor.]

The milk yield was estimated of lowland ewes and of hill ewes on the hill and on lowland pastures. The difficulties of estimating milk yield under natural conditions are discussed; the method used was to allow the ewe and lamb to graze together during the recording period, the ewe having a light sacking udder cover which prevented the lamb sucking. At suckling time the cover could easily be manipulated. Yield was estimated for one 24-hr. period each week. Weights of ewes at service and parturition and weights of lambs at 10 weeks were recorded. Width of udder at parturition was measured. The total yield of the lowland ewes in 10 weeks was 157.9 lb., a high daily level being maintained somewhat longer than in the hill ewes. The yield of ewes on the hill was 109.3 lb., and of hill ewes on lowland pasture 171.6 lb., indicating the importance of feeding and environment for milk production. The weights of lambs at 10 weeks were: lowland 44.8 lb., hill 36.2 lb. and hill on lowland 53.4 lb. In the early stages most of the variation in the weights of lambs was directly related to the milk yield of the dams. The growth rate of the lamb in the first 4 weeks was considered a good indication of the milking capacity of the ewe. A close relation was found also between the birthweight of the lamb and the milk yield of the mother, and in hill sheep between the weight at service and the milk yield. From this the importance of adequate nutrition and good early growth of ewes kept for breeding is apparent. The width of the udder was closely related to milk yield and to the growth of the lamb during the first 4 weeks. Milk yield was well maintained in subsequent years, and was strongly heritable in hill ewes. Selection for milk yield could be conveniently based on weight of the ewe and growth rate of the lamb to 4 weeks. There was no relation between fleece weight and milk yield.—T. D. Bell.

5834

NOLAN, J. C. and HILSTON, N. W. **Utilization of non-protein nitrogen by pregnant ewes (1952).** *Wyoming Agric. Exp. Stat. Mimeo Circular* No. 32, June 1953, pp. 14.

Five groups of 20 pregnant yearling ewes were used in a trial to compare supplements of soya

bean meal, urea or combinations of the two. The control group 1 was given a ration of hay, maize and beet molasses, supplying adequate total digestible nutrients but less than the minimum protein requirement. The experimental groups got the same with urea or soya bean meal or both to give a balanced ration on the basis of crude protein. Group 2 had urea only; group 3 had one-quarter urea and three-quarters soya bean meal; group 4 half urea and half soya bean meal and group 5 soya bean meal only. The trial lasted 113 days, and the ewes were shorn before lambing and the fleeces were weighed.

Satisfactory gains in weight were made by all groups, but the final weight of group 5 was significantly greater than that of groups 1 to 4, and that of groups 2 to 5 significantly greater than that of group 1. Lambs of ewes from groups 2 and 5 were significantly heavier than those of groups 1, 3 and 4, and there was more lambing trouble in groups 1, 2 and 4. Lambs of groups 1 and 2 were less vigorous than the others. The extra energy supplied by the soya bean meal may have influenced the results.—T. D. Bell.

5835

MASON, R. W., STRATTON, P. O. and HILSTON, N. W. **Utilization of non-protein nitrogen by pregnant ewes.** *Wyoming Agric. Exp. Stat. Mimeo Circular* No. 35, December 1953, pp. 13.

The trial was similar to that reported in the preceding Abst. but, in this case, to eliminate the possible effects of the extra energy supplied by the soya bean meal the rations for the 5 groups were made equal in energy by varying the amount of maize. Group 1 received only urea as a supplement; group 2 had three-quarters of the crude protein supplied by urea and one-quarter by soya bean meal; group 3 had one-half urea and one-half soya bean meal; group 4 had only soya bean meal and group 5 was the low-protein control, getting only the basal ration. The trial lasted 126 days. The ewes had been served to lamb during the last month of the trial, and were shorn 6 weeks before the end.

Final weights of group 4 were significantly greater than those of group 1, which were the lightest. However, there were more non-lactating ewes in group 4 than in group 1; group 5 also had a high percentage of non-lactating ewes, which might explain the high final weights of that group as a whole, in spite of the poor ration. If only the lactating ewes were considered, those in groups 3 and 4 gained best. The fleece weights of group 1 were significantly greater than those of the other groups. Birthweights of lambs of the supplemented groups were greater than those of group 5, and they were more vigorous. The lambs from

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group 5 grew less well than those of the other groups.—T. D. Bell.

5836

IVANENKO, V. I. Vliyanie sochnykh kormov i belkogo pitaniya karakul'skikh suyagnykh matok na ikh produktivnost'. [The effect on production of giving succulent feeds and proteins to pregnant Karakul ewes.] *Karakul. Zverovodstvo*, 1954, 7, No. 6, 18-25. [Ukraine Sci. Res. Inst. Animal Management.]

Several series of experiments are discussed, the first dealing with the effect of increased protein content of the ration, 50 to 60 per cent. above the existing standards, and the second with the effect of different succulent fodders at different stages of pregnancy.

In the first series one group received 78.5 g. digestible protein (total feed units 1.03), another group 127 g. (total feed units 1.03) and the third group 130.5 g. (total feed units 1.10). The greatest increase in liveweight was in the third group. Increasing the protein content of the ration also produced higher yields of milk and wool and better lambs. In the series comparing different succulent fodders, silage increased the milk yield, particularly when it was given during the second stage of pregnancy. At this stage, however, only about 0.5 kg. of succulent fodders should be given per ewe daily, since higher amounts impaired the quality of the wool.—H. Scherbatoff.

5837

TANEJA, G. C. The effect of drought and type of birth on body weights of Merino sheep measured at different ages. *J. Austral. Inst. Agric. Sci.*, 1955, 21, 26-29. [New South Wales Univ. Technol.]

Results from 284 spring-born and 269 autumn-born Merino ewe lambs indicated that at 5, 11 and 17 months of age those born early in spring were heavier than those born late, but no difference in weight was found between early and late autumn lambs of the same ages. The difference in spring may have been due to season and drought feeding. Bodyweight at one age was closely related to bodyweight at any other age. Between 5 and 11 months, 5 and 17 months and 11 and 17 months correlations were +0.630, +0.644 and +0.676 with a multiple correlation between the three of +0.732. A single lamb was significantly heavier at the 5 per cent. level than a twin at 5 months but not significantly heavier at 11 and 17 months.

J. C. Gill.

5838

TANEJA, G. C. The relative importance of heredity and environment in body weight increments at different ages in Australian Merino sheep. *Austral. J. Agric. Res.*, 1955, 6, 343-349. [Sch.

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Wool Technol., N.S.W. Univ. Technol., Sydney.]

Rates of growth between 5 and 11 and between 11 and 17 months of age of 284 lambs born in spring and 269 born in autumn were studied. Environment had more effect than heredity on growth rate. The effect of environment was greater in the earlier period, and no relation was found between the environmental effects in the 2 periods. Genetic effects in the 2 periods also showed no correlation, which suggested that different sets of genes were operating in the 2 periods.—T. D. Bell.

5839

ASKER, A. A., RAGAB, M. T. and BASTAWISY, A. E. Effect of crossing Egyptian sheep on growth and development of lambs. *Empire J. Exp. Agric.*, 1954, 22, 256-260. [Dept. Animal Breeding, Fac. Agric., Univ. Cairo, Giza.]

5840

WUSSOW, W. and KÖNIG, K. H. Der Einfluss unterschiedlicher Jugendernährung auf Entwicklung und Schlachtergebnis von Lämmern. [Effect of different diets in youth on development and slaughter results of lambs.] *Arch. Tierernährung*, 1954, 4, 1-24. [Inst. Tierzucht, Martin Luther Univ., Halle, Wittenberg.]

Ten wether and 10 ewe lambs of the Merino mutton breed were divided into 2 similar groups at a mean age of 117 days and stall-fed for 15 weeks. Two of each sex in each group were then killed and the rest were put out to pasture with the flock until they were brought in for fattening and slaughtered at 13 months of age. The 2 experimental diets, high and low in bulk, provided on the average during the 15 weeks, in g. per head daily, lucerne hay 615 and 149, oats 100 and 273, dried beet pulp 285 and 213, linseed meal 25 and 152, pea meal 25 and 152 and green fodder 1394 and 907. The composition of these rations, also in g. per head daily, was digestible crude protein 141 and 136, starch value 606 and 622, dry matter 1232 and 1022, crude fibre 312 and 192.

To begin with the high-fibre group grew more quickly, but by the 14th week the low-fibre group had almost caught up, because their appetites improved. Both groups, but especially the low-fibre group, had a check for about 2 weeks when they were shorn. When the survivors of each group went out to pasture they lost on the average 3.57 and 2.57 kg. liveweight in the first week. The low-fibre group then went ahead, but by the end of the pasture period the two groups were equal.

There was no great difference in body measurements between the 2 groups. The wool clips both in the early period and at the end of the pasture

period were higher in the high-fibre group, though staple length was similar. Carcase measurements in the animals killed early were similar, but the low-fibre animals contained more bone and the meat had a higher protein content. The sheep killed at 13 months of age showed more difference in favour of the high-fibre group, which contained a higher proportion of meat and also more fat. They tended to have greater length and volume in the digestive tract, but this was not significantly related to body size.

It is concluded that the high fibre intake in early life was advantageous.—D. Duncan.

5841

GUYER, P. Q. and DYER, A. J. **Study of factors affecting sheep production.** *Missouri Agric. Exp. Stat. Res. Bull.* No. 558, July 1954, pp. 79.

Thirty-two 2-year-old ewes on bluegrass pasture given a supplement of 2 lb. concentrates per head daily during the last 60 days of pregnancy were compared with an unsupplemented flock on the same pasture. The supplemented ewes made greater gains during pregnancy, had heavier fleeces, produced larger lambs at birth and gave more milk. Lambs from the supplemented ewes were heavier at 16 weeks and were marketed earlier and at higher prices. A supplement to ewes on fescue-ladino pastures resulted only in heavier fleeces and heavier twin lambs at birth. Dystocia was not associated with size and type of sire or body conformation of ewe. Single lambs after a large ram were heavier at birth and made faster growth than those after a small ram. There was little difference with twins. Milk consumption, lambs per ewe, and birthweight were closely related to rate of growth of lambs. Milk yield was highest in the second week after lambing and total yield was greater with twins than with single lambs. There was little difference in the growth rate of ewe and wether lambs. An extensive review of the literature is included.

J. C. Gill.

5842

BUSH, L. F., WILLMAN, J. P. and MORRISON, F. B. **A study of the protein requirements of fattening feeder lambs.** *J. Animal Sci.*, 1955, 14, 465-469. [Cornell Univ., Ithaca, N.Y.]

In trials with 297 lambs, those fed on rations containing 11.8 per cent. total protein made higher average daily gains than did those on 10.0 and 11.0 per cent. protein. Feed efficiency was similar at all levels. Rate of gain and degree of finish were not significantly affected by the amount of alfalfa hay given with a full feed of maize silage, but lambs on maize silage alone showed greater feed efficiency than did those on a full feed of silage plus 0.75 or 0.50 lb. hay.—J. C. Gill.

5843

HÄRING, F., LEYDOLPH, W. and SCHOLZE, F. **Milchlämmermast auf unterschiedlicher Futtergrundlage. [Fattening milk lambs on different basal diets.]** *Arch. Tierernährung*, 1954, 4, 25-33. [Inst. Tierzucht Milchwirtsch., Univ. Göttingen.]

Two groups were used, each of 16 ewes, with 21 and 20 lambs; several breeds and crosses were included. Each ewe of group A received, in kg. daily, improved fodder beet 1.5, meadow hay 0.25, oat straw 0.5, beet leaf silage 1.5, Troblako [a preparation of dried beet leaves] 0.25; ewes with single lambs received protein feed 0.15 and meadow hay 0.25, those with twins 0.3 and 0.5. Those of group B received fodder beet 3.0, lucerne hay 0.25, oat straw 0.5 and Troblako 0.25, ewes with single lambs oats and beans 0.15 and lucerne hay 0.25 and those with twins 0.3 and 0.5. The two rations provided before lambing, in g. daily, digestible protein 74 and 105, starch equivalent 509 and 435; for ewes with single lambs protein 113 and 138, starch equivalent 673 and 634; for ewes with twins protein 152 and 190, starch equivalent 837 and 813. All lost some weight during the experiment. All lambs received at 2 weeks of age oats and lucerne hay; later those of group A got protein feed and Troblako, those of group B oats and beans.

Single lambs gained during the experiment 284 and 264 g. daily, twins 250 and 206 g. The single lambs, ate, for each kg. liveweight increase, digestible protein 270 and 259 g., starch equivalent 1247 and 1339 g. For twins the values were 287 and 283, 1305 and 1392.

The lambs were killed at about 35 kg. liveweight, means for group A 35.9 and for group B 34.0 kg. The carcase weights were 17.6 and 16.5 kg., or 51.8 and 51.4 per cent. The fat yields were 6.8 and 7.9 per cent. of the carcase weight.

D. Duncan.

5844

BOTKIN, M. P. and PAULES, L. **Effect of aureomycin in various ratios of roughage to concentrate for feeder lambs.** *Wyoming Agric. Exp. Stat. Mimeo Circular* No. 44, April 1954, pp. 7.

Different ratios of roughage to concentrate, 1:1, 1.5:1 and 2:1, each with or without aureomycin supplied as Aurofac 2A, 6 lb. per ton feed, were compared for fattening lambs. About 50 lambs were self-fed and 16 hand-fed on each treatment. The roughage was alfalfa hay and the concentrate was two-thirds whole barley and one-third dried beet pulp. When similar ratios of roughage to concentrate were compared, aureomycin gave a slight but insignificant improvement in efficiency of feed conversion and dressing percentage, but was uneconomic because of the high cost of the antibiotic. Rate of liveweight increase, efficiency and

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dressing percentage decreased as the proportion of roughage increased. Hand-fed lambs gained more slowly and were less efficient than self-fed but dressing percentage and price per lb. were higher. In the hand-fed lambs a correlation of + 0.80 was found between rate and efficiency of gain when initial weight was constant.—T. D. Bell.

5845

JORDAN, R. M. **Alfalfa hay, alfalfa silage and corn silage for fattening lambs.** *S. Dakota Agric. Exp. Stat. Circular* No. 106, April 1954, pp. 6.

Three trials were made to compare alfalfa hay, alfalfa silage and maize silage as roughages for fattening lambs. In each trial the lambs received the same concentrates and the group getting silage was also given a small quantity of alfalfa hay. In the first trial rate of growth and efficiency were greater on the alfalfa hay, which was leafy and green in this trial. In the other trials the silages were superior to the brown, somewhat stemmy hay used. There was little to choose between the 2 silages in any trial. Dressing percentage and carcass grade were not influenced by the rations given.—T. D. Bell.

5846

FAULKNER, E. K. and PAULES, L. **Saffmeal for fattening lambs (second year's trials).** *Wyoming Agric. Exp. Stat. Memo Circular* No. 12, March 1952, pp. 7.

Five groups of lambs of initial liveweight 75 lb. were used to compare saffmeal (safflower meal) of 18 and 28 per cent. protein content with soya bean oilmeal of 41 per cent. protein content, given on an equivalent protein basis, as protein supplements, and to compare self-feeding with hand-feeding. The trial lasted for 112 days, when the lambs were killed at about 110 lb. liveweight and graded. The concentrates were made up of whole barley, and for group 1, 28 per cent. protein saffmeal, group 2, 18 per cent. protein saffmeal, group 3 soya bean oilmeal, group 4, 28 per cent. saffmeal and group 5, 18 per cent. saffmeal. Groups 1 and 2 were self-fed and the others were hand-fed. Costs of fattening based on local current prices were estimated.

The 28 per cent. saffmeal gave cheaper and faster gains than the 18 per cent. saffmeal fed in the same way. Self-feeding gave cheaper and faster gains than hand-feeding and also gave better carcass grade and dressing percentage. Group 1 was comparable to group 3 but cost of gain was slightly higher, though this was offset by higher carcass grade and dressing percentage. Weight increase of group 2 was equal to that of group 4, but efficiency of feed conversion was not so good and cost of liveweight increase was consequently higher.—T. D. Bell.

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5847

MEYER, J. H., WEIR, W. C., ITTNER, N. R. and SMITH, J. D. **The influence of high sodium chloride intakes by fattening sheep and cattle.** *J. Animal Sci.*, 1955, **14**, 412-418. [Dept. Animal Husb., Univ. California, Davis.]

Growing and fattening sheep given rations with 0.66, 4.8, 9.4 and 12.8 per cent. of sodium chloride made similar daily gains and were equally efficient in feed utilisation. High sodium chloride intakes did not affect the digestibility of the ration, but there was some indication that carcass grade was reduced. Daily gain, feed efficiency and dressing percentage were not affected in fattening steers given 9.33 per cent. sodium chloride, but there was some decrease in carcass grade.—J. C. Gill.

5848

BUOY, L. L., GARRIGUS, U. S., FORBES, R. M., NORTON, H. W. and MOORE, W. W. **Toxicity of some arsenicals fed to growing-fattening lambs.** *J. Animal Sci.*, 1955, **14**, 435-445. [Dept. Animal Sci., Univ. Illinois, Urbana.]

Arsenic, as 3-nitro-4-hydroxyphenylarsonic acid, arsanilic acid, and potassium arsenite, was given at levels of 0.05, 0.1, 0.2 and 0.4 per cent. in a hay, maize and soya bean meal ration given to 12 individually penned lambs to appetite. The same amounts, with the omission of the 0.05 per cent. level, were given to 9 mature ewes in a second trial. There was no difference in growth of lambs due to the level or to the compound of arsenic. The rations containing 3-nitro-4-hydroxyphenylarsonic acid were eaten best, and this compound appeared less toxic than the others. Lambs getting 0.2 and 0.4 per cent. arsanilic acid had convulsions and the ewe on the 0.4 per cent. level died. Liver, kidney and muscle arsenic contents rose when arsenicals were given and pathological changes indicated severe haemolysis, not necessarily accompanied by outward signs of toxicity. J. C. Gill.

5849

KOCH, W. and HEIM, E. **Der Einfluss der östrogenen Hormone auf die Schafmast und die Qualität des Schaffleisches.** [Effect of oestrogens on fattening of sheep and the quality of mutton.] *Züchtungskunde*, 1955, **28**, 343-355. [Inst. Tierzucht, Univ. Munich.]

Literature is reviewed. In the first experiment, 10 non-pregnant ewes, average weight 63.5 kg., were given 200 mg. Foragynol (Di-*p*-acetoxyphenylhexadiene) by injection in the neck; 8 similar ewes served as controls: 15 lambs, average weight 32.2 kg., were given 100 mg. of the synthetic oestrogen and 12, average weight 31.3 kg., were controls. After 28 days, the average weight of the treated ewes was 69.0, of the controls 71.0

kg. The treated lambs weighed on the average 41.4 kg. and the controls 38.0. The treated ewes, but not the lambs, lost weight for the first 6 days. There was no effect on quality of meat.

In the second series 20 wethers, average weight 65.6 kg., were given 200 mg. Foragynol; 5 were given both oestrogen and 1 ml. A.T. 10 to counteract the effect on Ca metabolism and 15, average weight 67.2 kg., were controls. At the end of the 43 days the average weights in the above order were 70.4, 73.0 and 75.5 kg. Again there was no effect on quality.

In the third experiment, 39 ram lambs, average weight 23.7 kg., were given 100 mg. oestrogen and 40, average weight 23.3 kg., were controls. At the end of 59 days the average weights were 35.5 and 33.4 kg. and quality was not affected. Five of the treated lambs showed inflammatory changes in the testes and these lost weight.

Quality was measured in terms of water content and intramuscular fat.—I. Leitch.

5850

MAQSOOD, M. Effects of the thyroid gland on fleece growth in sheep. *Brit. Vet. J.*, 1955, 111, 163-169. [Animal Res. Stat., Univ. Cambridge.]

Suffolk rams 4½ months old were given thyroxine or thiouracil in their diets for 11 months. Similar

animals were kept as untreated controls. Thyroxine increased and thiouracil decreased fleece weight and fibre length significantly. Diameter of fibres was not affected.—T. D. Bell.

5851

SELLERS, K. C. and LEECH, F. B. Survey of losses associated with pregnancy and parturition in Yorkshire sheep. *J. Agric. Sci.*, 1955, 46, 90-96. [Vet. Invest. Centre, Minist. Agric. Fish., Leeds.]

The survey included 4 per cent. of the flocks and 6.3 per cent. of the breeding ewes of Yorkshire during the exceptionally favourable lambing season of 1953 after severe weather at mating time. Lambing was successful in 89.68 per cent. of the breeding ewes and barrenness accounted for 3.66 per cent. of the 10.32 per cent. which did not breed successfully. In the Holderness area there were few abortions but rates of stillbirths and deaths of ewes during pregnancy and parturition were high. In the Wolds, where pregnant ewes are folded on arable crops and where *Vibrio foetus* infection is known to be present, the incidence of abortion was twice that in other areas. Hay feeding appeared to reduce mortality in all regions. J. C. Gill.

See also Absts. 4795, 5126.

PIGS

5852

BARBER, R. S., BRAUDE, R. and MITCHELL, K. G. Studies on milk production of Large White pigs. *J. Agric. Sci.*, 1955, 46, 97-118. [Nat. Inst. Res. Dairying, Univ. Reading.]

Two gilts and 3 sows with litters were studied to ascertain the frequency of suckling. The litters, of ages ranging from 6 to 51 days, were continuously watched for 24 hr. The interval between sucklings was, on the average, about 1 hr., slightly less in the younger, slightly more in the older litters. The shortest interval was 25 and the longest 96 min., but most were between 50 and 70 min. During the 12-hr. period from 8 p.m. to 8 a.m. sucklings were slightly fewer than during the day.

In an experiment with 2 gilts suckling litters of 6 and 5, weight changes were recorded until weaning at 56 days. The litters were allowed to suck normally except for certain 48-hr. periods, spaced throughout the lactation, when suckling was controlled and piglets were allowed to suck only every 2½ or 3 hr.; finally there was one 24-hr. period when they sucked every hour. During these controlled periods piglets were weighed before and after suckling to measure the milk yields of the dams. When suckling was allowed

only at the longer intervals they lost weight during the controlled periods and for 24 hr. afterwards. Milk production over the 48-hr. was less than in the 24-hr. period when suckling was allowed every hour, although this latter period was nearer the end of lactation and yield could be expected to have declined. During each controlled period of 48 hr. yield was less in the second 24 hr. than in the first.

Milk yield of 3 gilts during 56 days' lactation was estimated from the milk consumed by the piglets, which were allowed to suck every hour during controlled periods of 24 hr. The estimated yield was 768 lb. Details of the behaviour during suckling, the choice of teats, the size of the piglets and the yield of the teats are described and discussed. Variations of yield of different teats and at different times were recorded. During the first 3 weeks, when they were getting only milk, the rate of growth of the piglets was directly related to their milk intake, but later, when creep feeding was available, the relation no longer held. On milk only, the efficiency of feed conversion was higher than during the last 5 weeks before weaning.

The chemical composition of the milk changed during the first 3 weeks, after which it remained

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fairly constant. Fat increased from between 3.5 and 5.5 to between 8.5 and 10.0 per cent., total solids decreased from about 30 to about 20 per cent., and solids-not-fat from about 25 to about 11 per cent.—T. D. Bell.

5853

LASSITER, J. W., TERRILL, S. W., BECKER, D. E. and NORTON, H. W. Protein levels for pigs as studied by growth and self-selection. *J. Animal Sci.*, 1955, **14**, 482-491. [Illinois Agric. Exp. Stat.]

Pens of 5 pigs of average weight 31 lb. were self-fed on rations containing either 10, 12, 14 or 16 per cent. protein, there being 2 pens for each protein level. There were also 4 lots each of 10 pigs of average weight 29 lb. on four $\frac{1}{4}$ -acre paddocks of alfalfa pasture and self-fed on rations containing 8, 10, 12 or 14 per cent. protein. Protein selection tests were also made with pairs of pigs in dry lot and on pasture.

In dry lot, both before and after 100 lb. liveweight, rate and efficiency of gain tended to improve with each rise in protein level. Before 100 lb. growth rate on 10 per cent. protein was significantly lower than on 12, 14 and 16 per cent. protein, and growth rate on 12 per cent. protein was significantly lower than on 16 per cent. After 100 lb. growth rate on 10 per cent. protein was significantly lower than on the 12, 14 and 16 per cent. levels.

On pasture, both before and after 100 lb. liveweight, rate and efficiency of gain also tended to improve with each rise in protein level. Statistical analysis indicated that the optimum protein level was between 12 and 14 per cent.

Pigs under 100 lb. given maize with free choice of protein supplement selected diets with 13.7 or 15.3 per cent. protein when in dry lot and 10.8 per cent. protein when on pasture. After 100 lb. the pigs in dry lot selected diets with 10.9 or 12.7 per cent. protein and those on pasture 10.0 or 9.9 per cent. In dry lot the protein levels selected were lower when ground maize was given than with shelled maize.—I. A. M. Lucas.

5854

HOHLS, H. W. Die Berechnung des maximalen täglichen Eiweißansatzvermögens von Schweinen aus in der Literatur veröffentlichten Daten und dessen Bedeutung bei der Durchführung von Fütterungsversuchen. [Computing the maximum daily capacity of pigs to lay down protein, from data published in the literature, and its importance in feeding experiments.] *Ztschr. Tierernährung Futtermittelk.*, 1955, **10**, 44-55. [Bundesforschungsanst. Kleintierzucht, Celle.]

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In pigs the daily weight increase is proportional to the amount of the production ration only as long as the digestible protein content of the latter does not exceed the animal's ability to lay down tissue protein. When the limit is exceeded, the surplus protein is not laid down as meat. In comparing the values of different sources of protein it is important to restrict the quantities within the limit, otherwise differences are not truly shown. The maximum rates of protein deposition for several breeds of pig at weights between 50 and 150 kg. are shown in diagrams, and it is demonstrated that the amounts of protein used in feeding experiments are often too large. Several experiments are selected from the literature as evidence that too high a protein intake may distort the effects of antibiotic supplements.—D. Duncan.

5855

PAYNE, W. J. A., NAIDU, R. K. and SILLS, V. E. Pig feeding trials. The relative value and economy of animal, plant, and a mixture of animal and plant protein feeds in the ration of fattening porkers in Fiji. *Fiji Agric. J.*, 1954, **25**, 65-70.

A trial was made with 16 Tamworth \times Berkshire pigs fattened from 42 lb. liveweight, 6 weeks after weaning, to 120 lb. liveweight. Conditions prevented the trial from starting at weaning, so all the pigs were reared on plant protein until the trial could be begun. Then 4 rations were compared, designated high animal protein, group 1, low animal protein, group 2, high protein of mixed animal and plant origin, group 3 and high plant protein, group 4. Animal protein was supplied by meatmeal and dried buttermilk powder, and plant protein by cocoanut and groundnut meals. All animals had molasses and greenfeed, elephant grass, to appetite. The protein percentages of the rations were, for groups 1 to 4 respectively, 17.0 to 14.4, 12.4 to 9.9, 14.5 to 13.3, 14.4 to 12.4, the lower figures of each pair being the percentage protein given after 70 lb. liveweight was reached. Group 1 gained 1.26 lb. daily, required 2.95 lb. meal per lb. liveweight increase, took 62 days to reach slaughter weight of 120 lb., and had a dressing percentage of 80.3. For group 2 the corresponding figures were 1.05, 3.48, 72 and 77.2; for group 3, 1.34, 3.25, 54 and 81.3; and for group 4, 0.73, 3.55, 111 and 75.5. These results are discussed in relation to the findings of British workers in similar trials, and to the scarcity of animal protein supplements in Fiji.—T. D. Bell.

5856

DAMMERS, J. De behoefte aan aminozuren voor groeiende varkens. [Amino-acid requirements of growing pigs.] *Tijdschr. Diergeneesk.*,

1955, 80, 361-365. [Rijkslandbouwproefstat., Hoorn.] English, French and German summaries.

In the first table all the known estimates of requirements of pigs for the amino-acids arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine as "per cent. of the ration", the weight of the pigs concerned and the percentage crude protein in the ration, are collected. Few of these estimates were made with synthetic diets and the amount of the amino-acid present may have been more than enough. In the second table are presented derived estimates of requirements suitable for diets with 13 to 17 per cent. crude protein, as is common practice in the Netherlands, in choosing which the minimum amounts in non-synthetic diets have been given most weight. They are in order of the list above, and as *l*-isomers except for methionine, phenylalanine and tryptophan which are *DL*, 0.25; 0.40; 0.65; 0.90; 1.00; 0.60 or 0.30 plus 0.30 cystine; 0.90 or 0.60 in the presence of tyrosine; 0.60; 0.20; 0.60 per cent. of the ration. These estimates are close to those for the rat (see Mitchell, Protein and Amino acid Requirements of Mammals, 1950).—I. Leitch.

5857

PFANDER, W. H. and TRIBBLE, L. F. Some effects of adding supplements of lysine, methionine and tryptophan to practical swine rations. *J. Animal Sci.*, 1955, 14, 545-555. [Univ. Missouri, Columbia.]

Trials were made with pigs fattened from weaning to 100 lb. liveweight. In one series the control groups received a basal ration which included vitamin B₁₂ and aureomycin, and had 18 or 16 per cent. protein supplied by tankage and soya bean oilmeal, reduced at 75 lb. liveweight to 16 and 14 per cent. The experimental groups got the basal ration plus 0.01 per cent. *L*-lysine, or 0.04 per cent. *DL*-methionine or both. The supplements increased growth rate and efficiency of feed conversion.

In another series the addition of 0.01 per cent. *L*-lysine, 0.04 per cent. *DL*-methionine or 0.04 per cent. *DL*-tryptophan increased growth rate and efficiency, but the amino-acids were not as effective in combination as given separately. When the antibiotic was excluded from the basal ration the stimulating effect of *L*-lysine was reduced.

On rations without animal protein neither *L*-lysine, *DL*-methionine nor a combination of the 2 increased growth rate, but efficiency was slightly improved.—T. D. Bell.

5858

EGGERT, R. G., MAYNARD, L. A., SHEFFY, B. E. and WILLIAMS, H. H. Histidine—an essential

nutrient for growth of pigs. *J. Animal Sci.*, 1955, 14, 556-561. [Dept. Animal Husb., Cornell Univ., Ithaca, N.Y.]

Six piglets were weaned at 6 days old and kept on a stock milk-type diet based on casein for 8 days, after which 3 were given a basal diet very low in histidine and 3 the basal diet with histidine added. The basal diet contained purified amino-acids and diammonium citrate as the only sources of nitrogen. The growth of the piglets on the basal diet with histidine added was satisfactory but somewhat below the performance expected on a diet based on casein. These pigs were taken off the experiment after 18 days. After 22 days 2 pigs on the basal diet were growing only very slowly and were changed over to the diet containing histidine. The third pig was changed over to this diet on the 28th day. After the change-over the appetites and growth rates of these pigs increased greatly, although later in the experiment 2 died, one showing a hypertrophied heart. It was concluded that histidine is required for the normal growth of young pigs, although the requirement for it may be low.—I. A. M. Lucas.

5859

Axelsson, J. Der Einfluss des Rohfasergehaltes des Futters auf das Wachstum von Jungschweinen. [Influence of the crude fibre content of the ration on the growth of young pigs.] *Arch. Tierernährung*, 1955, 5, 1-16. [Inst. Fütterungslehre, Landwirtschaft. Hochsch., Upsala.]

See Abst. 5466, Vol. 24. The study reported there has been somewhat extended, with similar results.—D. Duncan.

5860

GERT, G. L'influenza esercitata dal contenuto in fibra greggia degli alimenti sull'incremento ponderale e sulla conformazione della carcassa dei suini. [The influence of the crude fibre content of the diet on weight gain and carcass conformation of pigs.] *Riv. Zootec.*, 1955, 28, 152-153.

5861

GARD, D. I., BECKER, D. E., TERRILL, S. W., NORTON, H. W. and NALBANDOV, A. V. Sources of unidentified factors for the pig. *J. Animal Sci.*, 1955, 14, 532-544. [Illinois Agric. Exp. Stat., Urbana.]

Five experiments were made to study whether grass juice concentrate, a dried whey product, dried brewer's yeast, dehydrated alfalfa meal, menhaden fish solubles, or streptomycin residue contributed unidentified substances necessary for the rapid growth of pigs. In 3 of the experiments the basal diet consisted of purified ingredients and

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in the remaining 2 it was a practical fortified maize and soya bean oilmeal ration. Weanling pigs with an initial weight of 23 to 33 lb. were used, and each experiment lasted 8 weeks.

Ten per cent. alfalfa meal in the diet depressed growth. This effect was apparently not due to the fibre of the alfalfa and may have been due to its saponin content. The streptomycin residue depressed growth when included in the purified diet but promoted growth when included in the practical diet. Neither dried brewer's yeast nor the dried whey product nor menhaden fish solubles appeared to contain unidentified growth substances for the pig, but grass juice concentrate produced significant growth responses and significant increases in feed consumption. This growth response also approached significance when adjusted for the difference in feed consumption. It is suggested that the oestrogens of the grass juice concentrate may have been responsible for its growth-stimulating property.—I. A. M. Lucas.

5862

KRAUSE, H. and VOGEL, G. Über die Wirkung der APF-Zufütterung auf die Wachstumsgeschwindigkeit von Schweinen bei ausreichendem Eiweißangebot. [The effect of APF supplements on the growth rate of pigs with an adequate supply of protein.] *Arch. Tierernährung*, 1955, 5, 17-25. [Inst. Vet. Physiол., Humboldt Univ., Berlin.]

At a state pig feeding centre in the summer and autumn of 1954 pigs of both sexes and several breeds were fattened from 65 kg. to 100 kg. on a daily ration of fishmeal (56.9 per cent. digestible protein) 100, meatmeal (48.9 per cent. protein) 192.3, coarsely ground barley or rye (7.3 per cent. protein) 1050, kitchen waste of unknown and variable protein content 2000 and chalk 20 g., and from 100 to 120 kg. on the same with the cereals raised to 2550 g.; 671 pigs had a daily supplement of 15 g. Betapan, containing animal-protein factor and vitamin B₁₂, and 238 controls did not. The pigs were weighed in groups monthly and the results are shown graphically.

The pigs given Betapan reached 120 kg. in 3½ months, fully 4 weeks before the controls. Their daily gains were very steady during the first month or so and subsequently followed an S-shaped curve; those of the controls, at first lower, rose rapidly to a peak and then fell away. From a study of costs it was concluded that up to 80 kg. liveweight the supplement was justified.

W. M. Deans.

5863

WAHLSTROM, R. C. and WILSON, R. F. Feeding pigs trace-mineralized salt. *S. Dakota Agric. Exp. Stat. Circular* No. 108, June 1954, pp. 7.

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In a trial with 2 groups of 15 pigs, initial liveweight 49 lb., fattened to slaughter weight of 225 lb., salt with trace elements added was compared with common salt. The mineral mixture was 2 parts bonemeal, 2 parts limestone and 1 part NaCl, which had trace minerals included with it for one group. The pigs were fed, and the mineral mixture was given, to appetite. There was no difference between the groups in rate or efficiency of gain.

A similar comparison was made in a second experiment, but in this case the pigs were lighter to start with, 33 lb., and the mineral mixture was of equal parts of bonemeal, limestone and salt, trace minerals being added as before. Two groups of 25 got the trace mixture and 2 groups did not. The pigs getting the trace minerals grew faster, but there was no advantage in efficiency. Possible reasons for the difference in results between the experiments are discussed.—T. D. Bell.

5864

BARBER, R. S., BRAUDE, R., MITCHELL, K. G. and CASSIDY, J. High copper mineral mixture for fattening pigs. *Chem. and Indust.*, 1955, No. 21, 601. [Nat. Inst. Res. Dairying, Shinfield, Reading.]

Pigs fattened from 44 lb. liveweight for 18 weeks, given a mineral supplement supplying 250 p.p.m. Cu in their ration, gained slightly, but not significantly faster than control pigs on a standard diet of barley meal, fine wheat offal and whitefish meal. The difference was almost all during the first 8 weeks, and efficiency was also greater in this period. There was no difference in carcass grade, or in efficiency over the whole period. Further experiments are in progress.—T. D. Bell.

5865

BECKER, D. E., TERRILL, S. W. and NOTZOLD, R. A. Supplementary protein and the response of the pig to antibiotics. *J. Animal Sci.*, 1955, 14, 492-498. [Illinois Agric. Exp. Stat.]

In the first experiment 3 groups of weanling pigs were self-fed for 8 weeks on a diet of maize and soya bean oilmeal and 3 on a diet of maize and menhaden fishmeal. Both diets were supplemented with minerals and vitamins. One group on each diet was a control, one received 6 mg. chlortetracycline [aureomycin] per lb. diet and the third received 6 mg. of a mixture of chlortetracycline, procaine penicillin and streptomycin per lb. diet.

In the second experiment 4 groups of weanling pigs were self-fed, one on a diet of maize and soya bean oilmeal and 3 on a diet of maize and menhaden fishmeal which either had no supplement, or had 0.05 per cent. DL-tryptophan or 2.0 per cent. fish soluble solids added.

In experiment 1 the addition of chlortetracycline alone or the antibiotic mixture to the maize and soya bean diet improved rates of gain by 10.4 and 14.4 per cent., respectively, but when added to the maize and menhaden fishmeal diet they improved rates of gain by 38.9 and 83.3 per cent., respectively. Feed conversion efficiency was improved by the inclusion of either supplement in the diet of maize and menhaden fishmeal but by neither when added to the diet of maize and soya bean oilmeal. The antibiotic mixture was superior to chlortetracycline alone, this effect being more pronounced with the diet of maize and menhaden. In the absence of antibiotic pigs grew 73.6 per cent. faster on the diet of maize and soya bean oilmeal than on the diet of maize and menhaden fishmeal, but in the presence of antibiotic this difference was reduced to 8.3 per cent.

In experiment 2, pigs on the diet of maize and menhaden fishmeal, which contained 0.10 per cent. tryptophan, grew more slowly than those on the diet of maize and soya bean oilmeal, which contained 0.17 per cent. tryptophan, but their performance was improved up to the standard of the latter by the supplement of 0.05 per cent. DL-tryptophan. The addition of fish soluble solids to the diet of maize and menhaden fishmeal did not affect growth.—I. A. M. Lucas.

5866

TAYLOR, J. H. and HARRINGTON, G. Influence of dietary antibiotic supplements on the visceral weights of pigs. *Nature*, 1955, 175, 643-644. [Agric. Res. Council, Field Stat., Compton, near Newbury, Berks.]

Pigs fattened to 200 lb. liveweight with a dietary supplement of penicillin had significantly heavier livers and non-significantly lighter small intestines than controls. With aureomycin the livers were lighter and the spleens and small intestines significantly lighter than in controls. The differences between the weights of small intestine and between the weights of liver on the 2 treatments were significant. Antibiotics did not affect the weight of stomach, caecum or large intestine. The total weight of viscera in the pigs getting penicillin was greater than in those getting aureomycin, which may have been the reason for the lower dressing percentage. The differences between the effects of the antibiotics suggest that they may have different modes of action.—T. D. Bell.

5867

DAVEY, R. J., GREEN, W. W. and STEVENSON, J. W. The effect of aureomycin on growth and reproduction in swine. *J. Animal Sci.*, 1955, 14, 507-512. [U.S. Dept. Agric., Agric. Res. Centre, Beltsville, Md.]

Aureomycin at rates of 10, 50 or 100 mg. per lb. of a feed containing no animal protein was given to 3 generations of pigs. The higher levels had no adverse effect on reproductive performance as judged by number of pigs born per litter, birth-weight or weaning weight. Rate of liveweight increase in each generation from weaning to 220 lb. was significantly greater in the pigs getting 50 mg. aureomycin. There was no significant difference between the treatments in efficiency of feed utilisation, but the pigs getting 100 mg. aureomycin tended to eat less than those getting 50 mg., and ate slightly less per lb. liveweight increase.

T. D. Bell.

5868

BOHMAN, V. R., HUNTER, J. E. and McCORMICK, J. The effect of graded levels of alfalfa and aureomycin upon growing-fattening swine. *J. Animal Sci.*, 1955, 14, 499-506. [Dept. Animal Husbandry, Univ. Nevada, Reno.]

A basal diet of ground milo with a protein supplement was modified by the inclusion of 10, 30 or 50 per cent. alfalfa meal and these 4 diets were given with and without 10 mg. aureomycin per lb. feed. The diets given before 120 lb. liveweight contained 4.3, 6.9, 12.6 and 17.6 per cent. crude fibre; after 120 lb., when the protein content was somewhat reduced, they contained 3.6, 7.0, 13.0 and 17.1 per cent. crude fibre. All rations were pelleted and self-fed and the pigs were slaughtered at about 200 lb. liveweight.

Average daily gains decreased with each increase in alfalfa content of the diet. Daily feed consumption was lower on the 2 higher levels of alfalfa, but this effect was not large enough to account for the differences in rates of gain. As the alfalfa content of the diet increased the feed conversion efficiency became worse, although pigs on rations containing 50 per cent. alfalfa consumed the least concentrate (milo and protein supplement) per lb. gain. The addition of aureomycin significantly increased rate of gain, but there was no significant interaction between level of alfalfa and presence of antibiotic, although there was a tendency for the response to antibiotic to decrease as the level of alfalfa rose. Aureomycin improved feed conversion efficiency at all levels of alfalfa.

Aureomycin had no effect on carcass quality measurements, but as the level of alfalfa rose the dressing percentage, depth of back fat, and percentage of belly bacon and fat back in the carcass significantly decreased, and the percentage of ham, shoulder and loin significantly increased. As the level of alfalfa rose the size of the stomach and large intestine, but not of the small intestine, increased. The size of these organs was not affected by dietary antibiotic, nor was the level of ascarid infestation.—I. A. M. Lucas.

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5869

HANSON, L. E., CARPENTER, L. E., AUNAN, W. J. and FERRIN, E. F. **The use of arsenilic acid in the production of market pigs.** *J. Animal Sci.*, 1955, 14, 513-524. [Univ. Minnesota.]

In the first experiment 4 groups of 10 pigs were used to compare a basal ration with the same ration plus supplements of 30, 60 or 90 g. arsenilic acid per ton feed for growth and fattening from weaning to 200 lb. liveweight. The experimental animals gained faster than controls, but not significantly, and there was no difference between groups in efficiency of feed conversion up to 125 lb. liveweight. Most of the difference in growth rate was in the first 4 weeks. After 125 lb. liveweight gains were not recorded because of an outbreak in all groups of lameness, the cause of which could not be diagnosed.

The second experiment was a comparison between 3 different protein levels all with 60 g. arsenilic acid per ton feed; a fourth group had free access to separate feeders, one containing ground maize and the other a high-protein balancer meal, so that in effect the animals chose their own level of protein. Arsenilic acid, 240 g. per ton, was included in the balancer meal. Differences in weight increase between the groups were not significant, and were not related to the protein levels.

In neither experiment did the treatments influence carcass quality, measurements or dressing percentage. Small amounts of arsenic were retained in muscle, liver and kidney, proportional to the amount of arsenilic acid given. When arsenilic acid was withdrawn 2 or 4 days before slaughter the amount of arsenic retained was greatly reduced.

T. D. Bell.

5870

HANSON, L. E., FERRIN, E. F. and SINGH, S. N. **The influence of arsenilic acid on protein requirements of growing pigs.** *J. Animal Sci.*, 1955, 14, 525-531. [Univ. Minnesota.]

Diets based on maize, soya bean oilmeal, tankage, linseed oilmeal, alfalfa meal, minerals and vitamins, compounded to contain either 18, 16 or 14 per cent. crude protein, were given to pigs from weaning to 125 lb. liveweight. For feeding from 125 to 200 lb. liveweight the crude protein content was reduced to 15, 13 and 11 per cent., respectively. Pigs were also given the ground maize and supplement free choice. The 3 fixed protein levels were given with and without an additional supplement of 60 g. arsenilic acid per ton of meal, and the free choice diet was given with and without the addition of 240 g. arsenilic acid per ton of protein supplement. There were thus 8 treatments. There were 2 replicates, with one group of 5 pigs on each treatment in each replicate.

Although pigs on the 18 or 16 per cent. protein diets grew the most rapidly during the first fortnight, protein level had no significant effect on average growth rate from weaning to 125 lb. A small advantage in rate of gain of pigs getting arsenilic acid was also not significant over this period. There was no significant effect of treatment on growth rate between 125 and 200 lb.

Feed conversion efficiency was slightly improved with arsenilic acid, but under the conditions of the experiment arsenilic acid did not have a protein-sparing effect, nor was there any evidence that it was toxic.

The pigs on free choice selected rations containing 14.4 and 15.2 per cent. crude protein before they reached 125 lb. and 12.8 and 12.2 per cent. crude protein after 125 lb.—I. A. M. Lucas.

5871

MORIMOTO, H., TAKAHASHI, A. and HOSHII, H. **[Effect of thiouracil upon the growth of young pigs and chickens.]** *Bull. Nat. Inst. Agric. Sci., Japan* [G], 1955, No. 10, 27-36. In Japanese; English summary.

The daily ingestion of 0.25 g. thiouracil by young pigs had no effect on growth. Higher amounts, 0.5 or 0.75 g., produced an increased rate of growth and better feed utilisation.

Administration of 0.15 g. daily to 3-month-old chickens increased their rate of growth from 4 to 8 weeks, after which growth rate fell.

Prolonged administration to pigs and administration to 2-month-old chickens had a bad effect on the thyroid. (From summary.)

J. S. Thomson.

5872

BEESON, W. M., ANDREWS, F. N., PERRY, T. W. and STOB, M. **The effect of orally administered stilbestrol and testosterone on growth and carcass composition of swine.** *J. Animal Sci.*, 1955, 14, 475-481. [Dept. Animal Husb., Purdue Univ. Agric. Exp. Stat., Lafayette, Ind.]

Sixty pigs of average weight 45 lb. were divided into 6 groups which all had free choice of maize, protein supplement and mineral supplement. The following additional supplements were given: group 1, none; group 2, 60 g. terramycin per ton of protein supplement; group 3, 2.0 mg. stilboestrol per pig daily; group 4, terramycin in protein supplement and 2.0 mg. stilboestrol per pig daily; group 5, 20.0 mg. testosterone per pig daily; group 6, terramycin in protein supplement and 20.0 mg. testosterone per pig daily. The hormones were always given in the protein supplement. The pigs were slaughtered at about 225 lb.

Neither hormone significantly affected growth rate when there was no terramycin in the diet, but pigs receiving terramycin plus testosterone grew

significantly more slowly than those receiving only terramycin. Pigs receiving terramycin grew significantly faster than the control group. Neither hormone affected feed consumption or feed efficiency.

Stilboestrol increased mammary growth in both males and females and pigs receiving testosterone appeared somewhat trimmer in the sides and jowls.

Pigs receiving antibiotic but no hormone had the fattest carcasses. Testosterone increased the weights of the hams and picnics, and testosterone or stilboestrol given with terramycin resulted in heavier loins. There was a trend towards the production of leaner carcasses in both stilboestrol groups, but testosterone had a more marked effect in reducing the fat, and increasing the lean, content of the carcasses. Oestrogens were not deposited in the edible portions of the carcasses when stilboestrol was given.—I. A. M. Lucas.

5873

LUCAS, I. A. M. and CALDER, A. F. C. **The interaction between environment and level of feeding for pigs from weaning to bacon weight.** *J. Agric. Sci.*, 1955, **46**, 56-77. [Rowett Res. Inst., Bucksburn, Aberdeenshire.]

Trials were made in winter and summer to compare groups of pigs given high or low plane rations, and housed in good warm or bad cold and draughty pens. In this experiment high and low plane referred to the total digestible nutrient content of the rations, which had adequate protein, vitamins and procaine penicillin. The pigs grew and fattened from weaning to 200 lb. liveweight, with the exception of the groups on low plane rations in the bad piggery, which were removed from the experiment at 150 lb. liveweight, because their growth after 100 lb. was unsatisfactory. Altogether 168 pigs were used.

Growth and efficiency were worst affected from 45 to 100 lb. liveweight by low plane feeding in the bad piggery during the winter: on the high plane there was no ill effect in the same environment. The higher temperature in the bad piggery during summer seemed to be the reason for the better performance of the low plane pigs in it during the summer.

Though not statistically significant, there were indications that from 100 to 200 lb. liveweight growth was better in the high plane pigs in the bad piggery than in the good. Efficiency was better from 45 to 100 lb. liveweight in the good piggery on the low plane ration than on the high in either piggery, but from 100 to 200 lb. liveweight it was not better than in the pigs on high plane nutrition in the bad piggery.—T. D. Bell.

5874

SELF, H. L., GRUMMER, R. H. and CASIDA, L. E. **The effects of various sequences of full and**

limited feeding on the reproductive phenomena in Chester White and Poland China gilts. *J. Animal Sci.*, 1955, **14**, 573-592. [Dept. Animal Husb., Univ. Wisconsin, Madison.]

The effects of different sequences of full and limited feeding upon ovulation rates, embryo survival and other related phenomena were determined for Chester White (CW) and Poland China (PC) gilts. In 2 experiments the pigs were assigned to their treatments at 72 and 70 days of age, respectively. Each experiment was divided into 3 phases: (1) the prepubertal period, (2) the first oestrous cycle, and (3) the first 25 days of gestation after mating at the second heat.

In the first experiment 32 CW and 32 PC gilts were used. All were mated at the second heat and half were slaughtered 24 to 48 hr. later. The remainder were slaughtered on the 25th day after mating. Four lots each containing 4 CW and 4 PC gilts were fed to appetite during phase 1 and 4; similar lots received about two-thirds of the amount eaten by the full-fed pigs. During phases 2 and 3 two of the 4 lots on each treatment in phase 1 were fed to appetite and 2 lots received about two-thirds full feeding. The 4 treatments were termed FFF (full-fed during the 3 phases), FLL (full-fed during phase 1 and limited during phases 2 and 3), LFF (limited in phase 1 and full-fed in phases 2 and 3) and LLL (limited throughout). The diets contained 20 per cent. protein before 125 lb. liveweight and 15 per cent. protein thereafter.

In experiment 2, 37 CW and 37 PC gilts were all slaughtered at 25 days after mating at the second heat. The treatment groups, each containing equal numbers from each breed, were FFF, FFL, LFL and LLL.

The mean age of 225 days at puberty of the CW gilts in experiment 1 was significantly higher than the 206 days of age at puberty of the PC gilts, but this difference may have been affected by scouring in the FFF group of CW gilts. In experiment 2 there was no significant difference in age at puberty between breeds. In both experiments full-fed pigs were significantly older at puberty than limited-fed pigs and there were significant negative correlations between 154-day weights and ages at puberty. In experiment 2 the weights and ranges of weights at puberty of the full-fed pigs were significantly higher than for the limited-fed pigs. There was no significant relation between the day of birth in the farrowing season and age at puberty and there was no difference between breeds in length of first oestrous cycle, although it was more variable in CW gilts than in PC gilts.

Experiment 1 showed that limited feeding during the first oestrous cycle after full-feeding during the prepubertal period did not affect the

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slight expected increase in ovulation rate from first to second heat of the PC gilts, although it caused a marked decrease in ovulation by the CW gilts. Nevertheless over all treatments CW gilts produced more ova at the second heat than PC gilts.

In experiment 1 the FFF and LFF groups both produced more ova at second heat than the FLL or LLL groups. In experiment 2 the FFF, FFL and LFL groups produced more ova than the LLL group. Both experiments thus indicated that full-feeding for about 3 weeks before second heat is sufficient to raise ovulation rate to that of pigs continuously full-fed.

Fertilisation rate was not affected by diet treatment, breed of gilt, breed of boar or individuality of the boar.

In neither experiment did the percentage survival of embryos at 25 days after fertilisation differ between breeds, but in experiment 2 a larger number of CW than of PC embryos survived. This was a reflection of their higher ovulation rate. Data pooled from both experiments showed that despite the lower ovulation rate associated with limited feeding there were larger litters because of a higher survival rate. This effect was seen in experiment 1 even with pigs changed to limited feeding only after puberty. In experiment 2 the largest number of living embryos was found in the LFL group.

Correlations showed that the individual gilts within a treatment group which gained fast immediately before or after breeding maintained a higher embryo survival rate than poorer-doing gilts within the same group. Second heat ovulation rate was negatively associated with survival rate.—I. A. M. Lucas.

5875

KRÜGER, L. Über Versuche mit hohen Gaben von Lebertranemulsion. [*Experiments with large amounts of cod liver oil emulsion.*] *Futter u. Fütterung*, 1955, No. 50, 1-4. [Inst. Tierzucht Milchwirtsch., Univ. Giessen.]

Young pigs in 3 groups of 6 were given a basal ration of, per cent., wheatmeal [Weizenbollmehl] 33, oats 22, barley 42.5 increasing to 64.5, lucerne meal 2 and minerals 0.5, with 2 to 2.5 litres skimmed milk daily. The groups received no supplement or 30 or 60 g. cod liver oil emulsion per head daily mixed with the milk. The higher intake of cod liver oil reduced the time taken to reach 105 kg. from 122 to 105 days and produced no ill effect.

Calves given from 10 increasing to 30 or from 20 to 90 g. cod liver oil emulsion daily up to 13 weeks of age showed no ill effect, and the oil allowed skimmed milk to replace whole milk and thus reduced costs. Steers at 350 kg. liveweight

after high cod liver oil intakes did not differ from those given whole milk.

The ill effects reported from cod liver oil feeding by other workers could not be reproduced.

D. Duncan.

5876

MEHNER, A. and SCHERRBACHER, H. Schweinemastversuche mit Pantomehl. [*Pig fattening experiments with Pantomehl.*] *Züchtungskunde*, 1955, 26, 297-302. [Inst. Tierzucht-lehre, Landwirtsch. Hochsch., Hohenheim.]

Pantomehl is a proprietary feed which contains, per cent., 30 fishmeal and 70 of a mixture of 50 parts concentrated fish press juice, 35 parts wheat bran and 15 parts soya bean meal. It has 33.6 per cent. digestible protein and 54.3 per cent. starch equivalent; cod meal has 54.0 and 59.5. In the first experiment there were 2 groups each of 6 pigs. The experimental rations were of chalk 1, cod meal 12, 6 or 3 and barley to 100, or Pantomehl 20, 10 or 5 and barley to 100. Protein allowance was the same in each interval. Mean daily rates of weight gain from, roughly, 25 to 100 kg. liveweight were 748 and 729 g., but the cod meal group grew much faster to 40 kg. and slightly faster from 40 to 70 kg. There was no difference in feed consumption per kg. weight gain.

In a second experiment there were 2 groups each of 7 pigs, roughly 30 kg. at the beginning. The allowances of cod meal and Pantomehl were reduced, for the first 2 time intervals, to 8 and 4.8, and 13.3 and 8 per cent. Mean daily rates of gain were 685 and 716 g. Again the cod meal group grew faster at first, but in the interval from 70 to 100 kg. the daily rates were cod meal 718 and Pantomehl 939 g. On the average the cod meal group ate 3.72 and the Pantomehl group 3.57 kg. feed per kg. weight gain, the advantage relating only to the last stage.—I. Leitch.

5877

VOSLOO, W. A., VAN DER VYVER, B. J. and STEENKAMP, D. J. Sweet, yellow lupin-seed meal for baconers. *Farming in S. Africa*, 1955, 30, 221-223. [Stellenbosch-Elzenburg Coll. Agric., Stellenbosch.]

For fattening pigs to bacon weight, half the fishmeal in a ration of yellow maize meal, pollards, lucerne meal and fishmeal could be replaced by yellow lupin seed meal during the period from weaning to 100 lb. liveweight. After that weight the whole of the fishmeal could be replaced by lupin seed meal without detrimental effect on growth or carcass measurements.—J. S. Thomson.

5878

LUCIFERO, M. Le barbabietole nell'ingrassamento dei suini. [*Beet in pig fattening.*] *Riv. Zootec.*, 1955, 28, 153-154.

5879

- MEREGALLI, A. Osservazioni sull'impiego del foraggio verde nell'ingrassamento dei suini. [The use of green forage for fattening pigs.] *Riv. Zootec.*, 1955, 28, 109-110.

5880

- MEREGALLI, A. L'influenza del grado di macinazione dell'orzo sulla sua digeribilità nei suini. [Influence of degree of milling of barley on its digestibility for pigs.] *Riv. Zootec.*, 1955, 28, 122.

5881

- CLAUSEN, H. and THOMSEN, R. N. 43. Beretning om sammenlignende forsøg med svin fra statsanerkendte avlscentre 1953-54. [43rd Report on comparative experiments with pigs at state-recognised breeding centres, 1953-54.] *Forsøgslab. København Beretn.*, 1955, No. 277, pp. 139. English and German summaries.

5882

- HARRINGTON, G. and POMEROY, R. W. An analysis of carcass measurements of post-war British bacon pigs. *J. Agric. Sci.*, 1955, 45, 431-451. [Agric. Res. Council. Unit Animal Reproduction, Sch. Agric., Univ. Cambridge.]

Certain carcass quality measurements were taken on sides of bacon from carcass competitions of the National Pig Breeder's Association (NPBA) held between 1947 and 1953, on Danish No. 1 sides, and on a number of commercial sides from Britain, Denmark, Poland and Holland. Comparisons were made with carcass measurements from NPBA competitions held between 1932 and 1937.

Data from Large White carcasses in post-war NPBA competitions showed that sides from gilts were longer, had thicker bellies and larger "eye" muscles, and had smaller fat measurements than those from hogs. The size of the "eye" muscles gradually decreased between 1948 and 1952.

When compared with the pre-war measurements the carcasses at post-war NPBA shows were longer, had thicker bellies and smaller fat measurements, and were not as deep in the chest, but there was no change in size or shape of the "eye" muscle.

When compared with Danish No. 1 sides the British post-war show carcasses did not differ significantly in fat measurement over the shoulder, but they had 2.0 mm. more fat over the middle of the back. The British sides had thinner bellies, were deeper, had heavier fore ends and were shorter than the Danish.

When commercial sides were compared the Danish had lighter fore ends and heavier middles than the British. The Dutch were longer and

had lighter fore ends and heavier gammons than the British. The Polish sides were the shortest and had the lightest gammons.

Correlation coefficients were calculated to show the relation between different carcass measurements, and regression equations show the magnitude of the changes in carcass measurements with increases in carcass weight and carcass length.

I. A. M. Lucas.

5883

- BROUGH, O. L. and SHEPHERD, G. Objective grade specifications for slaughter barrow and gilt carcasses. *Iowa Agric. Exp. Stat. Res. Bull.* No. 421, January 1955, pp. 228-244.

It was considered that a system of grading fat pigs by carcass evaluation would reflect their value on the market better than grading by liveweight and visual appraisal. A system is suggested based on a study of 600 carcasses of castrated males and gilts ranging in liveweight from 165 to 315 lb., or in carcass weights from 105 to 224 lb. The index of lean, i.e., the percentage of carcass weight represented by the weight of the high-value lean cuts, gives an accurate assessment of the value of the carcass. Back fat thickness and carcass length were the two objective measurements which had the highest correlations with the index of lean. When carcasses were graded on this system accuracy in foretelling the market value was good.

T. D. Bell.

5884

- ZOBIRSKY, S. E., LASLEY, J. F., BRADY, D. E. and WEAVER, L. A. Pork carcass evaluation. *Missouri Agric. Exp. Stat. Res. Bull.* No. 554, July 1954, pp. 60.

The relation between weight and measurements of different parts of the carcasses of 207 pigs slaughtered at about 200 lb. liveweight were studied. A close negative correlation existed between thickness of backfat, which could be measured either on the live pig by probe or on the carcass, and the proportion of highly priced cuts in the carcass. Dressing percentage could be estimated from measurements of body depth and width.

T. D. Bell.

5885

- BARBER, R. S., BRAUDE, R. and MITCHELL, K. G. The value of electrically warmed floors for fattening pigs. *J. Agric. Sci.*, 1955, 46, 31-36. [Nat. Inst. Res. Dairying, Univ. Reading.]

In 2 experiments there were 4, and in one experiment 3, groups of pigs. Average initial weights were 35, 63 and 42 lb., in the 3 experiments, which lasted 12, 15 and 8 weeks. In each experiment 2 groups were in pens with electrically heated floors, 2 in pens with unheated floors. Details of the construction of the heated floors, of the tempera-

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tures at different points within the heated and control pens under different conditions, of atmospheric temperatures inside and outside the pens and of electricity consumption are presented.

Liveweight gains and feed consumption were recorded. The results showed no advantage from heating the floors.—T. D. Bell.

See also Absts. 4761, 4983, 5421, 5459.

GOATS, RABBITS AND OTHER MAMMALS

5886

MORRIS, M. L. Nutritive requirements of the cat. 2. The feeding of cats exclusively on canned, sterilized foods. *North Amer. Vet.*, 1955, 36, 468-471. [Topeka, Kans.]

For part 1 see Abst. 3955, Vol. 24.

A group of 13 castrated male cats was fed on an adequate fresh meat diet with lard, yeast, calcium carbonate and skimmed milk, followed by the same diet in canned form. They were then divided into 4 groups, one continuing on the same diet while the others were fed on 3 representative commercial cat foods based on whole fish or fish by-products. Those on the control diet remained normal, but some of those on one of the fish diets showed emaciation, skin lesions and neurological signs. Injection of vitamin B₁ into one of the latter produced a gradual improvement, but the neurological signs remained even when the animal was given the control diet. It is concluded that a canned ration properly compounded can contain all the essentials for maintenance.—J. S. Thomson.

5887

JONES, T. J. Canine nutrition. *J. Amer. Vet. Med. Assoc.*, 1955, 126, 315-318. [Sch. Vet. Med., Univ. Georgia, Athens.]

5888

PEREL'DIK, N. SH. and TITOVA, M. I. Peredovoi opyt kormleniya vzroslykh norok. [Experiments in feeding adult mink.] *Karakul. Zverovodstvo*, 1954, 7, No. 2, 27-33. [All-Union Sci. Res. Lab. Fur Animals.]

A survey is made of methods of feeding practised by foremost sovkhoses, which enable mink to carry and rear their young without loss of weight. This loss is considerable on less efficient sovkhoses, and is evident in July after the pups have been weaned. One of the chief differences in the methods of feeding is the large amount of animal protein given to the animals throughout the year on the more advanced sovkhoses, the daily ration for adult mink being 25 to 30 g., corresponding to 125 to 150 g. raw meat.

Optimum daily standards and rations for adult mink at different seasons from which good results have been obtained are given as follows: July to August: 210 to 260 Cal., including 20 to 25 g. animal protein; September to December: 250

to 300 Cal., 23 to 28 g. animal protein; January to March: 250 to 290 Cal., 25 to 28 g. animal protein; April: 280 to 300 Cal., 27 to 32 g. animal protein. For the above periods the percentage of total energy derived from meat and fish is from 45 to 55, 45 to 65, 52 to 65 and 52 to 65; from milk 7, 5, 7 to 10, 10 to 12; from grain 32 to 42, 24 to 44, 21 to 28, 22 to 44; from vegetable 3, 3, 1 to 2, 1 to 2; and from cod liver oil and yeast 3, 3, 3 to 10, 3 to 10.

During the summer animals may die of enlarged liver, but milk or cereals up to 15 per cent. of the energy value of the diet appears to prevent this.

During lactation the standard ration of the dam should supply 200 Cal., to which is added a supplement, per pup, of 10 Cal. at the beginning of lactation, rising to 170 Cal. towards the end.

H. Scherbatoff.

5889

ZHARKOV, I. V. Osobennost' letnego kormovogo rezhima losya v Zhigulyakh. [The peculiarities of the summer feeding habits of the elk in Zhiguli.] *Byull. Mosk. Obsch. Ispytatel' Prirod., Otdel Biol.*, 1954, 59, No. 5, 3-8.

The main feed of the elk from May to August consists of herbaceous plants. During May and June only the vegetative parts are eaten. In August only the generative organs of plants, such as flowers and the ears of cereals, are eaten. In the summer herbaceous plants form 80 per cent. of the total eaten, only 20 per cent. of the total consisting of the shoots and young green leaves of trees such as the sycamore. In August the percentage of woody plants goes up to 40 and that of herbaceous plants falls to 60 of the total. Water plants which usually form part of the elk's feed in other parts of the U.S.S.R. are completely absent in this district, where the elk is at the southernmost limit of its distribution, on the borders of the forest steppe and the steppe zones. The principal difference in the winter feeding habits of the elk and the spotted deer is that when the ground is covered with snow the elk feeds entirely on the twigs and bark of trees; the spotted deer feeds on the grass which it digs for under the snow.

H. Scherbatoff.

5890

BELOUS, I. S. Peredovoi olenovodcheskii sovkhos "Maikhe". [The first-class deer sovkhos

"Maikhe".] *Karakul. Zverovodstvo*, 1954, 7, No. 5, 54-55.

The Maritime Province, which is the East part of the U.S.S.R. in Asia, is the native habitat of the spotted deer, 80 per cent. of all those in the U.S.S.R. being found there.

This particular sovkhos, notwithstanding its being one of the worst situated for obtaining fodder, of those in the Far East Animal Trust, was able in the first 3 years of the 5-year-plan to increase the herd of deer by 25 per cent., by giving the deer 1½ times more coarse fodder and 2½ times more succulent fodder than in the rest of the Trust. The fodder was also carefully prepared, the coarse fodder being cut up and steamed with a mixture of concentrates; bones were given, and a mineral supplement and salt bricks were always available.

During the winter the deer were kept at pasture divided into paddocks which were grazed in rotation. Oats, soya bean and Japanese millets were sown for feed. The young deer gradually became domesticated, 900 being pastured on free range in charge of herdsmen, thus gradually relieving the farm of the necessity of building fences. The management of the herd was exactly like that of a flock of sheep.—H. Scherbatoff.

5891

RYASHCHENKO, L. P. Iz opyta past'by pyatnistykh olenei pastukhami v sovkhozakh Dal'zverostresta. [The experience of pasturing spotted deer on the state farms of the "Dal" Fur Bearers Trust.] *Karakul. Zverovodstvo*, 1954, 7, No. 6, 39-42. [Supporting Point All-Union Sci. Res. Lab. Fur Animals and Pantiferous Deer Management.]

This is a discussion and criticism of the methods employed on different sovkhoses for training spotted deer for pasturing on free range by herdsmen.

The domestication of spotted deer is a matter not only of a preliminary training in fenced yards and enclosures with moveable fencing and sheds for shelter but of the personality of the herdsmen. Regular feeding has not been properly organised in most sovkhoses and young deer are often left without feed at night, when green fodder should be supplied. Regular rotation of pastures is also essential.—H. Scherbatoff.

5892

TAYLOR, J. I. The rearing of an African elephant in captivity. *Vet. Rec.*, 1955, 67, 301-302. [Animal Health Res. Centre, Entebbe, Uganda.]

A 2-week-old orphan elephant was successfully reared for a week on 20 pints daily of cow's milk, supplying 13.2 oz. protein, 19.6 oz. lactose and 14.4 oz. fat, fortified with 1.8 oz. protein as calcium caseinate, 12 oz. lactose and 5 oz. cream. This

mixture was thought to resemble the composition of elephant milk, although wide variations in composition were noted in the literature. Two tablespoonfuls of blackcurrant juice, 2 yeast tablets and 1 oz. cod liver oil were also given daily. The animal gained 25 lb. by the end of the week and scouring had ceased. Owing to expense of upkeep the animal had to be transferred to a Zoological Society collector in Nairobi, and it died shortly afterwards of gastro-enteritis.—J. S. Thomson.

5893

NATIONAL RESEARCH COUNCIL, U.S.A. Nutrient requirements for domestic animals. 9. Nutrient requirements for rabbits. *Publ. No. 331*, 1954, pp. 12.

The nutrient requirements of the rabbit have not been investigated as fully as those of other domestic animals. From the available information the suggested requirements of total feed, total digestible nutrients (TDN) and digestible protein for maintenance, normal growth, fattening, gestation and nursing, including a litter of 7, are tabulated for rabbits weighing from 4 to 15 lb. These requirements are also presented as total feed as a percentage of bodyweight and TDN and digestible protein as percentages of total feed. The requirements for minerals and vitamins are not precisely known. Qualitatively, mineral requirements are probably the same as those of other animals, but quantitatively only Mn and Mg have been estimated. Of the vitamins, nicotinic acid and vitamin E have been estimated. The synthesis of other B vitamins in the caecum and the habit of coprophagy indicate that dietary supplements of these vitamins are not necessary, and from the available evidence it would appear that vitamin C is also not required in the diet.

In rabbits deficiencies of energy, protein, minerals or vitamins are usually small, and clearly defined indications are rarely seen. Salt is often lacking in normal feeds, and it is advisable to include some in the ration. Signs of deficiency of vitamins A and E are the same as in other animals, and rickets, presumably similar to that encountered in other animals, results from deficiency of vitamin D and faulty Ca:P ratio, though a dietary supplement of the vitamins is not usually necessary. Nicotinic acid is essential in the diet, and "egg white disease", thought to be a sign of biotin deficiency, has been encountered.

Suitable concentrates and roughages are enumerated. These include the grains, oilseed meals, grass and legume hays, fresh grass and roots. Cottonseed meal should not be given to the young. Unextracted oilseeds and animal protein supplements are unpalatable. Full feeding should be allowed only to pregnant and nursing does and animals being fattened for meat. Pelleted and

purified rations are discussed and there is a table giving the digestible crude protein and TDN of the most common feeds used in rearing rabbits.

T. D. Bell.

5894

ELENEK, YA. Vliyanie kormleniya kukolkoi tutovogo shelkopryada na plodovitost' samok, rost i razvitiye molodnyka krolikov. [The effect of feeding silkworm chrysalides to rabbits on fertility and the growth and development of the young.] *Karakul. Zverovodstvo*, 1954, 7, No. 6, 48-50. [V.I. Ulyanov-Lenin Univ., Kazan.]

Giving silkworm chrysalides to rabbits in summer and winter helped to increase the number of rabbits in a litter, the number of survivals and also the growth and development of the young. Rabbits of 1 to 2 months should be given 6 g. daily and of 3 to 4 months 8 to 12 g. During the winter does were given 15 g. per head daily in addition to their winter ration of oats, bran, potatoes and

clover hay. The milk yield of the does also was increased.—H. Scherbatoff.

5895

LEONTYUK, S. V. Protivokoksidioznye ratsiony dlya molodnyaka krolikov. [Anti-coccidiosis rations for young rabbits.] *Karakul. Zverovodstvo*, 1954, 7, No. 5, 56-59. [Sci. Res. Inst. Rabbit and Animal Management.]

The best anti-coccidiosis ration for young rabbits was a ration rich in green food (70 per cent. of the nutrient value of the total ration), containing not more than 30 per cent. concentrates (oats and oilcake) and not more than 10 per cent. digestible protein of the total number of feed units. A small amount of "acidophilin", 50 g., may be added. This ration should be used from the moment rabbits leave the nest up to 3 to 4 months.

"Acidophilin" is effective in rabbit coccidiosis.

H. Scherbatoff.

See also Absts. 4777, 5447.

POULTRY

GROWTH AND FATTENING

5896

AXELSSON, J. Influence of some factors on hatchability of chicken eggs and on growth rates of embryos and chicks. *Kgl. Lantbrukshögsk. Ann.*, 1954, 21, 81-103. [Inst. Animal Nutrit.]

The loss in weight of eggs during the 24 hr. after laying when held at 20° C. (68° F.) was a good indication of their hatchability, the highest percentage hatched being from eggs losing 100 to 160 mg. The size of the egg also influenced hatchability. The optimum weight was about 56.4 g., and hatchability was less in larger or smaller eggs, with great variation between individuals.

There was a direct relation between the size of the egg and the weight of the newly hatched chicken, 10 g. increase in egg weight giving 6.3 g. increase in the weight of the chicken. The weight of the chicken was about 66.7 per cent. of that of the egg. An increase of 10 g. in egg weight caused an increase of 17.3 g. in the weight of the chicken at 6 weeks of age. The hatching weight and the weight at 6 weeks were related so that an increase of 10 g. in the former gave an increase of 29.9 g. in the latter.

Three feed mixtures were used to rear the chickens. They contained 5.4, 7.0 and 8.6 per cent. crude fibre, with 2801, 2670 and 2539 Cal. metabolisable energy per kg., but were otherwise equal. The proportion of fibre in the ration did not affect mortality. Digestibility of all constituents decreased as fibre increased. Weight increases to 6 weeks old were lowest with the high-

fibre ration, and it was calculated that the optimum level of crude fibre would be 5.75 per cent. The chickens were most efficient in feed conversion at the lowest level of fibre. When carcasses were analysed at hatching all chickens had about 59 Cal. energy in the body tissues. At 6 weeks of age the greatest energy content was in the group getting 7.0 per cent. crude fibre. The low, medium and high groups retained 17.0, 18.5 and 17.9 per cent. of the metabolisable energy of the feed, respectively, and it was calculated that the best retention of energy would be at a crude fibre level of 7.26 per cent.—T. D. Bell.

5897

GODFREY, G. F. and WILLIAMS, C. Unsuitability of the chick weight: egg weight ratio as an indicator of post-natal growth. *Poultry Sci.*, 1955, 34, 164-166. [Oklahoma Agric. Exp. Stat., Stillwater.]

5898

FRANSEN, J. M., ANDREWS, F. N. and CARRICK, C. W. The effect of plane of nutrition on growth and sexual development of Barred Plymouth Rock cockerels. *Poultry Sci.*, 1955, 34, 205-209. [Purdue Univ., Agric. Exp. Stat., Lafayette, Ind.]

A strain of Barred Plymouth Rock cockerels that had been selected for their rapid growth and early maturity was reared from hatching to 10 weeks of age on ration 1, meat-and-bone scraps 12, dried buttermilk 4, lucerne meal 3, wheat bran 15,

wheat middlings 15, a vitamin D concentrate and yellow maize meal to 100; or ration 2, condensed fish solubles 3, soya bean oilmeal 36, maize gluten meal 6, dried whey 3, minerals 3.5, choline, nicotinic acid, riboflavin, calcium pantothenate, vitamin B₁₂, a vitamin A and D concentrate, aureomycin and yellow maize meal to 100.

On ration 1 the birds finished with a mean weight of 918 g.; on ration 2 they reached this weight in their eighth week and finished with a weight of 1318 g. The mean weights of testes on the 2 rations at 10 weeks of age were 1.40 and 1.68 g., respectively, a non-significant difference. Expressed as a percentage of bodyweight, the testes of the birds receiving ration 1 were heavier than those of the faster-growing birds on ration 2. Histological examination of the testes showed that about 60 per cent. of the cockerels in each group had spermatids, sperm heads or spermatozoa.

There is no evidence, therefore, that the ration which gave a faster rate of growth in the first 10 weeks of life had any corresponding effect on sexual development.—K. J. Carpenter.

5899

PATRICK, H. Influence of protein source on consumption and excretion of water and excreta voided by broiler chicks. *Poultry Sci.*, 1955, 34, 155-157. [Poultry Dept., Univ. Tennessee, Knoxville.]

Meat-type chicks were fed in their sixth week on a commercial mash containing 21 per cent. crude protein. They were reared in wire-floored cages in a room kept at 70° F. and drank 1.9 lb. water per lb. of feed consumed. Other birds were fed on the same rations supplemented with either meat scraps, fishmeal, soya bean oilmeal, groundnut meal, cottonseed meal, casein or milk albumin at the expense of yellow maize meal so as to raise the crude protein content to 28 per cent. On these rations the consumption of water ranged from 1.6 to 2.1 lb. per lb. of feed consumed.

From this and a further experiment it is concluded that protein concentrates do not always increase the water requirement of broilers.

K. J. Carpenter.

5900

MAHADEVAN, V. Protein requirements of poultry. *Indian Vet. J.*, 1954, 31, 77-82. [Dept. Animal Nutrit., Madras Vet. Coll.]

5901

SUNDE, M. L. Relationship between protein level and energy level in chicks. *Federation Proc.*, 1955, 14, 451-452. *Proc.* [Dept. Poultry Husb., Univ. Wisconsin, Madison.]

5902

FINDRIK, M. and SREMAC, Z. Djelovanje animalnih proteinskih koncentrata, sojine ekstrakcije prekrupе i metilthiouracila na porast tjelesne težine i iskorišćivanje hrane kod tova pilića. [The effect of animal protein concentrates, soya bean oilmeal and methylthiouracil on the increase of bodyweight and utilisation of feed in fattening chickens.] *Vet. Arhiv*, 1955, 25, 161-166. English and German summaries.

Six groups of cockerels, aged 10 weeks, were fattened on a basal ration of ground maize 100, ground barley 100 and ground oats 50, with additions of 50 parts each of fishmeal, meat-and-bone meal, powdered whole milk, bloodmeal, and soya bean meal alone or with 0.05 per cent. methylthiouracil.

The highest rate of gain was obtained with fishmeal, followed by dried milk and meat-and-bone meal; that obtained with bloodmeal was significantly less. The poorest results were with soya bean meal, and the addition to it of methylthiouracil had no significant effect. (From summary).

J. S. Thomson.

5903

FOX, M. R. S., ORTIZ, L. O. and BRIGGS, G. M. Toxicity of ethionine in the young chick. *J. Agric. Food Chem.*, 1955, 3, 436-438. [Lab. Biochem., Nat. Inst. Arthritis and Metabol. Dis., Pub. Health Serv., Bethesda, Md.]

Two synthetic diets were used in trials with chickens from hatching to 4 weeks of age. One contained 0.4 per cent. methionine and one had none. The addition of 0.2 per cent. ethionine to the first of these diets depressed growth and efficiency. Cystine, 0.3 per cent., further depressed growth and 1.0 per cent. choline lessened the depression due to ethionine. A higher level of choline, 1.5 per cent., was not quite as effective as 1.0 per cent. In combination, 0.3 per cent. cystine and 1.0 per cent. choline counteracted one another.

On the diet without methionine, the addition of 0.4 per cent. of that amino-acid improved growth and efficiency, which were then depressed by 0.1 per cent. ethionine. With cystine and choline the effects were the same as with the other diet. Elemental sulphur also increased the depression due to ethionine, and 0.18 mg. vitamin B₁₂ per kg. diet did not prevent it.

When 0.2, 0.3 or 0.4 per cent. methionine was added to the diet already containing 0.4 per cent., growth was progressively depressed. Again it was found that ethionine depressed growth on the ration with 0.4 per cent. methionine, but it did not prevent the depression caused by excess methionine. In this trial male and female were compared: there was no difference between the responses.

These trials refer only to young chicks; the findings may not be applicable to adult birds.

T. D. Bell.

5904

DONOVAN, G. A., JOHNSON, E. L., BALLOUN, S. L. and PHILLIPS, R. E. The long range effect of low level methionine supplementation in growing turkey rations. *Poultry Sci.*, 1955, 34, 251-256. [Dept. Poultry Husb., Iowa State Coll., Ames.]

Broad Breasted Bronze turkeys were reared from hatching to 24 weeks of age in indoor pens on an all-mash system. Mash 1, to 8 weeks of age, was of fishmeal 2.5, meat-and-bone scrap 2.5, soya bean oilmeal 48, lucerne meal 4, minerals 5.5, a vitamin supplement (including choline 0.1) and yellow maize meal to 100. Mash 2 and 3, to 16 and 24 weeks of age, were of similar constituents with less of the protein concentrates. The calculated crude protein contents of the mashes were 28.6, 22.0 and 17.0 per cent., and their methionine contents, estimated microbiologically, were 0.41, 0.34 and 0.28 per cent.

The male birds receiving these diets finished with a mean liveweight of 20.9 lb.; others that received the same rations each supplemented with 0.025 or 0.05 per cent. DL-methionine weighed 21.2 and 21.9 lb. The weights for a parallel series of females were 13.9, 13.8 and 14.5 lb. The feed conversion ratios for the groups, males plus females, were 4.58, 4.40 and 4.23.

In a parallel trial with Beltsville Small White turkeys the addition of 0.05 per cent. DL-methionine again gave faster growth to market weight and an improvement in the efficiency of feed conversion. Results with the smaller supplement were inconclusive.

In each trial additional treatments were tested in which, from 8 weeks onwards, birds had free choice of a grain mixture, calculated to contain 9.9 per cent. crude protein and 0.22 per cent. methionine, and a balancer mash, containing 29.6 per cent. crude protein and 0.42 per cent. methionine, or the same mash supplemented with methionine as before. Under these conditions the supplements were without any consistent effect; this would be explained if the birds ate a high proportion of mash to grain so that their intake of methionine, without the supplement, was equal to that of the birds that received the all-mash rations plus methionine.

It is concluded that the value of methionine supplements in turkey feeding results from the correction of a dietary deficiency and that there is no need to assume a special property of free as opposed to bound methionine.—K. J. Carpenter.

5905

MONSON, W. J., HARPER, A. E., BENTON, D. A., WINJE, M. and ELVEHJEM, C. A. Effect of

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arginine and glycine on the growth of chicks receiving complete, purified diets. *Poultry Sci.*, 1955, 34, 186-190. [Dept. Biochem., Coll. Agric., Univ. Wisconsin, Madison.]

Groups of 15 chicks were housed in wire-floored cages and fed from hatching to 4 weeks of age on a control ration made up of casein (alcohol-extracted) 18, gelatine 10, minerals 6, soya bean oil 0.5, L-cystine 0.5, vitamin B₁, riboflavin, nicotinic acid, vitamin B₆, calcium pantothenate, choline chloride, biotin, inositol, folic acid, vitamin B₁₂, p-aminobenzoic acid, 2-methyl-1:4-naphthoquinone, α -tocopherol acetate and sucrose to 100; they also received a fish oil, rich in vitamins A and D, by dropper. In 4 trials these groups weighed 273, 300, 315 and 262 g.

Parallel groups that received a similar ration in which the gelatine was omitted and 1 per cent. of L-arginine hydrochloride and 1.5 per cent. of glycine were included showed similar rates of growth. Where dextrin was used to replace sucrose, or when the rations were supplemented with an antibiotic mixture of bacitracin and procaine penicillin, growth was from 2 to 8 per cent. faster with gelatine than with the mixture of arginine and glycine.—K. J. Carpenter.

5906

ROSENBERG, H. R., WADDELL, J. and BALDINI, J. T. The effect of added methionine in broiler diets containing high levels of fish meal. *Poultry Sci.*, 1955, 34, 114-117. [Stine Lab., E.I. du Pont de Nemours and Co., Inc., Newark, Del.]

Duplicate groups of New Hampshire chickens were fed to 8 weeks of age on each of 3 experimental rations containing 21.5 per cent. crude protein. Ration A was of soya bean oilmeal 35, maize oil 3, minerals 3.5, a complex vitamin supplement, procaine penicillin and yellow maize meal to 100. Rations B and C were similar but included 5 and 15 per cent., respectively, of fishmeal added at the expense of soya bean oilmeal, and with adjustments in the levels of minerals and maize meal. The finishing weights on these rations were 1317, 1298 and 1318 g. The same rations were also given with a supplement of 0.05 per cent. DL-methionine, and the final weights were 1, 4 and 2 per cent. heavier than with the rations unsupplemented.

Both by calculation, and by actual estimation, ration A had the lowest content of cystine plus methionine, so that the failure to obtain a greater response by adding methionine to this ration than by adding it to those of higher sulphur amino-acid content suggests that the mechanism by which free methionine stimulates growth is not the correction of a simple dietary deficiency.

K. J. Carpenter.

5907

FISHER, H., SCOTT, H. M. and JOHNSON, B. C.
The role of glycine in chick nutrition. *J. Nutrition*, 1955, 55, 415-430. [Div. Animal Nutr., Dept. Animal Sci., Univ. Illinois, Urbana.]

Chicks were housed in wire-floored cages and fed from 3 to 25 days of age on a control ration of casein 18, maize oil 3, cellulose 3, L-arginine hydrochloride 1, glycine 1, DL-methionine 0.3, choline chloride 0.2, minerals 5.3 and glucose to 100, with supplements of the known vitamins with the exception of nicotinic acid and vitamin B₁₂. They finished with a mean weight of 269 g. Parallel groups of birds that received the same ration supplemented with either 4 per cent. of glycine, 40 µg. vitamin B₁₂ per kg. or 200 mg. nicotinic acid per kg., singly, 2 supplements at a time or all 3 supplements together, finished with weights ranging from 285 to 315 g. Of the 3 supplements, glycine appeared to have the greatest effect. The glycine supplement also had a striking effect in raising the efficiency of feed conversion to 0.66 g. per g. feed as compared with 0.46 for the chicks receiving the control ration.

Since it had been expected that the addition of glycine to the control ration would depress growth, instead of stimulating it, the same supplement was added to a second control ration made up of Drackett (soya bean) protein 30, maize oil 3, cellulose 3, L-cystine 0.25, choline chloride 0.2, minerals 5.3, glucose to 100 and the same vitamin supplement with the addition of nicotinic acid and vitamin B₁₂. Birds receiving this ration weighed 365 g. at 26 days of age, and others receiving the same ration supplemented with glycine weighed 369 g. The addition of 4 per cent. DL-methionine had a slight growth-depressing effect in each case.

Although the addition of glycine did not affect the rate of growth in the second experiment it did improve both the efficiency of feed conversion and the rate of feathering; the glycine content of the feathers was unchanged.—K. J. Carpenter.

5908

NABER, E. C., CRAVENS, W. W., BAUMANN, C. A. and BIRD, H. R. Glycine toxicity in chick. *Federation Proc.*, 1955, 14, 446. *Proc. [Dept. Biochem., Univ. Wisconsin, Madison.]*

5909

DYMSZA, H., BOUCHER, R. V. and MCCARTNEY, M. G. The influence of fiber content and physical form of the diet on the energy requirements of turkeys. 1. Studies with turkey poults. *Poultry Sci.*, 1955, 34, 435-439. [Dept. Agric., Pennsylvania State Univ., University Park.]

Groups of 20 male turkey poults were reared on 3 experimental rations containing 5, 10 and 15 per cent. of crude fibre, each being given both in the form of mash and of "crumbles", i.e., granulated feed with the fine particles sifted out. Each ration contained 28 per cent. of crude protein and incorporated fishmeal, yeast and whey with a supplement of procaine penicillin. The 3 rations contained 3.6, 21 and 38 per cent. of oat hulls, and soya bean oilmeal and yellow maize meal formed the other variables.

The birds receiving the 3 mash rations finished with mean weights of 2025, 1761 and 1066 g.; the corresponding figures with "crumbles" were 2236, 1929 and 1681 g. The average feed consumptions per head of the mashers were 5.66, 5.54 and 4.54 kg., and of the crumbles 5.77, 5.68 and 6.13 kg. These figures indicate that the depression of appetite with increased fibre that was clearly shown in the mash series did not occur with the "crumbles". The increased consumption of the high-fibre crumbles did not, however, compensate for their lower productive energy value (as calculated from the tables of Fraps).

Variability in weight gain between individuals within a group was considerably greater among those receiving the high-fibre mash than in the others. Replication of the trial with females showed the same trend of results with slower absolute growth throughout.—K. J. Carpenter.

5910

RUNNELS, T. D. Animal fat in combination with various other ingredients in broiler rations. *Poultry Sci.*, 1955, 34, 140-144. [Dept. Animal and Poultry Indust., Univ. Delaware, Newark.]

The use of detergents instead of soap has now resulted in a surplus of animal fats. To utilise this surplus it is suggested that animal fats might be incorporated in poultry rations.

Experiments were made with young cockerels on a control ration of yellow maize meal and soya bean oilmeal to which additions were made of 3 per cent. animal fat, 1.5 per cent. dried sardine fish solubles, 6 per cent. condensed whey and 2.5 per cent. dehydrated alfalfa meal, individually and in all possible combinations.

Paired data for growth to 10 weeks showed non-significant increases in growth rate for all the supplemented groups as compared with controls. For the group receiving animal fat there was a saving of about 11 per cent. in feed efficiency.

J. S. Thomson.

5911

SIEDLER, A. J., SCHEID, H. E. and SCHWEIGERT, B. S. Effects of different grades of animal fats on the performance of chicks. *Poultry Sci.*, 1955, 34, 411-414. [Div. Biochem., Amer. Meat Inst. Found., Chicago, Ill.]

N.A. and R., October 1955

In each of 2 experiments a group of 25 cockerels was fed to 10 weeks of age on a mash made up of soya bean grits (solvent-extracted) 16, meat scrap 8, menhaden fishmeal 3, bloodmeal 2, maize gluten meal 2, lucerne meal 2, butyl fermentation solubles 1, iodised salt 0.5, fish oil 0.3, manganese chloride, nicotinic acid and yellow maize meal to 100. The 2 groups finished with mean weights of 1280 and 1300 g., and feed conversion efficiencies of 0.40 and 0.42 g. gain per g. feed.

Parallel groups received the same rations supplemented with either 3 or 6 per cent. of white, yellow or brown grease or prime or No. 2 tallow. All these fats had been selected on the basis of free fatty acid content and stabilised with an antioxidant mixture containing butylated hydroxyanisole. The free fatty acid content of the 5 samples was 3, 59, 17, 3 and 31 per cent., respectively, and none contained more than 1.7 per cent. of unsaponifiable material. Finishing weights ranged from 1220 to 1410 g. in the first trial, and from 1240 to 1370 g. in the second. These weights did not differ significantly from those of the control groups, nor was there any effect on feed conversion efficiency. A final treatment with a 3 per cent. supplement of stabilised free fatty acids (from hydrolysis of white grease) was also without effect.

The eating quality of the birds was excellent from every treatment; some judges considered that the use of fats in the diet had increased the juiciness of the birds. From analysis of excreta it was concluded that all the fats used were highly digestible.—K. J. Carpenter.

5912

SCHWEIGERT, B. S. and SIEDLER, A. J. **Use of fats in animal feeds. Use of animal fats in poultry and dog rations.** *J. Amer. Oil Chem. Soc.*, 1954, **31**, 52-53. [Div. Biochem., Amer. Meat Inst. Found., Univ. Chicago, Ill.]

5913

SUNDE, M. L. **Use of fats in animal feeds. The use of animal fats in poultry feeds.** *J. Amer. Oil Chem. Soc.*, 1954, **31**, 49-52. [Poultry Dept., Univ. Wisconsin, Madison.]

5914

DARROW, M. I. and ESSARY, E. O. **Influence of fats in rations on storage quality of poultry.** *Poultry Sci.*, 1955, **34**, 427-431. [Res. Labs., Swift and Co., Chicago, Ill.]

In the first trial a normal broiler ration given to New Hampshires from day-old to 10 weeks of age was compared with the same ration plus 5 per cent. tallow or 5 or 10 per cent. hydrolysed soya bean oil, and in the second trial the additions were 5 or 10 per cent. hydrolysed cottonseed oil or 10 per cent. hydrolysed soya bean oil. The birds

were all killed at 10 weeks of age, dressed and stored in a refrigerator for 6 or 9 months, when organoleptic and chemical tests were made. The experimental diets did not have any detrimental effect on taste or acceptability after either 6 or 9 months' storage, and peroxide values did not indicate any rancidity in skin or visceral fats of the carcasses.—T. D. Bell.

5915

O'ROURKE, W. F., PHILLIPS, P. H. and CRAVENS, W. W. **The phosphorus requirements of growing chickens and laying pullets fed practical rations.** *Poultry Sci.*, 1955, **34**, 47-54. [Wisconsin Agric. Exp. Stat., Madison.]

The results of 3 experiments showed that from hatching to 3 weeks of age chickens receiving a practical basal ration supplemented with bonemeal as the source of inorganic P required at least 0.73 per cent. P for optimum growth. From 4 to 10 weeks 0.60 and from 10 weeks to sexual maturity 0.42 per cent. was adequate.

In a further experiment cockerels required 0.75 per cent. P in the ration from 0 to 8 weeks old, but for pullets 0.60 per cent. was sufficient when growth was the criterion. Date of first egg was not retarded when only the basal ration containing 0.32 per cent. P, nearly all from plant sources, was given, and although the birds did not grow as well in the early stages as those getting a higher percentage of P, at 42 weeks old they had reached normal weight for this age. Egg production was maintained on a basal ration containing 0.43 per cent. P. No account was taken in these experiments of the Ca:P ratio; in some of them Ca was given to appetite.—T. D. Bell.

5916

FANGAUF, R., KLEIN, F. W. and BARLÖWEN, G. v. **Futtermischungen mit verschieden hohen Fettgehalten als Bestandteil des Kükenfutters. [Bonemeal with different fat contents as a component of chick rations.]** *Arch. Geflügelk.*, 1955, **19**, 186-190. [Lehr- und Versuchsanst. Kleintierzucht, Kiel, Steenbek.] English summary.

Five groups of 30 chickens received from hatching to 8 weeks of age a basal diet with a mineral mixture or with 3 per cent. bonemeal. The first 3 bonemeal samples contained 7, 4 or 1 per cent. fat and the fourth was a decalcified and defatted feeding bonemeal.

There was no ill effect from the high-fat bonemeal.—D. Duncan.

5917

KRATZER, F. H., DAVIS, P. N. and MARSHALL, B. J. **Cottonseed meal in rations for starting poults, growing turkeys and turkey breeder hens.**

Poultry Sci., 1955, **34**, 462-468. [Dept. Poultry Husb., Univ. California, Davis.]

Turkey poults were reared intensively from 2 to 29 days of age on a ration of cottonseed meal 45, dried whey 2, lucerne meal 5, minerals, vitamins, antibiotics and mixed cereals to 100; their daily gain was 4.59 per cent. This ration had a calculated lysine content of 1.0 per cent.; birds that received the same ration supplemented with 0.5 per cent. DL-lysine hydrochloride and 0.1 per cent. DL-methionine had a mean daily gain of 5.52 per cent. A further group that received the control ration with half of the cottonseed meal, which was a commercial sample prepared by screw pressing, replaced by soya bean oilmeal had a mean daily gain of 5.89 per cent.; with a supplement of 0.1 per cent. DL-methionine the gain was 5.69 per cent.

In a second trial of the same type, in which one-quarter, one-third, one-half, two-thirds and three-quarters of the cottonseed meal was replaced by soya bean meal in the control ration, mean daily gains were 5.61, 5.69, 5.80, 5.83 and 5.93 per cent., respectively.

Turkeys were also brought to market weight on similar rations with progressively decreasing levels of protein. In each treatment the percentage of fishmeal was decreased from 5, to 8 weeks of age, to 1.25 from 19 weeks onwards. With cottonseed meal as the sole vegetable protein concentrate, from 40 to 12 per cent., the mean finishing weights at 28 weeks of age were 9500 and 6800 g. for males and females. These figures did not differ significantly from those obtained with soya bean meal as the sole vegetable protein concentrate, although growth with the cottonseed meal had been slower in the first 4 weeks. Similarly, there was no "white-barring" of the feathers in either group after 16 weeks although this was almost universal for the first 8 weeks among the poults receiving cottonseed meal.

Lastly, turkey hens were penned intensively and fed on a ration of cottonseed meal 14.4, fishmeal 2.5, lucerne meal 5, dried whey 5, minerals, vitamins and mixed cereals to 100. The birds were inseminated artificially; after 3 months on the ration the mean hatchability of the fertile eggs laid was 58 per cent. Further groups that received similar rations with half or all of the cottonseed replaced by soya bean oilmeal gave corresponding hatchability figures of 49 and 54 per cent. Sample eggs from both the groups receiving cottonseed were found to develop characteristic discolouration of both yolks and whites.

It is considered that the maintenance of normal hatchability with 14 per cent. cottonseed meal in the ration may be attributed to the use of a batch of meal of particularly high quality.

K. J. Carpenter.

5918

COUCH, J. R., CHANG, W. Y. and LYMAN, C. M. The effect of free gossypol on chick growth. *Poultry Sci.*, 1955, **34**, 178-183. [Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., Agric. and Mech. Coll. System, College Station.]

Graded levels of free gossypol in the form of pigment glands were given to chicks to test their tolerance. When free gossypol formed 0.06 per cent. or less of the diet there was no detrimental effect on growth rate, mortality or feed efficiency.

The addition of 1 per cent. DL-lysine hydrochloride increased the rate of growth at all levels of free gossypol, but did not change the tolerance for gossypol.—D. H. Shrimpton.

5919

GERRY, R. W. High efficiency rations for poultry. *Maine Agric. Exp. Stat., Bull. No. 523*, January 1954, pp. 26.

After a series of testing trials in which meat-type chicks were raised to 12 weeks of age a ration is recommended consisting of soya bean oilmeal 22.5, fishmeal 5, distiller's dried solubles 2.5, maize gluten meal 2.5, a butyl fermentation product rich in riboflavin 1, lucerne meal 3, a vitamin D concentrate, nicotinic acid, choline chloride, vitamin B₁₂, procaine penicillin, minerals 3.25 and yellow maize meal to 100; this ration contains only 4 per cent. crude fibre. Rations of this type gave as rapid growth and more efficient feed conversion than those of similar protein and vitamin content but with more fibrous grains and wheat milling by-products replacing part of the maize meal. Under the commercial conditions at the time of the trials it was economic to use the high-energy type through the whole 12-week period of rearing.

In trials with laying hens normal rates of egg production were obtained with high-energy rations, and feed consumption was approximately 10 per cent. less than with rations incorporating 30 to 35 per cent. of milling by-products and containing altogether 6 to 7 per cent. of crude fibre. Another advantage with birds kept on deep litter was that the lower feed consumption of the high-energy birds was accompanied by lower water consumption and less difficulty with damp litter.—K. J. Carpenter.

5920

FINDRIK, M. and CEK, A. Djelovanje lucernina brašna na rast pilića. [Effect of lucerne (alfalfa) meal upon growth of chickens.] *Vet. Arhiv*, 1955, **25**, 97-102. English and German summaries.

Alfalfa meal at a level of from 10 to 25 per cent. in the ration of young chickens, replacing an equivalent amount of wheat bran, depressed feed intake, growth rate and feed utilisation. At a

level of 5 per cent. growth rate was slightly depressed but feed efficiency was increased. (From summary.)—J. S. Thomson.

5921

LEME DA ROCHA, G. and RAIMO, H. F. Contribuição para o estudo dos substitutos dos farelos de trigo na alimentação das aves. 3. Mucuna preta. 4. Caupi. [Substitutes for wheat bran in the rations of birds. 3. Velvet bean. 4. Cowpea.] *Bol. Indúst. animal, São Paulo*, 1954, 14, 31-44. English summary.

Groups of 45 day-old chickens were used. The basal ration contained 35 per cent. wheat bran and middlings, replaced in the experimental rations by 35 per cent. velvet bean meal or cowpea meal. The experiment had 2 periods, from hatching to 14 weeks and from 14 weeks to 7 months of age.

The velvet bean meal was unsuitable for young chickens; growth was very poor and 46 per cent. died in 6 weeks, so the group was abandoned. Cowpea meal was as valuable for growth as wheat bran; the experimental group had 90-21 per cent. of the liveweight of controls after 14 weeks, but utilisation of their ration had been better. There was no difference in feathering. From 14 to 30 weeks the cowpea group gained 16.5 g. less than controls, and they started to lay on the average 5 days later and produced 2-15 per cent. fewer eggs.

It is concluded that cowpea meal is suitable for replacing wheat bran in poultry rations.

D. Duncan.

5922

SNYDER, E. S., PEPPER, W. F., SLINGER, S. J. and ORR, H. L. The value of pasture in the production of goose broilers. *Poultry Sci.*, 1955, 34, 35-38. [Dept. Poultry Husb., Ontario Agric. Coll., Guelph.]

White Chinese × Emden goslings were fattened from 3 to 14 weeks old. They received a pelleted ration, grain and water to appetite. Half the birds were reared on pasture, the other half in dry lot. They were weighed at 6, 9, 12 and 14 weeks and slaughtered at 14 weeks. The goslings reared without pasture were significantly heavier at all ages, their dressing percentages were 10 per cent. higher, and they gave more attractive carcasses than those reared on pasture. Those reared on pasture required less feed per lb. gain, and of the feed consumed about one-half was grain; when no pasture was allowed the ratio of pellets to grain was 40:1. Satisfactory geese as broilers killed at 14 weeks of age could therefore be produced by either method, but the more economical one was rearing on pasture.

T. D. Bell.

5923

ROSENBERG, M. M. Response of chicks to graded concentrations of cane final molasses. *Poultry Sci.*, 1955, 34, 133-140. [Dept. Poultry Husb., Univ. Hawaii, Honolulu.]

Three trials are reported on the effect on growth and feed efficiency of substituting different amounts of blackstrap molasses for part of the yellow maize in a ration of Napier meal, maize, soya bean oil meal and herring meal with mineral and vitamin supplements.

In the first experiment levels of 11.5, 23.0 and 34.5 per cent. molasses were used for groups of day-old chickens for 42 days, all rations being nearly equal in protein content. The 2 lowest levels did not depress growth rate. At the highest level the males grew significantly slower than their controls and the females at about the same rate as their controls.

Experiments 2 and 3 were similar on a slightly modified ration, except that 3 additional levels of molasses were tried, namely, 7.5, 16.5 and 28.5 per cent. When the results of these 2 trials were combined it was found that, apart from some group differences in rate of growth of pullets and cockerels, growth rate in all the molasses groups was as good as in the controls.

Efficiency of feed conversion was reduced significantly as the level of molasses rose but at the prevailing prices of feedingstuffs the molasses rations were cheaper than the control.

It is concluded that molasses can be included in the chick ration up to 34.5 per cent. but the optimum level would appear to be between 7.5 and 23 per cent. At the highest level tried the ration became too moist, and there was an increase of moisture in the faeces as the level of molasses rose.—J. S. Thomson.

5924

THAYER, R. H. and HELLER, V. G. Antibiotics and nitrogen utilization in growing cockerels. *Poultry Sci.*, 1955, 34, 97-102. [Oklahoma Agric. Exp. Stat., Stillwater.]

A group of 50 chicks was reared from hatching to 33 days of age on a ration of soya bean oilmeal 45, wheat protein hydrolysate 1, DL-methionine 0.24, soya bean oil 2.5, minerals, vitamins and glucose to 100. A second group received the same ration supplemented with 20 mg. of procaine penicillin G per lb. The mean finishing weights of the groups were 452 and 489 g.

At the end of the group feeding trial 5 cockerels from each group were housed for a 4-day experimental period in individual metabolism cages and continued to receive their previous diet. Of the nitrogen in the 2 rations, 14.2 and 13.9 per cent. were excreted as true protein in the faeces; 40.7

and 36.8 per cent. of the absorbed dietary N was excreted as urinary N.

From these and similar results with a practical ration given with and without the addition of penicillin or aureomycin it is concluded that antibiotic supplements can improve the utilisation of dietary protein by poultry.—K. J. Carpenter.

5925

LIBBY, D. A. and SCHAEBLE, P. J. Observations on growth responses to antibiotics and arsonic acids in poultry feeds. *Science*, 1955, **121**, 733-734. [Dept. Poultry Husb., Michigan State Coll., East Lansing.]

Successive batches of chicks were reared to 6 weeks of age in the same house over a 4-year period. In the first year birds that received either a low-level antibiotic supplement or a supplement of arsonic acids grew 19 and 16 per cent. faster than those that received the control ration without a supplement. This effect decreased until in the last year the mean growth stimulation obtained with these supplements was only 3 per cent. in each case.

However, over this period, and with the same strain of birds, growth on the control ration alone improved by 19 per cent., so that the final growth rate without antibiotics or arsonic acids was equal to that previously obtained only with these supplements. Mortality rates with the control ration also fell from 8.5 to 2.8 per cent.

It is concluded, therefore, that the failure to obtain a significant response to growth stimulants is not due to the development of alimentary tract bacteria that are resistant to their influence, but rather to the continued use of antibiotics in the building so as to eliminate those micro-organisms that had previously been responsible for depressing the growth rate of the chicks.—K. J. Carpenter.

5926

McDONALD, M. W. A failure of chickens to respond to arsanilic acid. *Poultry Sci.*, 1955, **34**, 55-56. [Poultry Exp. Stat., Seven Hills, N.S.W.]

Contrary to the results of Bird (*Feed Age*, 1952, **2**, 80), growth in chickens was not stimulated by the addition of 4.5 g. arsanilic acid per 100 lb. mash. The addition of 160 mg. procaine penicillin per 100 lb. of the same mash produced a significant increase in growth rate, but there was no further stimulation when arsanilic acid also was added.

J. S. Thomson.

5927

BAILLON, S. L. The effect of quaternary ammonium derivatives in chick diets. *Poultry Sci.*, 1955, **34**, 191-196. [Dept. Poultry Husb., Iowa State Coll., Ames.]

A series of 7 experiments is reported in which 4 alkyl quaternary ammonium derivatives were given to groups of young chickens on adequate diets, with or without antibiotics and housed in old or new quarters.

The quaternary ammonium derivatives consistently improved growth to 8 weeks in chickens housed in old quarters but had no effect on those in new quarters. Feed efficiency was significantly improved in both environments. The best results were obtained when the derivatives were given at a low level, 30 to 35 mg. per lb. feed, during early growth and at a higher level, 75 to 150 mg. per lb. feed, during the later stages. The addition of 2 per cent. fat to the ration improved feed utilisation still further.—J. S. Thomson.

5928

WRIGHT, M. M. and DUDLEY, F. J. A comparison of the effects of pellet and mash diets of similar composition on the productivity of Khaki Campbell ducks to the end of their fourth laying season. *Poultry Sci.*, 1955, **34**, 474-483. [Nat. Inst. Poultry Husb., Newport, Shropshire.]

In a series of trials Khaki Campbell ducklings were reared from hatchlings in 1946, 1947 and 1948 in houses with access to grass runs. They were fed to appetite on commercial feeds of unknown but similar composition with from 17 to 19 per cent. crude protein. The feeds were as mash or in pellet form and the mash was mixed with water to a crumbly consistency. At first feeding was frequent but after 9 weeks of age the ducks got only 2 feeds daily. There were 240, 146 and 99 birds in the groups for the years.

Birds on pellets drank much more water than did those on mash and their rates of feathering and of general development were more rapid. At 20 weeks their mean liveweight was about 5.2 lb. with only small differences between the groups. In nearly all birds feed consumption was highest in the period 8 to 12 weeks of age.

At 20 weeks groups of 40 ducks were selected at random from the hatches for laying trials over 4 years. Feed consumption was from 594 to 605 and from 591 to 615 lb. per duck for the pellet and mash groups, respectively, and their egg yields from 582 to 653 and from 599 to 632. In each comparison the differences between the forms of feed were inconclusive. Laying was most intense during April, May and June and did not cease entirely at any time of the year. The birds which laid heavily in the first 2 years seemed unable to continue thereafter at the same rate. Mortality was not significantly different in the groups and, for all birds over the whole period, was 41 per cent. More than one-third was caused by reproductive disorders.

The ducks would not have repaid the cost of their food in the third and fourth years and, in some cases, keeping them for a second year might have been uneconomic.—K. J. Carpenter.

5929

LANSON, R. K. and SMYTH, J. R. **Pellets vs. mash plus pellets vs. mash for broiler feeding.** *Poultry Sci.*, 1955, **34**, 234-235. [Dept. Poultry Husb., Univ. Maine, Orono.]

White Plymouth Rock male chicks were fed on mash for 4 weeks, then group 1 had the mash in pellet form, group 2 had one-third in pellet form and the rest as mash, and group 3 continued to get mash only. They were fattened to 10 weeks of age and then killed. Group 1 was best and group 3 worst in final liveweight and efficiency of feed conversion. Mortality was low and there was no feather picking in any group.—T. D. Bell.

5930

MCCALLY, E. H. and SPICKNALL, N. H. **Meat yield from live, dressed, and eviscerated Rhode Island Red chickens during growth and at maturity.** *Poultry Sci.*, 1955, **34**, 145-148. [U.S. Dept. Agric., Agric. Res. Serv., Animal and Poultry Husb. Res. Branch.]

The liveweight, dressed weight, eviscerated weight with giblets and weight of edible meat of 125 Rhode Island Red pullets, 85 cocks and 30 hens were measured, and relations between them were calculated. The liveweights ranged from 1134 to 3628 g., pullets being 10 to 16 weeks old, and hens and cocks 38 weeks old. Regression equations were computed. The most accurate calculation could be made between values involving the least treatment of carcass in dressing; thus weight of edible meat was best calculated from eviscerated weight. There was little difference between the classes of birds, and one equation could be used for them all. A table is given showing the calculated dressed yield of birds from 2.5 to 8.0 lb. liveweight.—T. D. Bell.

5931

COLLES, R. **Changes in the pattern of poultry keeping.** *J. Roy. Agric. Soc. Engl.*, 1954, **115**, 69-82. [Minist. Agric., 1/4 Cambridge Terr., Regent's Park, London, N.W.1.]

See also Absts. 4762, 4854, 4984, 5871, 6013.

EGG PRODUCTION

5932

ERIKSSON, S. **Energy requirement for maintenance of adult hens.** *Kgl. Landbrukshögsk. Ann.*, 1954, **21**, 385-388. [Nat. Animal Exp. Stat., Uppsala.]

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Non-laying Rhode Island Red hens weighing 2 kg. required 160 Cal. metabolisable energy daily at 20° C. (68° F.). The requirement was 12 per cent. greater at 15° C. (59° F.), but in the experiment reported the hens were beginning to moult when the observations at the lower temperature were made, so that the results need confirmation.

T. D. Bell.

5933

HEYWANG, B. W., BIRD, H. R. and VAVICH, M. G. **The level of protein in the diet of laying White Leghorns during hot weather.** *Poultry Sci.*, 1955, **34**, 148-152. [Agric. Res. Serv., U.S. Dept. Agric., Animal and Poultry Husb. Res. Branch, Glendale, Ariz.]

Groups of 25 White Leghorn pullets were housed in an indoor pen with straw litter and given either all-mash ration 1 of sardine meal 4, commercial casein 1, lucerne meal 5, butyl fermentation solubles 0.3, cod liver oil 0.3, minerals 6.5 and yellow maize meal to 100, which contained 11.5 per cent. crude protein; or rations 2 to 6 which were of similar composition with higher levels of sardine meal and casein, in a 4:1 ratio, so as to give 12, 13, 15.5, 17, 18 and 19.1 per cent. crude protein.

The trial continued for 112 days of hot weather with daily average maximum and mean temperatures of 102° and 88° F. The egg outputs per head in the 6 groups were 37, 55, 55, 45, 54 and 56, and there was no appreciable change in liveweight in any group.

In a second trial which began with 153 days of relatively cool weather, daily maximum and mean temperatures being 72° and 59° F., mean productions on rations 1 to 6 were 69, 74, 91, 77, 78 and 82, and in a second period of 120 days of hot weather 50, 49, 50, 60, 54, 56 and 60.

It is concluded that a 15 per cent. level of crude protein is satisfactory in a laying ration of the type employed where it is to be given during hot weather.—K. J. Carpenter.

5934

NEAL, W. M. **Supplemental methionine for breeding hens.** *Poultry Sci.*, 1955, **34**, 242-243. [Route 6, Box 970, Tampa 4, Fla.]

In a series of field trials DL-methionine was added at a level of 0.05 per cent. of the total feed to the rations of laying birds receiving good practical diets of mash plus grains.

It was concluded that this supplement had the effect of reducing the proportion of eggs that were unsuitable for incubation because of their poor shell texture. It was suggested that the inadequacy of the rations without this supplement might have been due to the high temperatures at the time and the presence of some ascarid infestation and non-specific enteritis.—K. J. Carpenter.

5935

CARVER, D. S., RICE, E. E., GRAY, R. E. and MONE, P. E. The effect of No. 2 tallow in poultry rations on the flavor of fresh and stored eggs. *Poultry Sci.*, 1955, **34**, 131-132. [Res. Labs., Swift and Co., Chicago, Ill.]

Flavour of fresh eggs or of eggs stored for 1 or 2 months from hens fed for 11 days on a ration containing 3 per cent. of No. 2 tallow was not impaired.—J. S. Thomson.

5936

MACINTYRE, T. M. and JENKINS, M. H. Effect of different feeding methods on the efficiency of egg production. *Poultry Sci.*, 1955, **34**, 376-383. [Canada Exp. Farm, Nappan, N.S.]

Ten groups, each of 20 Barred Plymouth Rock pullets housed in an indoor pen with 6 in. feeding space per bird, were fed for 280 days on a laying mash, provided to appetite in their hoppers and made up of fishmeal 2, meatmeal 1, powdered milk 1, soya bean oilmeal 8, maize gluten meal 3, wheat middlings 7, wheat bran 6, wheat shorts 11, hominy feed 5, yellow maize meal 5, rolled wheat 10, rolled barley 10, crushed oats 22, cereal grass 3.5, minerals 5 and fish oil 0.5. In addition, a scratch grain feed was given daily in a quantity equal to that of the mash consumed, consisting of whole wheat 40, oats 25, cracked yellow maize 15, whole barley 10 and buckwheat 10. These birds had a 9.5 per cent. mortality, and laid 164 eggs per hen housed, with a mean weight of 62 g.

Similar groups of birds received 3 further treatments. They all received scratch grain and, in addition, had (1) a wet mash feed placed on top of the dry mash at noon each day; (2) laying mash to appetite and laying pellets distributed over the litter at noon or (3) laying pellets fed to appetite in the hopper with no mash. Mortality rates with these treatments were 10.5, 8.5 and 15.0 per cent. There was no appreciable difference in the total weight of eggs produced.

In further similar trials, all-mash feeding, either to appetite or provided in 4 feeds daily, gave results similar to those obtained with scratch grain and mash. However, inferior results were obtained when both grain and mash were provided to appetite in separate hoppers. The provision of pellets, for an evening scratch feed, that were made up of grassmeal 25, hominy feed 25, dried distiller's solubles 10 and middlings to 100 failed to increase the egg production of birds receiving an all-mash ration to appetite in their hoppers.

K. J. Carpenter.

5937

SIZEMORE, J. R., LILLIE, R. J., BIRD, H. R. and DENTON, C. A. Further studies on the influence of aureomycin in the chick diet upon subsequent reproductive performance of laying

hens. *Poultry Sci.*, 1955, **34**, 432-435. [U.S. Dept. Agric., Agric. Res. Serv., Animal and Poultry Husb. Res. Branch.]

In a previous paper (Abst. 1368, Vol. 24) the authors reported the findings of a trial in which birds reared on a ration supplemented with a vitamin B₁₂ and antibiotic concentrate subsequently gave eggs with better hatchability than eggs laid by birds receiving the same breeding ration but reared without the vitamin B₁₂ antibiotic supplement.

They now report the results from a second laying year in which the former group still gave generally better hatchability than the latter, even when the comparison was made with a breeding ration containing aureomycin. The difference appeared to be the result of a higher embryonic mortality in eggs from the latter group after the first week of incubation. There was also a tendency for the inclusion of aureomycin in the breeding ration to reduce embryonic mortality in both groups of birds.—K. J. Carpenter.

5938

WAIBEL, P. E., POMEROY, B. S. and JOHNSON, E. L. Effect of Arasan-treated corn on laying hens. *Science*, 1955, **121**, 401-402. [Dept. Poultry Husb., Univ. Minnesota, St. Paul.]

5939

OLSSON, N. and KYRNING, S. Försök med grönfoderensilage i hönsens utfodring. [Silage as a feed for laying hens.] *Kgl. Lantbruks-högsk. Statens Hushållsförsök Medd.* No. 56, 1954, pp. 22. English summary.

A preliminary account of experiments in 1949 was published in *Proc. 9th World's Poultry Congr.*, 1951, **2**, 153. The 1949 results are reproduced here with those for 1950 and 1951.

The experimental groups were of purebred or hybrid Leghorns, 31 to 43 hens and 4 cocks per group, 6 to 8 months old at the beginning. The silage was of clover and grass in 1949 and of lucerne, second cut, in the later years, made with 3 kg. molasses and 3 litres water per 100 kg. green crop. Records were kept of egg yield and weight, hatchability, content of carotenoids and vitamin A and colour density of the yolk; feed consumption and liveweight and health of the fowls. The ration was a conventional mixture of cereals with yellow maize or haymeal or both, oilseed meal, fishmeal, dried milk, yeast, bonemeal, chalk, salt and charcoal. Methods of analysis are described and results are presented in detail. The silage groups had approximately 30 g. (range 26 to 33 g.) daily or silage to appetite with 0.42 per cent. cod liver oil in the mash. The latter group of hybrid birds in 1951 ate only 16 g. daily.

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There was no difference in weight or health between the groups. The supply of precursors of vitamin A in the several combinations of silage with haymeal and/or yellow maize was adequate. There was no difference in fertility or hatchability. Groups that got vitamin A had more vitamin A in eggs than the others, which had eggs with more carotenoids and a deeper yolk colour. There was a slight excess of feed per kg. egg in the silage groups.—I. Leitch.

5940

HEYWANG, B. W., BIRD, H. R. and ALTSCHUL, A. M. Relationship between discolorations in eggs and dietary free gossypol supplied by different cottonseed products. *Poultry Sci.*, 1955, **34**, 81-90. [Agric. Res. Serv., U.S. Dept. Agric., Animal and Poultry Husb. Res. Branch, Glendale, Ariz.]

Groups of 10 to 12 White Leghorn pullets were fed on diets containing free gossypol at 0.001, 0.002, 0.003, 0.004, 0.005 and 0.008 per cent. which were variously provided by raw decorticated cottonseed, or screw-press, hydraulic, solvent-extracted or pre-press solvent-extracted cottonseed meal. The yolks of more than 1900 of their fresh eggs and of more than 13,000 of their eggs held in commercial cold storage at 35° F. for periods up to 6 months, or in a refrigerator at 55° F. for periods up to 7 days, were examined for discolouration.

At the 0.001 per cent. level of free gossypol only 1 fresh egg had a discoloured yolk, but 5 per cent. of all the yolks held in storage were discoloured. At the 0.008 per cent. level of free gossypol the figures were 16 and 60 per cent. discoloured yolks. The effects of gossypol from solvent-extracted meals were less severe than from other sources.

D. H. Shrimpton.

5941

GRAU, C. R. Availability to laying hens of various forms of gossypol. *Federation Proc.*, 1955, **14**, 435. *Proc.* [Dept. Poultry Husb., Univ. California, Davis.]

5942

CHARETTE, L. A. and TESSIER, J. L. Snow as a water replacement for poultry. *Canad. J.*

Agric. Sci., 1955, **35**, 175-180. [Exp. Stat., Kapuskasing, Ont.]

Barred Plymouth Rock pullets were used in laying trials in the winters of 1948-49, 1950-51 and 1951-52, in which birds got the same rations, and were housed in the same conditions, but got either drinking water warmed to 35° to 45° F. or snow. The trials, dependent on the availability of snow, lasted 112, 158 and 161 days in the 3 years during which they were made. Snow in place of water did not cause significant difference in egg size, total feed consumed, or mortality. The number of eggs laid was significantly greater when the birds had access to water, and efficiency of feed utilisation was higher. Weight increases were also better when water was given.—T. D. Bell.

5943

CARSON, J. R. and BRALL, G. Absence of response by breeder hens to ultraviolet energy. *Poultry Sci.*, 1955, **34**, 256-262. [Dept. Poultry Sci., Storrs Agric. Exp. Stat., Univ. Connecticut.]

Barred Columbian and Rhode Island Red laying hens were used in 2 year's trials in which the control groups were given 14 hr. daily incandescent light, and experimental groups had, in addition, 14 hr. daily antirachitic ultraviolet irradiation, continuous germicidal ultraviolet irradiation or both. The results showed that the treatments had no significant effect on egg production, egg weight, shell thickness, hatchability or mortality of adult birds.—T. D. Bell.

5944

VAN ALBADA, M. On the significance of some characteristics of egg production in breeding utility breeds of poultry. *Netherlands J. Agric. Sci.*, 1955, **3**, 135-154. [State Poultry Inst., Beekbergen, Netherlands.]

Trials with White Leghorns from 1947 to 1952 showed that more accurate selection could be based on average length of laying cycle and age at first egg than on total production for the first laying year. To apply this method, careful observations must be made for a few months while the birds are trap-nested.—T. D. Bell.

See also Absts. 5780, 5917, 5918, 5923, 6013.

OTHER BIRDS

5945

JUKES, H. G., HILL, D. C. and BRANION, H. D. Effect of penicillin on the growth of pheasants. *Poultry Sci.*, 1955, **34**, 235-236. [Dept. Nutrit., Ontario Agric. Coll., Guelph.]

A group of 13 pheasants was kept in a darkened room and fed from hatching to 4 weeks of age on a

ration of fishmeal 2.5, meatmeal 2, dried butter-milk 2, soya bean oilmeal 42, grassmeal 5, minerals 5.25, fish oil 0.5, yellow maize meal 16 and ground wheat to 100 with supplements of methionine, riboflavin, nicotinic acid and vitamin B₁₂. They finished with a mean weight of 160 g. A parallel group that received the same ration supplemented

with 10 p.p.m. of procaine penicillin G finished with a mean weight of 173 g.

It is concluded that this result provides further

evidence that pheasants respond to antibiotics in the same way as chickens and turkey poults.

K. J. Carpenter.

FOOD ECONOMICS AND STATISTICS

5946

WYLLIE, J. The production of human food in the United Kingdom before, during, and since the war. *Empire J. Exp. Agric.*, 1954, 22, 241-255. [Wye Coll., Univ. London.]

This study covers the period of 11 years from 1939-40 to 1949-50, with 1936-39 as pre-war comparison. Official statistics of agricultural output in the United Kingdom are translated into calories, and fluctuations in output of the principal products and in their percentage contributions to total calories are given in tables. In 1939-40 crops contributed about 47 per cent. and livestock about 53 per cent. of total calories; in 1943-44, 71 and 29 and in 1949-50, 59 and 41, respectively. Milk and eggs contributed 30.2, 19.4 and 28.1 per cent. and meat 22.6, 9.4 and 13.2 per cent. Taking the yearly requirement per head as 1 million Cal., home production sufficed to feed 17.3, 26.3 and 23.8 million people and the acres required per person were 1.78, 1.15 and 1.28. The means by which production was increased are discussed and it is pointed out that *inter alia* mechanisation set free about 1 million acres formerly required to maintain farm horses. The same total calorie output can be achieved from different combinations of crops and livestock products; the diet provided by home production in 1949-50 was superior in "quality" to that of 1943-44 but the cost of 1 million Cal. was about £35 compared with £21 in the earlier year. In 1949-50 the approximate cost (i.e., price received by producer) of 1 million Cal. from wheat was £8, potatoes and sugar beet £13, meat £67, milk £44 and eggs £212.

W. M. Deans.

5947

LINDSTROM, D. E. Japan needs U.S. surplus food. *J. Farm Econ.*, 1955, 37, 125-127. [Rural Welfare Res. Inst., Internat. Christian Univ.]

In order to get more food for less cost, Japan is now importing much more wheat than rice, 46 million bushels against 24 million bushels in 1953. All political parties are agreed on the need for importing more wheat and inducing the people to change their eating habits. At present they consume on the average about 5 bushels per person per year, about 435 million bushels, but home production amounts to only about 330 million bushels. In view of the rapidly growing population and the unlikelihood of rapid increase in home production of cereals other than rice or of

milk and meat, the opportunity for the American farmer is obvious.—W. M. Deans.

5948

TEIXEIRA E SILVA, H. M. Tecnologia da produção e valor dos alimentos protéicos de origem animal. [Technology of production and value of protein feeds of animal origin.] *Bol. Indúst. animal, São Paulo*, 1954, 14, 134-140. English summary.

The value of animal by-products is discussed, including meatmeal and other slaughterhouse and cannery wastes, fish wastes and dairy products such as whey. It is concluded that large quantities of such substances are at present wasted in Brazil because of lack of facilities for processing them, and that installation of plant would soon give profitable returns.—D. Duncan.

5949

HAVEY, C. B. Economic aspects of hog production in North Dakota. *N. Dakota Agric. Exp. Stat. Bull.* No. 391, June 1954, pp. 39.

A survey was made of the south-eastern area of North Dakota. Half the farms in the area kept pigs and 78 per cent. of these kept breeding sows or gilts, and 71 per cent. of the latter group had 4 or fewer breeding sows. The majority bred for one farrowing only per year.

The survey showed that production efficiency, as returns per hour of labour or per unit of capital invested, increased sharply as the number of sows increased from 4 to 12, and less rapidly thereafter. The economic security of larger breeding herds was greater. There was a certain amount of risk in expanding the small enterprise, but this was usually profitable provided that it did not interfere with or reduce the scope of other enterprises on the farm. If expansion should cause interference then economic details should be carefully examined.

For efficiency and profit careful management in feeding and care at farrowing, in which there is room for improvement, are essential, especially in small enterprises. The seasonal market fluctuations in the price of fat pigs should be watched, and it should be decided whether current prices for feeds sold to the market would bring in less than the returns from pigs fattened on the feeds.

T. D. Bell.

5950

BEYNON, V. H. Home-grown or purchased feedingstuffs? The choice before the farmer. *Agriculture, J. Minist. Agric. Engl.*, 1955, **62**, 1-6. [Dept. Econ., Univ. Bristol.]

To be profitable, homegrown feedingstuffs must not only cost less than purchased concentrates: the saving must also compensate for any loss incurred by using the land in this way instead of for some more profitable enterprise. A simple method of budgeting to show the relative profit is described, with examples. These show that even on understocked farms dredge corn is of doubtful advantage, but kale is usually profitable and grass silage may be.—T. D. Bell.

5951

SWANSON, E. R. Solving minimum-cost feed mix problems. *J. Farm Econ.*, 1955, **37**, 135-139. [Univ. Illinois.]

The use of the University of Illinois electronic computer for solving the problems which arise in finding the minimum cost of mixtures to provide particular levels of certain nutrients is described. D. Harvey.

5952

SHOLTO DOUGLAS, J. W. E. H. Soilless cultivation of crops in India. *Nature*, 1955, **175**, 884-885. [Hydroponic Res., Minist. Food, India.]

The system of soil-less cultivation which has been evolved at the Bengal Government's station at Kalimpong is briefly described and some very high yields obtained with tomatoes, lettuce, maize, French beans, rice, potatoes, onion, beetroot and broad beans are quoted. An information centre on the method has its address at P.O. Box 31, Bombay, India.—D. Harvey.

5953

PAYNE, W. J. A., NAIDU, R. K., SILLS, V. E. and HOLMES, S. V. Fish farming. *Fiji Agric. J.*, 1954, **25**, 71-76.

Animal protein for pig feeding is in short supply in Fiji. To improve the position a successful attempt is being made to grow the fish *Tilapia mossambica* in a pond excavated near the piggeries of the Sigatoka Agricultural Station. The pond was planted with an aquatic plant, *Ipomoea reptans*, which has grown rapidly and abundantly, and the fish were imported as fingerlings from Malaya. They grew rapidly and reproduced after 2 months. The pond water, which must be kept stagnant, is manured from the sump of the piggery. *Ipomoea* can also be harvested; providing human food from the succulent green tips, and a readily eaten stockfeed from the rest of the plant. The possibility of *Tilapia* as a food for man is also being investigated, and shows promise. The cultivation of *Tilapia* in Malaya, and the limitations imposed by local conditions in Fiji, are described and discussed.—T. D. Bell.

5954

SJÖGREN, E. Jordbrukets exportfrågor. [Agriculture's export problems.] *Kgl. Lantbruksakad. Tidskr.*, 1954, **93**, 390-402. English summary.

A lecture which discusses Sweden's exports, with comparisons with other European countries and New Zealand.

5955

GÉNIN, G. L'organisation et l'efficience dans l'industrie laitière. [Organisation and efficiency in the milk industry.] *Lait*, 1955, **35**, 159-165.

See also Abst. 4700.

DIET IN ETIOLOGY OF DISEASE

GENERAL

5956

VAN DER GRIFT, J. Doel en werkwijze van de veterinaire verkenning van het Rijkslandbouwproefstation te Hoorn. [Functions of the veterinary field service of the Agricultural Research Station at Hoorn.] *Landbouwk. Tijdschr.*, 1954, **66**, 740-746. [Physiol. Rijkslandbouwproefstat., Hoorn.]

The English service of Veterinary Investigation Officers served as the pattern.

A study in 1952 of blood Cu in relation to pasture diarrhoea on 100 farms is reported. In each herd 3 to 6 samples were taken, depending on the size of herd and in 51 per cent. of these serum Cu was low, less than 0.60 mg. per litre blood; in 14 per cent. the results were between 0.60 and 0.70 mg.

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and in 35 per cent. Cu was normal. The low samples were got from cattle pastured on heath, clay or peat, low moor and river clay soils. Pasture diarrhoea was severe in 1952 and, in almost every case, was cured or prevented by CuSO_4 . The fall of blood Cu which occurs on pasture was much less in the dry autumn of 1953 and health and milk yield were better.

Other current investigations are concerned with the possible association of haemoglobinuria with lack of Na and the effect of brackish drinking water on cattle.—I. Leitch.

5957

JOHNS, A. T. Bloat in cattle on red clover. 1. *N.Z. J. Sci. Technol. [A]*, 1954, **36**, 289-320. [Grasslands Div., D.S.I.R., Palmerston North.]

Bloat was produced in 2 pairs of stall-fed identical twins and one cow by feeding cut broad red clover grown in pure swards. Many possible causes were examined to determine their relation to the incidence of bloat in the experimental animals and most of the common statements of causes, such as the rate of eating, or the weather, have been found to be false. Certain things have been shown: (1) belching occurs in bloating cows, but may be suppressed in severely bloated animals; (2) the bloat produced was of the frothy type and punctures of the rumen, or even opening the rumen widely *post mortem*, did not allow sufficient gas to escape to make much difference; (3) anti-foaming agents never failed to protect animals; and (4) certain animals are prone to bloat.

In general it is concluded that both a plant factor, about which several suggestions are made, and an animal factor are concerned.

A. T. Phillipson.

5958

CHARTON, A. Troubles provoqués par les pulpes de betteraves chez les ruminants. [Disturbances in ruminants caused by beet pulp.] *Rec. Méd. vét.*, 1954, 130, 761-776.

In the fresh state or as silage, beet pulp has a high content of water and sugar and very low protein, vitamin and mineral contents. It may cause severe digestive disturbance in cattle, the nature and treatment of which are discussed with reference to the literature. Recommendations are made for better treatment of beet pulp if it is to be used for cattle. It is considered safest to dry the pulp.—A. M. Copping.

5959

LUCIFERO, M. Gli inconvenienti provocati dalle polpe di barbabietola non utilizzate razionalmente. [Disorders caused by sugar beet pulp not used sensibly.] *Riv. Zootec.*, 1955, 28, 140-142.

A review.

5960

PUNTRIANO, G. O. Further research on the prevention of kidney stones in sheep from the colloidal approach. *Amer. J. Vet. Res.*, 1955, 16, 101-104. [Wyoming State Vet. Lab., Laramie.]

For earlier work in which the concept is defined see Abst. 3990, Vol. 24.

Three groups of 6 lambs, 7 to 9 months old, were given a ration of concentrates containing 50 per cent. beet pulp, and alfalfa hay. Such a diet was believed to cause urinary calculi. This treatment lasted 5 months. One group was implanted with hyaluronidase. A fourth group, as control, got only alfalfa hay. In the 2 groups getting concentrates but no hyaluronidase urine examinations

gave evidence of the formation of calculi in the kidneys, but in the other groups there was no such evidence. There was also imbalance of the protective colloid: crystalloid ratio in these same lambs. Analysis of the calculi showed silica in amounts from 60 to 75 per cent. This was thought to be the cause of the calculi, the excess of silicate either increasing the proportion of crystalloids or forming silic [silicic] acid and increasing the proportion of non-protective colloids; in either case imbalance of the colloid: crystalloid ratio would result. The acid would also form a gel and act as a nucleus for the formation of calculi.—T. D. Bell.

5961

ALEXANDER, G., McCANCE, I. and WATSON, R. H. Some observations on losses among Merino lambs. Age at death, birth weight and duration of gestation of the lambs from one flock. *Austral. Vet. J.*, 1955, 31, 85-90. [Div. Animal Health Prod., C.S.I.R.O., Parkville, Victoria.]

Details of deaths of single lambs in a flock of Merino sheep are reported. Of a total of 421 lambs, 25 were stillborn, 13 died within 3 days and 13 died between 7 and 28 days. There were 21 males and 4 females in the stillborn, but among the other 26 the sexes were evenly distributed. Birthweights of the stillborn were significantly more and of those dying after birth significantly less than those of surviving lambs. Gestation periods did not differ significantly between the groups except for females which died between 7 and 28 days, for which they were longer.—T. D. Bell.

5962

ANDERSEN, A. C. The pathogenesis of telangiectasis in the bovine liver. 1. The incidence of telangiectasis. *Amer. J. Vet. Res.*, 1955, 16, 27-34. [Univ. California Sch. Vet. Med., Davis.]

Of 1570 bovine livers examined at an abattoir 61.8 per cent. showed telangiectasis. The incidence was much higher in animals coming off the range which were given supplementary feeding for a lengthy period before slaughter than in those slaughtered immediately or those receiving a minimum of supplementary feeding.

J. S. Thomson.

5963

COLES, R. The economic significance of the incidence of mortality in fowl. *Brit. Vet. J.*, 1955, 111, 235-252. [Minist. Agric. Fish. Food.]

Over 4000 birds were involved in observations made on the mortality of a flock of White Leghorns during 4 consecutive seasons of 78 weeks. During this time there was no culling. Mortality fell from 30 per cent. in the first to 14 per cent. in the fourth season, and just under half the deaths were due to

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avian leucosis and fowl paralysis. Most deaths occurred between 11 and 36 weeks of age, when more were due to leucosis and fowl paralysis than to other causes. The mortality of late hatched (May) birds was less than of early (February to March), but the late hatched were older when they started to lay, so that fewer eggs were produced per bird in a season, offsetting the advantage of greater numbers of birds. The economic significance of the period of highest mortality and the breeding of resistance to leucosis are discussed.

T. D. Bell.

5964

MEREGALLI, A. La lotta contro la mortalità dei suinetti. [The struggle against piglet mortality.] *Riv. Zootec.*, 1955, 28, 123-124.

DEFICIENCY DISEASES

5965

STRAUCH, D. and BRÜNNER, F. Weitere Untersuchungen zur Frage der Mitwirkung des Mineralstoffmangels bei Störungen der Fruchtbarkeit der Rinder. [Further studies on the part played by deficiency of minerals in disturbances of fertility in cattle.] *Berl. Münch. tierärztl. Wochenschr.*, 1955, 68, 160-163. [Vet. Hyg. Inst., Justus Liebig Hochschule, Giessen.] English summary.

Three herds in Württemberg were studied; in each there was difficulty in getting the cows in calf, and in 2 the cows had non-specific vaginitis. The soil and homegrown fodder were somewhat low in P, but in 2 of the herds the P intake was apparently adequate, the diets containing 0.54 and 0.49 per cent. phosphoric acid. The herds were divided into 3 groups and given for 2 months no treatment, or a mixture of CaCO_3 and phosphate at the rate of 120 g. daily, or a trace element solution containing Mn, Co, Cu, Zn and I added to the concentrates.

At the end of treatment the vaginitis had cleared up in 12 out of 14 affected cows given Ca and P, 9 out of 13 given trace elements and 2 out of 12 untreated. Five out of 5 cows not pregnant at the beginning were in calf after treatment with Ca and P and 5 out of 6 treated with trace elements, but neither of the 2 untreated sterile animals bred.

D. Duncan.

5966

GRASITUIS, J. Klinische lessen over sporenelementen. [Clinical lectures on trace elements.] *Tijdschr. Diergeneesk.*, 1955, 80, 379-399. [Inst. Mod. Veevoeding "De Schothorst", Hoogland.]

This lecture deals with copper. See also Title 4450, Vol. 25.

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5967

SHANKS, P. L. and DONALD, L. G. An unusual mouth condition in sheep. *Vet. Rec.*, 1955, 67, 312-313. [N. Scotland Coll. Agric., Aberdeen.]

The condition reported consisted in nervous excitability and inability to close the mouth, with resultant loss of weight and emaciation through inability to eat. All the lambs of a flock grazing hill pasture were affected more or less severely. All but the 3 worst recovered when given bonemeal and injections of vitamins A and D. Consideration of the soils and fertilising programmes of the pastures indicated that the cause of the condition was gross deficiency of Ca and P. Reseeded pastures should not be used for growing stock, in which the Ca and P requirements are high, and if this cannot be avoided, extra supplements of bonemeal should be given.—T. D. Bell.

5968

MANN, I. A mobile bone meal factory to counter phosphorus deficiency in African livestock. *Colonial Plant Animal Prod.*, 1954, 4, 275-292. [Dept. Vet. Serv., Kenya Colony.]

Pasture analyses and the replies received to a questionnaire addressed to veterinary workers support the conclusion that throughout Kenya deficiency of P is a condition limiting production. The equipment described, mounted on a 3-ton lorry and trailer, has been designed to deal with bones at the rate of 3 tons a day and, under careful European supervision, to provide a product completely sterile for feeding to stock. The capital cost excluding the price of the lorry is £2250, and it is estimated that bonemeal might be sold to African farmers at about £11 per ton; the price current in Nairobi is £18.—D. Harvey.

5969

BENNETTS, H. W. Copper and cobalt deficiency of livestock in Western Australia. *J. Agric. W. Austral.*, 1955, 4, 43-63. [Animal Health and Nutrit. Labs.]

The distribution of Cu and Co deficiencies in Western Australia is described. There is some seasonal fluctuation in the severity of signs of deficiency. Cu deficiency in cattle produces retarded growth and unthriftiness of young stock, limb abnormalities, diarrhoea and anaemia. Unthriftiness, anaemia and diarrhoea occur also in adult cattle, and suppression of oestrus is common. Cattle eat soil. In severely deficient areas "falling disease" used to occur, but it has now been eliminated. Sheep have stringy wool, anaemia and diarrhoea, and lambs have ataxia. Foals in the Gingin and Dandaragan districts used to have limb abnormalities, now prevented by stable-feeding the mares.

Besides the serious Co deficiencies in the Denmark district and in the "coast disease" areas, there is widespread occurrence of less severe deficiency within about 15 miles of the coast.

The quantities of Cu and Co needed by different classes of stock and the best ways of supplying them are discussed.—D. Duncan.

5970

BARBER, R. S., BRAUDE, R. and MITCHELL, K. G. **Studies on anaemia in pigs. 1. The provision of iron by intramuscular injection.** *Vet. Rec.*, 1955, **67**, 348-349. [Nat. Inst. Res. Dairying, Univ. Reading.]

Anaemia, as indicated by Hb level, was prevented by a single intramuscular injection of 2 ml. of an iron-dextran complex containing 50 mg. Fe per ml. The injection was given on the seventh day of life. The result was comparable to that obtained in a control group getting 30 mg. Fe as pyrophosphate in solution by mouth daily from the 7th to the 14th day. Another type of intramuscular injection of Fe, a suspension of phosphate, had no effect, and results with this were the same as with untreated controls, which became seriously anaemic.—T. D. Bell.

5971

BROWNLEE, W. M. **The treatment of piglet anaemia.** *Vet. Rec.*, 1955, **67**, 350-354. [Res. Dept., Vet. Sci. Div., Boots Pure Drug Co., Ltd., Thurgarton, Notts.]

Hb was estimated and total Fe in circulating Hb was calculated in baby pigs which had been made anaemic by being housed in conditions preventing access to Fe and being given a diet low in Fe. Some piglets were treated with a suspension of iron phosphate, or with an iron-dextran complex, both by an intramuscular injection supplying 100 mg. Fe. Others received by mouth a single dose of 500 mg. reduced Fe, and others remained as untreated controls. The injection of Fe as phosphate provided no Fe for Hb formation. Oral administration of reduced Fe gave a utilisation of 5 per cent., and the Fe in the form of iron-dextran complex was used to the extent of 85 per cent. in 9 days. In practice, one injection might cure anaemia but a second after 10 days would be advantageous if the pigs' appetite were poor. The creep feed should have a high Fe content.

T. D. Bell.

5972

TUCKER, H. F. and SALMON, W. D. **Parakeratosis or zinc deficiency disease in the pig.** *Proc. Soc. Exp. Biol. Med.*, 1955, **88**, 613-616. [Dept. Animal Husb., Agric. Exp. Stat., Alabama Polytech. Inst., Auburn.]

Pigs with severe dermatitis grew slowly and had diarrhoea, vomiting and anorexia; in extreme

cases they lost weight and died. Calcium pantothenate, nicotinic acid, pyridoxine, inositol, biotin, folic acid, vitamin B₁₂, choline, ascorbic acid, vitamins A, D, E and K, antibiotics, methionine, lysine and tryptophan in different combinations neither cured nor prevented the disease. In experiments with minerals the incidence and severity of the dermatitis were increased significantly by addition of 2 per cent. bonemeal or 1.5 per cent. CaCO₃ to the basal ration, but a mixture of trace elements effectively prevented its appearance. In further tests MnSO₄ alone had no effect, but addition of ZnCO₃ to the ration promptly cured the disease. The parakeratosis (dermatitis) syndrome occurred in pigs on basal rations containing 34 to 44 p.p.m. Zn and was cured by a supplement of 0.02 per cent. ZnCO₃. This indicated that in the pig the Zn requirement is relatively high.

I. A. M. Lucas.

5973

WÖHLBIER, W. **Erfahrungen mit Futterzusätzen bei Ernährungsstörungen in Süddeutschland. [Studies with supplements in nutritional disturbances in South Germany.]** *Ztschr. Tierernährung Futtermittelk.*, 1955, **10**, 61. *Proc. [Hohenheim.]*

See also Absts. 4750, 4893, 4987, 5341.

DISEASES OF METABOLISM

5974

LE BARS, H. and SIMONNET, H. **Quelques particularités métaboliques chez les ruminants. 1. Absorption et utilisation des acides gras à courte chaîne. [Certain metabolic peculiarities of the ruminants. 1. Absorption and utilisation of short-chain fatty acids.] 2. Conséquences physiologiques de l'utilisation des acides gras à courte chaîne. [2. Physiological consequences of the utilisation of short-chain fatty acids.] 3. Le rumen, organe régulateur. [3. The rumen as a regulating organ.]** *Rec. Méd. vét.*, 1954, **130**, 689-700; 777-788; **131**, 16-25.

A review of ruminant metabolism leading to a discussion of the cause of ketosis in cattle.

E. M. Hume.

5975

MARSHAK, R. R. **The nutritional concept as the underlying cause of bovine ketosis.** *Vet. Med.*, 1955, **50**, 159-163. [Springfield, Vt.]

5976

TOLLERSRUD, S. and WESTGAARD, P. **Laktasjonsjukdommer. [Disorders of lactation.]** *Landbruks hogsk. Inst. Husdyrernaering Föreläsningsskr.*, 1954, *Særtrykt No. 144*, pp. 16.

A brief semi-popular account is given of milk fever, acetonaemia and tetany, including grass tetany. Just before the war there were 7 or 8

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thousand cases of milk fever annually in Norway. With more pasture as feed and lower milk yields, the incidence fell to half that during the war. It has since risen greatly, to 6 times the 1945 incidence in 1950. On the other hand, acetonuria increased greatly during the war and fell after it, to rise again recently. Tetany also has increased recently and mortality was 14 or 15 per cent. in 1951.

All these disorders are attributed to disturbance of adrenal function, with complications, *e.g.*, of parathyroid in milk fever, of pituitary in milk fever and in acetonuria, which may be induced by underfeeding. The extension of grass tetany may be related to overmanuring with K relative to Ca and Mg.

General advice is given on feeding, with special emphasis on adequate feeding but not over-feeding during the dry period. Boda and Cole (*Hoard's Dairyman*, 10 January 1954) are quoted as having no milk fever in their herd and attributing their freedom to a low-Ca ration of green oats and barley with large supplements of P for 30 days before calving. The Ca:P ratio was about 1:3. Recommended Norwegian rations all have more Ca than P, and under Norwegian conditions a ratio of 1:3 would require very large supplements of P. A ration of timothy hay, timothy silage, straw and wheat bran would have almost equal amounts of Ca and P. The pros and cons of high-protein rations in the dry period are discussed. The conclusion is that the ration should be adequate in amount (Breirem's standard), appetising and balanced, with a supplement of P and of Cu and Co where necessary.—I. Leitch.

5977

LEWIS, E. F. Post-parturient metabolic disorders in the cow. An approach to therapy with special reference to prolonged recumbency. *Brit. Vet. J.*, 1955, 111, 253-257. [Dept. Med., Royal Vet. Coll., Streatley.]

Ideally, blood analysis should precede treatment for milk fever in dairy cows, since imbalance of Ca and P may be the cause rather than simple deficiency of Ca, but this is not always possible in practice. Magnesium should not be given unless there are clear indications of the need for it. Treatment with calcium borogluconate is described. Some cows will require more than others. Of 755 cases, 337 responded to one injection and only 12 showed inability to rise. The condition is often associated with other disorders, possibly resulting from mineral deficiency, such as degenerative muscle changes.—T. D. Bell.

5978

SEEKLES, L. and BOOGAERDT, J. Uitkomsten van een voederproef met magnesium-oxyde.

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houdende voederkoekjes ter voorkoming van grastetanie. [Results of a feeding test with cattle cake with magnesium oxide to prevent grass tetany.] *Tijdschr. Diergeneesk.*, 1955, 80, 331-346. [Lab. Med. Vet. Chem., Rijks-univ., Utrecht.] English, French and German summaries.

An earlier paper reviewed the problems of grass tetany (Title 3797, Vol. 23). A large-scale experiment was begun in spring 1954 with the co-operation of veterinary officers. An analogy is thought to exist between grass tetany and "ordinary" intestinal disturbances because of common signs which are detailed. Grass tetany, or better "nutritional tetany", is regarded as a special form of "indigestion".

The speed with which the syndrome develops and the incidence on different soil types exclude the possibility that, in the Netherlands, an absolute deficiency of Mg could, in general, be the cause of grass tetany. Prevention, nevertheless, must be based on maintaining a normal level of Mg in blood. Means to that end might be (1) the administration of some substance which would affect the Mg regulating centre in the direction opposite to that of the poisons formed in the gastro-intestinal tract of high-producing cows; (2) avoidance of the excesses of current practice, by reducing the over-use of N and K fertilisers, or by rationing pasture or giving supplements of low-protein, high-fibre feeds such as beet pulp; (3) prevention of the fall of blood Mg by subcutaneous injection of large amounts, 30 to 50 g., of $MgCl_2$, or daily administration by mouth of a Mg salt to counteract the toxic effects of feed. Grass tetany will not be completely prevented by these measures as in Norway, where the tetany-paresis syndrome is due to absolute Mg deficiency, or in England in cattle pastured all the year round. The third treatment is that most likely to be put into practice.

The use is recommended of commercial or technical MgO , with safeguards regarding absence of poisonous metals and solubility in rumen fluid; it should be incorporated in amounts to supply 25 to 30 g. Mg daily.

The incidence of grass tetany is about 1 to 2 per cent. of the total dairy herd in a normal year, 1.9 per cent. in the province of South Holland where the pasture is most productive and most heavily stocked. Because the incidence is so low, herds were chosen there and in the province of Utrecht in which grass tetany was known to occur with an incidence of 6 to 8 per cent. In a total of 1426 cows in the control group only 17 had grass tetany in the spring of 1954 (60 expected) and in the lot of 976 given Mg-containing cake only 4. The difference was significant. A more extensive and more rigidly controlled experiment was to begin in the spring of 1955.—I. Leitch.

5979

O'MOORE, L. B. Tetany with fatal termination in ewes. *Irish Vet. J.*, 1955, 9, 95. [Biochem. Div., Vet. Res. Lab., Thorndale.]

An outbreak of tetany with low blood Mg is reported in a flock of 3-year-old ewes which had recently lambed and were grazing on 2- to 4-year-old leys. Convulsions were precipitated by any sudden excitement such as falling into a ditch or being driven through a gap. Analysis of serum of 15 ewes taken at random showed 11 with serum Mg values of 2.5 mg. per cent. and 4 with values of 1.4 mg. per cent.; 2 ewes in convulsions had values of 1.2 mg. per cent. Mg and 6.0 mg. per cent. Ca. Injection of a solution of Ca and Mg cured the condition. It is suggested that leys should be grazed alongside permanent pasture.

J. S. Thomson.

5980

POOK, H. L. Hypomagnesaemia in ewes. *Vet. Rec.*, 1955, 67, 281-282. [Salisbury.]

In a flock of Border Leicester \times Suffolk ewes running on downland ley pasture, 11 ewes died suddenly about 10 days after lambing twins. Death occurred after convulsions in a matter of 2 or 3 hr. Blood samples could not be obtained from affected ewes, but in 2-tooth ewes a week after lambing 3 out of 4 had serum Mg levels of 1.3 mg. per 100 ml. or less.

Mineral licks of high Mg content were given, but without effect, and Mg was not acceptable in trough feeds. One ewe found in convulsions recovered after 2 subcutaneous injections of Mg. Losses ceased when the ewes were removed from the first-year ley to a 4-year-old ley pasture.

D. Duncan.

5981

HALLGREN, W. Studies on parturient paresis in dairy cows. *Nord. Vet.-Med.*, 1955, 7, 433-463. [Res. Stat., Vet. Inst., Skara, Sweden.] German and Norwegian summaries.

In a district in the west of Sweden in 1951 to 1953 a veterinary surgeon treated 881 cows with diagnoses of parturient paresis. About 85 per cent. had typical milk fever and responded to Ca given intravenously. Of the other 15 per cent., 77 were examined by research station staff, and 12 of these were also diagnosed as milk fever in relapse; all recovered after more Ca. The others were a mixed lot, of which 9 had myocardial weakness. Many were unable to rise, but alert, and these usually had very low serum inorganic P and responded to intravenous P, usually as calcium hypophosphite. It is concluded that several other metabolic disorders can be confusingly like parturient paresis.

Another 481 fatal cases were obtained over the whole of Sweden, 212 in 1950-51 and 269 in 1953-1954. The diagnosis in all was clinical, without

chemical blood tests. Critical review suggested that in fact only 26.9 and 27.1 per cent., in the 2 separate years, were of true milk fever. Another 20.3 and 5.6 per cent. were down but alert and probably represented the low-P condition; the fall in mortality is attributed to better diagnosis. Liver and heart disease were the next in frequency when post-mortem diagnosis was considered.

The differential clinical diagnosis of parturient paresis is discussed. The Sulkowitch test for urine Ca is not of much value (see also Abst. 4571, Vol. 21). There was little correlation between urine Ca and blood Ca.—D. Duncan.

5982

MCCLYMONT, G. L. and SETCHELL, B. P. Ovine pregnancy toxæmia. 1. Tentative identification as a hypoglycaemic encephalopathy. *Austral. Vet. J.*, 1955, 31, 53-68. [Nutrit. Res. Lab., N.S.W. Dept. Agric., Vet. Res. Stat., Glenfield.]

Fasting for 4½ days caused pregnancy toxæmia in 13 of a group of 50 ewes which were 130 \pm 4 days pregnant. All the sick ewes carried twins. Blood sugar values during the fast reached significantly lower levels in the 13 ewes which developed pregnancy toxæmia, but in some returned to normal while signs of the disease persisted. High blood ketone values were not associated with the appearance of the signs. Pathological macroscopic changes in the liver, kidney and adrenal gland were not constant in sheep killed before natural death intervened, and these changes were considered secondary. The changes observed in nervous reaction were typical of cerebral depression due to low blood sugar and were similar to the signs induced by insulin hypoglycaemia. The induction of these signs depended on the severity of the hypoglycaemia and on its duration. If the nervous signs of pregnancy toxæmia are due to cerebral depression of this type, failure to respond to glucose or other treatment can be explained by the fact that the changes in the brain have reached a stage when they are irreversible.—T. D. Bell.

5983

LUDVIGSEN, J. Undersøgelser over den såkaldte "muskeldégeneration" hos svin. [Studies of so-called "muscle degeneration" in pigs.] [2. Nogle virkninger af jodkasein og metylthiouracil på stofskifteprocesserne, muskulaturen og skjoldbruskkirtlen hos unge voksende svin. [2. Some effects of iodinated casein and methylthiouracil on metabolism, musculature, and the thyroid gland in young growing pigs.] 3. Virkningen af jodkasein, tyroxin og diiodhistidin på tilvækst, foderforbrug, muskulatur, skjoldbruskkirtel og kødkvalitet. [3. The effect of iodinated casein, thyroxine and

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diiodohistidine on growth, feed utilisation, musculature, the thyroid gland and pork quality.] *Forsøgslab. København Beretn.*, 1955, No. 278, pp. 59; No. 279, pp. 60. English and German summaries.

2. For Part 1, which outlines the nature and incidence of the disorder, see Abst. 1497, Vol. 25.

Literature on the effects of iodinated casein and thiouracil is reviewed and the suggestion is made that the discordant results with thiouracil may be explained on a breed basis, pigs with a high natural rate of growth showing much less effect than those with a low rate. It is further suggested that this depends on an association of high thyroid activity and slow growth. The pigs with which this report deals were not related to those described in Part 1.

The experiments with methylthiouracil and iodinated casein were repeated with 3 younger pigs of about 45 kg. liveweight, with a ration of cereals, soya bean meal, sour skimmed milk, minerals and "vitamin oil". The iodinated casein, 1.0 g. daily; arrested growth, i.e., weight increase, and was continued for only 14 days and methylthiouracil, 0.5 g. daily, was discontinued after 28 days when growth rate fell. Both were given again 14 days before slaughter. Balances of N, P and Ca were estimated over 14 days in each of the intervals with and without the drugs. Four control pigs were similarly treated. The results are presented in tables and graphs.

Retentions of N, P and Ca were above control levels in the pigs given thiouracil and below in those given iodinated casein. There was no difference in dry matter, total and protein N or soluble N in muscle, yet the animals given iodinated casein had "total muscular degeneration". This is in direct contradiction of the earlier findings with older pigs. An explanation in terms of blocking and stimulating the pituitary thyrotropic hormone is offered, which is thought to be supported by the finding that the thyroids of the pigs given iodinated casein were small and inactive, in those given thiouracil larger and more active than normal.

3. Further studies were made with 32 pigs from the same herd and closely related to those on which the first experiments were made, i.e., with a genetic predisposition to muscle degeneration. The ration was of cereals, skimmed milk, minerals and "vitamin oil". Some of the pigs were given a supplement of vitamin B₁ and pantothenic acid.

Many of the animals lost appetite and showed diarrhoea from time to time, without fever or any sign of infection, and with apathy and occasional death. These signs are thought to be part of the genetic syndrome. Muscle changes were advanced in the pigs that died, and the deaths are attributed to cardiac paralysis by the K of the effusions into

the heart muscle. There was hypertrophy of the adrenal cortex.

The curative effect of iodinated casein found in the first experiments was confirmed. Thyroxine in a large dose had no effect on the muscle; diiodohistidine had none on energy exchange but a slight effect on muscle, and it greatly increased thyroid weight. The effect of iodinated casein must be due to some other sub-product; it is not related to its effect on respiratory exchange and, in two preparations tested, that with little effect on energy exchange was by far the more active in curing muscle changes.

Hams from the pigs treated with iodinated casein, pickled, pasteurised at 76° C. and canned, were much superior in quality to those from control pigs with muscle degeneration.—I. Leitch.

POISONS OCCURRING IN FOOD

5984

HARVEY, J. M. and MOULE, G. R. Fluorosis of Merino sheep in Queensland. 3. The management of flocks to overcome fluorosis. *Queensland Agric. J.*, 1955, 80, 113-115.

For parts 1 and 2 see Abst. 4502, Vol. 25.

An experiment was made with 4 groups of 20 lambs, 3 months old at the outset. They were fed on poor quality grassy lucerne hay which they had to pull out of the bale. The experiment continued for 30 months. Group 1 had only water containing 10 p.p.m. fluoride for the whole period; group 2 had access to water containing 10 p.p.m. fluoride and water free from fluoride for alternating periods of 3 months; group 3 were similarly treated, but the alternating periods were of 6 months; group 4 had periods of 6 months on water containing 10 p.p.m. fluoride alternating with 3-month periods on fluoride-free water. These treatments were thought to simulate conditions arising in practice.

The teeth of sheep in group 1 were seriously affected, and large amounts of F were deposited in the bones. Group 3 suffered almost as much as group 1, and group 4 slightly less than group 3. There were only 3 sheep in group 2 which showed any sign of fluorosis.

The application of these findings to practical management is described. It is important not to let weanling lambs have access to water containing a large amount of fluoride for long periods. If no water free from fluoride is available, younger stock should be kept as near the source as possible so that they may have water which has not been concentrated by evaporation.—T. D. Bell.

5985

TESINK, J. De te nemen maatregelen bij chronische rundveefluorosis. [Measures to be taken in chronic fluorosis of cattle.] *Tijdschr.*

Diegenesek., 1955, 80, 299-308. [Kockeng-en.] English, French and German summaries.

For an earlier discussion of industrial fluorosis in Holland see Abst. 4503, Vol. 25.

Industrial fluorosis in a cow is described in detail. Where fluorosis occurs, cattle may not be bred. The factory is responsible for taking over all cattle and for replacing all immature cattle with others in which the dentition is complete. The herd shall be given cake in which Al_2O_3 is incorporated.

Methods are described for estimation of F in water, blood, urine, milk, feed and faeces, teeth and bone, horn and hair, soil, hay and grass.

I. Leitch.

5986

BUXTON, J. C. and ALLCROFT, R. **Industrial molybdenosis of grazing cattle.** *Vet. Rec.*, 1955, 67, 273-275; 276. [Vet. Invest. Lab., Sutton Bonington, Loughborough.]

Progressive emaciation and diarrhoea occurred in grazing cattle near an industrial town. The affected cattle were found to have blood Cu values of from 0.01 to 0.07 mg. per 100 ml. The conditions responded to treatment with $CuSO_4$ in the food or as a drench. Pasture samples contained, in p.p.m. dry matter, Cu 24 to 28, Mo 14 to 126 and F 4 to 12, and tree bark up to 250 p.p.m. Mo. Cows on one farm were excreting from 7 to 14 p.p.m. F in the urine after they had been housed for 2 months. Two animals had mottled incisors, but bone exostoses and lameness were not seen.

It was concluded that the condition was produced by aerial contamination of the pastures with Mo, and that it could be controlled by regular supplements of Cu.—D. Duncan.

5987

PARKER, W. H. and ROSE, T. H. **Molybdenum poisoning (teart) due to aerial contamination of pastures.** *Vet. Rec.*, 1955, 67, 276-279. [Vet. Invest. Dept., Wolverhampton.]

Scouring occurred in cattle on pastures in the English midlands near an aluminium alloy factory. The herbage contained from 25 to 50 p.p.m. Mo on one farm, and Cu treatment was quickly effective in curing the cows, which before treatment had blood Cu values as low as 0.02 mg. per 100 ml. On 2 other farms the blood Cu values and the response to Cu were similar. On a fourth farm, nearer the factory, pasture and trees were killed by contamination but the cows were in good condition; this pasture was subject to contamination with Cu and Zn as well as with Mo, and it was concluded that the Zn was responsible for the damaged herbage, and the Cu acted as antidote to the Mo.—D. Duncan.

5988

Tengkawang-schroot ongeschikt als veevoeder. [Tengkawang meal not suitable as cattle feed.] *Landbouwk. Tijdschr.*, 1955, 67, 216. [Rijks-landbouwproefstat., Hoorn.]

Tengkawang seeds are the seeds of species of *Shorea*, *Isoptera* and *Hopea* from which oil is expressed. The composition of the residue as cake or meal is shown. In a digestibility test 3 wethers given 600 g. meal and 600 g. grassmeal lost appetite within a day or two and one died with blood in the faeces and signs of severe poisoning. Since this might have been due to contamination, a second test was begun later with meal which did no harm to pigs as 40 per cent. of their ration. Wethers would not eat 600 g. and had slight diarrhoea; again one died suddenly. The percentage composition of the meal is: moisture 11.4, ash 5.1, crude protein 17.4, ether extract 1.4, crude fibre 10.2, N-free extract 54.5.—I. Leitch.

5989

COOKE, A. R. **The toxic constituent of *Indigofera endecaphylla*.** *Arch. Biochem. Biophys.*, 1955, 55, 114-120. [Hawaii Agric. Exp. Stat., Univ. Hawaii, Honolulu.]

The toxic principle of creeping indigo (*Indigofera endecaphylla*), one of the most promising legumes in the Hawaiian Islands, has been shown to be β -nitropropionic acid. In addition there is a fairly high nitrite content.—J. S. Thomson.

5990

PICKEN, J. C. (JR.), JACOBSON, N. L., ALLEN, R. S., BIESTER, H. E., BENNETT, P. C., MCKINNEY, L. L. and COWAN, J. C. **Toxicity of trichloroethylene-extracted soybean oil meal.** *J. Agric. Food Chem.*, 1955, 3, 420-424. [Iowa State Coll., Ames.]

The usual process of extracting soya beans with trichloroethylene was modified to encourage or impede auto-oxidative decomposition processes, the products of which were thought to be responsible for the toxicity of soya bean oilmeal extracted in this way. Trials with young calves showed that the modification introduced did not alter the toxicity.

Supplements of extracted soya bean oilmeal, soya protein and casein to which were added the products of auto-oxidation developed in the trichloroethylene extraction process did not cause any of the signs associated with poisoning by trichloroethylene-extracted soya bean oilmeal.

T. D. Bell.

5991

KLUSSENDORF, R. C. **Hemorrhage from feeding soybean oil meal.** *North Amer. Vet.*, 1955, 36, 273-274. [Terre Haute, Ind.]

N.A. and R., October 1955

A short note on the danger of soya bean oilmeal which has been extracted with trichloroethylene.

5992

FORSYTH, A. A. **British poisonous plants.** *Minist. Agric. Fish. Bull.* No. 161, 1954, pp. vi + 116. H.M.S.O., London. Price 6s. 6d. net.

See also Abst. 5670.

IMMUNITY

5993

RODABAUGH, D. E. and ELDER, C. **The effect of a low protein ration in hog cholera immunization.** *J. Amer. Vet. Med. Assoc.*, 1955, 126, 418-421. [Dept. Vet. Pathol., Sch. Vet. Med., Univ. Missouri, Columbia.]

In experiments in 4 consecutive years some sows were given a balanced ration and had access to bluegrass pasture, while others received a low-protein ration of ground yellow maize 95, linseed meal 5 parts and a mineral mixture and were kept on a plot of bare ground. The young pigs after weaning at 8 weeks were kept under the same conditions and were vaccinated with different products against hog cholera after 2 weeks, and 30 days later received a well-balanced fattening ration. Their immunity was challenged 45 or 90 days after vaccination by injection of fresh hog cholera virus, after which body temperatures were recorded daily for 2 weeks.

In pigs given antiserum and virus there was no significant difference between the diet groups and immunisation was effective. Modified virus vaccines either alone or with antiserum were less uniformly effective, but in 2 of the 3 years in which they were used clinical signs and deaths occurred only in pigs of the low-protein group. Even in this group most pigs showed nothing more than a transient rise in temperature.

It is concluded that the low protein intake was not solely responsible for failure of complete immunisation.—D. Duncan.

5994

ELDER, C. and RODABAUGH, D. E. **Role of protein in immunization of swine against cholera.** *Missouri Agric. Exp. Stat. Res. Bull.* No. 559, August 1954, pp. 16.

See above Abst.

5995

ÖBERG, G. and MELLANDER, O. **Antibody formation and nutrition. 2. Antibody titre in lambs and goats fed on homologous and heterologous milk using influenza and diphtheria vaccine as antigens.** *Acta Soc. Med. upsalien.*, 1955, 60, 14-16. [Hosp. Infect. Dis., Uppsala.]

For part 1 see Abst. 3807, Vol. 23.

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2. The experiment reported in the earlier paper was repeated with 5 more pairs of twin lambs, with similar results. Ten goat kids were removed from their dams when 2 days old and bottle-fed with fresh cow's or goat's milk. At 8 to 14 days old they were inoculated with influenza A virus and antibody titre was measured up to 82 days afterwards. The mean value was always higher in the goats fed on goat's milk, though weight increases and general condition did not differ. With diphtheria vaccine both groups gave about the same antibody response.—D. Duncan.

5996

SPEDDING, C. R. W. **The effect of a sub-clinical worm-burden on the productivity of sheep.** *J. Brit. Grassland Soc.*, 1955, 10, 35-43. [Grassland Res. Inst., Hurley, Berks.]

From infested ewes worm-free lambs were reared by folding the lambs and ewes on to fresh pasture every third day. They never returned to the pasture once it was grazed. Another group of similar lambs was allowed to become infested by grazing on heavily infested pasture. This group and their ewes were then grazed on the pasture already grazed by the worm-free group. Over a period of 2 months, the worm-free lambs showed a faster rate of liveweight gain than the infested lambs.—G. C. Hunter.

5997

GRUNSELL, C. S. **Seasonal variation in the blood and bone marrow of Scottish hill sheep.** *J. Comp. Pathol.*, 1955, 65, 93-107. [Dept. Vet. Hyg., Royal (Dick) Sch. Vet. Studies, Univ. Edinburgh.]

The relation of findings for blood and bone marrow to the helminths and nutritional state of Scottish hill sheep is discussed. Blood sampled in March and April had a lower red cell count than that taken in January, in early February and from May onwards. It is suggested that this is caused by the higher worm burden present in the sheep at that time of the year. There is a significant negative correlation between worm burden and packed cell volume in samples from January to early April. The absence of any association after mid-April is thought to be due to the improved nutrition of the sheep. The anaemia caused by *Trichostrongylus* spp. and *Ostertagia* spp. is not produced solely by blood loss.—G. C. Hunter.

5998

HILL, C. H., GARREN, H. W., KELLY, J. W. and BARBER, C. W. **Effect of nutrition on the resistance of chicks to fowl typhoid.** *Federation Proc.*, 1955, 14, 437. *Proc.* [Dept. Poultry Sci., N. Carolina State Coll., Raleigh.]

7. BOOK REVIEWS

5999

HAMBIDGE, G. **The story of FAO.** D. Van Nostrand Co., Inc., New York and Toronto : Macmillan and Co., Ltd., London, 1955, pp. xii + 303. Price 48s. net.

After the Conference at Hot Springs in 1943 there was created an Interim Commission on Food and Agriculture. Its membership was representative of all the countries which had participated at Hot Springs and its task was the preparation of plans for a permanent food and agriculture organisation. Before it could be accepted the draft constitution which the Commission drew up required approval by at least 20 of the governments and, when that was given, the first Conference was called for 16 October 1945 in Quebec. There the Constitution was signed and on that date FAO came into being with a membership of 42 countries. All this and many of the results which have followed are told in this history of the Organization by its present North American Regional Representative, whose early associations with it were as Executive Secretary to its parental Interim Commission and later as its first Director of Information.

The pages tell graphically and often in American idiom of the conception, birth and growth of FAO and of its activities in the four main regions Near East and Africa, Far East, Latin America and Europe. For each area the system followed is to describe first the regional projects and then the investigations in the individual territories. Much of the narrative is at the level of high policy, but the 48 illustrations, whether of man or of beast, show the down-to-earth nature of the work. The direct words of one sentence in which are defined the Organization's aims in the field of extension work in the Near East in particular, might well be used in a wider context to describe a fundamental objective; "It must dig down into the village life and bring up native leaders who can be imbued with the aims and the philosophy of this great educational movement, now becoming world wide. It must, above all, seek the full understanding and co-operation of farmers and farm workers and their families."

The story is one of success told sometimes with picturesque detail and on occasion in dramatised form, with little mention of difficulties and frustrations being encountered in the receiving countries. The absence of such references from the narrative raises the interesting and by no means academic question whether technical assistance provided by an international organisation is regarded differently and with less suspicion than it would be were it

coming instead from some metropolitan government.

The high price of the book may limit to a significant extent its circulation in many countries outside the dollar area where its appeal might be greatest.—D. Harvey.

6000

BANKS, A. L. (Ed.) **The development of tropical and sub-tropical countries with particular reference to Africa.** Edward Arnold (Publishers), Ltd., London, 1954, pp. xvi + 217. Price 18s.

In July 1953 an informal seminar was held in Gonville and Caius College, Cambridge. It was attended by 32 persons of whom most were from university staffs, some were from international foundations and only one was a woman. The subject discussed at the 7 sessions spread over 4 days was, in the main, the impact on tropical areas of the progress in technology made in the temperate regions of the world. In particular the continent of Africa was in mind. It is the advance in one branch of technology, that of sound recording, that has made the form of this book possible and, after some editing of the transcriptions of records, the reader can now, in a sense, listen in to the discussions that took place. From a reader's point of view the result is interesting; from the reviewer's it is perplexing, since the magnitude of the problems discussed seems to match well with the vastness of the area in which they have arisen.

The proceedings began with a broad review of the problems inherent in the development of Africa and, in the second session, rose to a higher level when the objectives of technical development were considered. The sessions which followed were devoted to power and water, food and its production, health and welfare, and education. The final session took the form of statements of possible lines of action suggested, in order round the table, by 24 of the participants who imagined themselves faced with deciding what seemed to them individually the most desirable project. Whether those coming later in the circuit were influenced or not by the opinions of earlier speakers is impossible to decide, but the subjects placed first in order of precedence were almost as numerous as the proposers themselves.

It seems probable that all agreed on the complexity of the situations to which their differing proposals would give rise. There was, therefore, much wisdom in the suggestion made earlier that the political authorities in both parent states and

colonial countries should not remain ignorant of the changes occurring in the countries which they rule.—D. Harvey.

6001

HARRIS, L. J. **Vitamins in theory and practice.** Cambridge University Press, 1955, 4th ed., pp. xxii + 366. Price 35s.

The present edition is the fourth. The first three appeared in the short period from 1934 to 1938. The fourth comes after a much longer interval, and bringing the matter up to date must have been a very formidable undertaking. At first one regrets that there is no bibliography, only names and dates, but one quickly realises that to have given references would have enormously delayed the appearance of the book and would have greatly altered its character. Footnotes too are almost non-existent, and parentheses are not very numerous. The matter is thus properly digested into the narrative with the result that the story can be read with comfort and the thread never be lost, which in so intricate a tale is particularly important. Dr. Harris's great gift for lucid exposition ensures the reader's enjoyment.

The two opening chapters summarise the salient points in the history of vitamins and introduce the reader to the ever-growing number of them. Ten chapters are devoted to individual vitamins or small groups of vitamins, and the last is called "Dietetics—What to Eat". It is very clear and simple, and provides a lot of information valuable for the practical lay person. The book aims at being intelligible and of interest to the general reader, but it is intended also for science students, medical men and women and the like. It certainly should serve them exceedingly well. It is so clearly written that the great bulk of it should be comprehensible to the lay reader, and anyone who acquaints himself with the whole contents should have a very good general working knowledge of vitamins. It is a book that every vitamin worker will find himself referring to if he keeps it at hand.

It is not possible to comment fully on what has not been included, but one does feel that reference might have been made to the production of vitamin E deficiency and muscular dystrophy by cod liver oil. The adverse effect of cod liver oil is a practical problem in animal husbandry. It affects cattle, poultry and rabbits, and the lay mind will have somehow to digest the fact that the one-time panacea has changed, in certain connections, into a mischief-maker. Dr. Harris has with wisdom and tact sought throughout to promote a scientific outlook in his readers, and here is an example which the scientist could use to explain to the layman that very unwelcome and upsetting facts can come to light in the course of scientific discovery.

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There is an index, but for a book of such wide scope it could have been more comprehensive.

E. M. Hume.

6002

BLADERGROEN, W. **Einführung in die Energetik und Kinetik biologischer Vorgänge. [Introduction to the energetics and kinetics of biological reactions.]** Wepf and Co., Verlag, Basle, 1955, pp. ix + 368.

The recognition that many aspects of the behaviour of organisms can be interpreted in terms of the properties of chemical reaction systems has emphasised the importance of the part that thermodynamics and kinetics can play in the development of biochemistry. In recent years a number of articles and reviews have dealt with aspects of this problem, but no systematic account has been available. This book is therefore to be welcomed. It is written at a relatively elementary level with adequate introductions to the fundamentals of both physical chemistry and biochemistry. The most satisfactory sections are those dealing with the concepts of thermodynamics and their application to biological problems. The chapters dealing with kinetics are less comprehensive, since the only type of kinetics considered in detail is that of enzymic reactions. The formal kinetics of reaction systems is not considered, although there are now a number of instances in which this has been applied successfully to biological reactions both *in vitro* and *in vivo*. The book is, however, successful in achieving an integration between biochemical and physico-chemical ideas and in outlining a field in which there are likely to be important developments in the future.—H. G. Bray.

6003

GLICK, D. (Ed.) **Methods of biochemical analysis.** Volume 2. Interscience Publishers, Inc., New York and London, 1955, pp. vi + 470. Price 75s.

The second volume of this series maintains the high standard set by the first. The analytical methods reviewed include those for steroids (infrared spectroscopy), adrenaline and *nor*adrenaline, lipids, lipoxidase, compounds with folic acid activity, vitamin E, coenzyme A, proteolytic enzymes, glutathione, serum glycoproteins and cytochrome *c* oxidase. Other sections deal with colour reactions for the determination of sugars in polysaccharides and with techniques for terminal and sequence studies of peptides and proteins. The methods considered are described in detail and a critical evaluation is made of their applicability.—H. G. Bray.

6004

KENT, P. W. and WHITEHOUSE, M. W. **Biochemistry of the aminosugars.** Butterworths Scientific

Publications, London, 1955, pp. ix + 311. [Dept. Biochem., Univ. Oxford.] Price 40s.

This appears to be the first extended account of amino-sugars and their derivatives to be published since Levene's monograph of 1925 and is therefore sure of a welcome among chemists and biochemists. The authors have collected their material assiduously and presented it in a clear and concise manner. The result is a textbook which will be of interest and value to students, teachers and research workers in many fields of chemistry and biochemistry. It must be said, however, that the title chosen for this book does not accurately indicate its scope. The authors state that their subject has been approached from a biochemical point of view and it is true that much of the background material is arranged and discussed from a biological standpoint. Only two chapters, however, are concerned with strictly biochemical information, namely, those dealing with the enzymic degradation of amino-carbohydrates and the metabolism of amino-sugars. It is clear from the length of these chapters that our knowledge of the role of amino-sugars in metabolism is still very meagre. The major, and more important, part of the book is chiefly concerned with the distribution, isolation and chemical behaviour of amino-sugars and related compounds and complexes. The section dealing with the chemistry of amino-sugars consists of chapters on the structure, properties and reactions of glucosamine, glycosides of glucosamine, galactosamine and 2-amino-hexonic acids. The book is well indexed and contains an extensive bibliography of all the topics treated.

H. G. Bray.

6005

PAECH, K. and TRACEY, M. V. (Eds.) *Moderne Methoden der Pflanzenanalyse*. Zweiter Band. Dritter Band. [Modern methods of plant analysis. Volumes 2 and 3.] Springer-Verlag, Berlin, 1955, pp. xii + 626, price 154s.; pp. xiii + 761, price 193s.

These two volumes form part of a four-volume work and follow a general account of up-to-date analytical methods which are applicable to plant materials. In their introduction the editors state that their "ambition . . . was to produce a laboratory manual of the highest standard possible". It can be said at once that they appear to have succeeded in their object extremely well. The different sections have been written by experts and, although the styles in which they write differ, all have produced accounts which will be of great value to the plant chemist and biochemist.

Particularly useful are the descriptions of the applications of chromatographic and ion-exchange techniques, which are becoming indispensable. Each review contains an extensive list of relevant references, so that these volumes will serve also

as an important bibliography. Volume 2 contains accounts of the estimation of mono- and oligo-saccharides and acidic monosaccharide derivatives, acyclic sugar alcohols, inositol and related compounds, ascorbic acid, phosphorylated sugars, starch, glycogen, fructosans and similar polysaccharides, cellulose and hemicelluloses, pectins, chitin, plant gums and mucilages, glycosides, fats and other lipids, volatile alcohols, aldehydes, ketones and esters, volatile acids, non-volatile mono-, di- and tri-carboxylic acids and lactones. Volume 3 is concerned with lower terpenes, pyrethrins and allied compounds, triterpenes and saponins, phytosterols, steroid saponins and cardiac glycosides, carotenoids, rubber and gutta, quinones, tropolones, simple benzene derivatives (phenols and acids), phenylpropane derivatives, lignans, anthocyanins, chalcones, aurins, flavones and related water-soluble plant pigments, lignin, natural tannins, anthraglycosides and dianthrone, growth substances in higher plants and antibiotics.—H. G. Bray.

6006

SCHARRE, K. *Biochemie der Spurenelemente*. [Biochemistry of trace elements.] Paul Parey, Berlin, 1955, pp. viii + 404. Price DM. 39.60.

This review consists of two main parts which deal with the role of 34 elements in soil and plants and of 24 elements in animal and human nutrition. Each section contains an extensive list of references which together occupy 130 of the 404 pages of the book, so that it will serve as an important bibliography.—H. G. Bray.

6007

DEUEL, H. J. (Jr.) *The lipids. Their chemistry and biochemistry*. Volume 2. *Biochemistry: Digestion, absorption, transport and storage*. Interscience Publishers, Inc., New York and London, 1955, pp. xxvi + 919. Price £10.

This book attempts to record and correlate all the available information concerning the digestion and absorption of lipids from the gastro-intestinal tract. Amongst the many topics covered are lipolytic enzymes, the role of bile, digestibility, pathways of absorption and methods used in the study of fat absorption. In addition to the full treatment accorded to triglycerides, an account of the fate of ingested phospholipids, waxes, sterols, hydrocarbons, carotenoids and fat-soluble vitamins is given. This section of the book is followed by an extensive description of blood lipids in normal and pathological states. The occurrence of lipids in the animal body as a whole is well covered and includes a detailed description of their distribution in specific tissues and their secretions.

As a work of reference the book is excellent, having an exhaustive subject index (over 50 pages)

and an author index. References in the body of the text are given in footnotes chapter by chapter.

G. A. Garton.

6008

RYTAND, D. A. and ANDERSON, J. (Ed.) **Annual review of medicine. Volume 6.** Annual Reviews, Inc., Stanford, Calif., 1955, pp. xiv + 459.

6009

MOUTIER, F. and CORNET, A. **Les gastrites. [Gastritis.]** Masson et Cie, 120, Boulevard Saint-Germain, Paris, 1955, pp. viii + 403. Price 4400 fr.

This text is largely a summary of the author's own work. Their experience in the diagnosis of gastritis in its different forms is described in detail with a wealth of illustrations reproduced both in black and white and in colour. From its nature the book must be of interest more to the clinician and the pathologist than to the nutritionist. The section devoted to treatment contains brief descriptions of the foods to be taken or to be avoided.—D. Harvey.

6010

HUTNER, S. H. and LWOFF, A. (Eds.) **Biochemistry and physiology of protozoa. Volume 2.** Academic Press, Inc., New York, 1955, pp. xiii + 388. Price 72s.

6011

SIMMONS, N. O. **Compound milling and associated subjects.** Leonard Hill, Ltd., London, 1955, pp. xix + 279. Price 42s.

Early in 1939 there was published "Provender Milling", by J. F. Lockwood, a member of a well known firm of milling engineers. In its two editions it has remained the standard text on the processing of feedingstuffs for livestock (see *Abst.* 2886, Vol. 15). Now a member of the same firm has prepared this book which deals more exclusively than did the earlier one with the machinery and gives less attention to the nutritional aspects of the subject. Descriptions have been assembled of all the varied types of machinery required for handling and treating the products between their arrival at the mill in their raw state and their leaving it in blended form ready for immediate

use. The result is a compilation which will be most valuable in countries where the manufacture of feedingstuffs is a growing industry.—D. Harvey.

6012

DANISH AGRICULTURAL ORGANISATIONS, COPENHAGEN. **Danish agriculture. Denmark as a food producer.** 1954, pp. 94.

This charming small book gives as good an account of Danish agriculture as has been written. It may be short, it may be quasi-popular, but the whole picture is there, historical and actual. Those who are accustomed to think of Denmark in terms of butter and eggs, cheese and bacon will be specially interested in the development of exports of breeding stock, meat, horses, seed potatoes, cereal seeds and fruit, especially apples. The book is illustrated with very good photographs and with marginal sketches, descriptive and comic or romantic.—I. Leitch.

6013

EWING, W. R. **Poultry nutrition.** W. Ray Ewing, Publ., Post Office Box 248, S. Pasadena, Calif., 1951, 4th ed., pp. xiv + 1518. Price 45.

This edition of a standard work is even more packed with information than its predecessors. The book mainly consists of a series of abstracts of many hundreds of papers classified under such headings as "protein", "fibre", "minerals", "slipped tendon". It is always clear what paper is being quoted, and contradictory opinions follow each other without comment, which is confusing until the principle is understood that the author is concerned to present first a guide to everything that has been said on each subject.

The short concluding chapters are of an entirely different nature and give clear practical advice on the designing of poultry rations, with comprehensive tables of the composition of feedingstuffs and the requirements of birds at different ages for individual vitamins and amino-acids so far as these are known.

With increased knowledge about the needs of turkeys, ducks and game birds the chapters dealing with these birds have been extended, and standards are given for the rates of growth and feed consumption that can be expected.

The 1500 pages of this book also include unexpected information, for instance on methods of sardine fishing on the Pacific coast (p. 259).

K. J. Carpenter.

8. FOOD AND AGRICULTURE ORGANIZATION (AND OTHER ORGANIZATIONS) OF THE UNITED NATIONS

Monthly Bulletin of Agricultural Economics and Statistics.

Vol. 4, No. 6, June 1955, pp. 40. Price \$0.50.
Vol. 4, No. 7, July 1955, pp. 48. Price \$0.50.
Vol. 4, No. 8, August 1955, pp. 60. Price \$0.50.

Yearbook of Food and Agricultural Statistics. 1954, Vol. 8, Part 1. Production. Rome, Italy, 1955. Price \$3.50. 1954, Vol. 8, Part 2. Trade. Rome, Italy, 1955. Price \$3.50.

Commodity Reports. Meat and livestock. Rome, Italy, July 1955, pp. 47. Price \$0.25.

Commodity Policy Studies No. 6. Uses of agricultural surpluses to finance economic development in under- developed countries. A pilot study in India. Rome, Italy, June 1955, pp. v + 65. Price \$1.00.

Of the 3 methods that might be employed to utilise surpluses (1) as an aid to economic development, (2) in welfare feeding programmes or (3) as relief in areas threatened by famine the first alone is dealt with in its applicability to India. The economic principles involved are fully considered so as to avoid interference with the economics of either the receiving or other exporting countries. The greater part of the study gives illustrative examples first of the distribution in kind of the surplus for use by those receiving it or by their families and second of additional employees being put to work on schemes of national importance and their extra requirements being met by the sale to them of the surplus products. Projects in the first group are mainly educational in nature; those in the second are concerned with road construction, irrigation works, re-forestation and prevention of soil erosion.

The need for other countries to work out similar development schemes with the present report as their model is stressed by the Director-General.

Commodity Policy Studies No. 7. The stabilization of the international trade in rice. A report on possible measures. Rome, Italy, August 1955, pp. iv + 38. Price \$0.50.

Report of the Council of FAO. Twenty-first Session, 6-18 June 1955. Rome, Italy, July 1955, pp. vi + 81.

The state of food and agriculture 1955. Review of a decade and outlook. Rome, Italy, September 1955, pp. xi + 236. Price \$2.50.

Since 1947 FAO has published annually a review of the state of food and agriculture. The 1955 edition is an enlarged one because the opportunity has been taken on the Organization's completing the first decade of its existence to include, in retrospect, a summary and, in

prospect, a long-term appraisal of developments and their effects. The recovery that has taken place in the post-war years and the progress in technology which has contributed so much to the increase in production are fully dealt with. Throughout the text there are many sets of data which allow comparisons of the pre- and post-war situations and the trends in the feeding of both man and animals are indicated. Nearly half of the book is devoted to a ten-year review of production, trade, prices and the short-term outlook for 19 commodities, 12 of which are foods or feedingstuffs.

Development Paper No. 52. Fact-finding with rural people. Rome, Italy, August 1955, pp. xii + 138. Price \$1.50.

This manual is intended both for the use of government officials and others whose duties may include the planning of social surveys and as a handbook of instruction for those who may have either to make the investigations or to interpret them. Suggestions for the selection of the facts to be investigated and for their analysis and presentation are amply dealt with and illuminating examples are given from actual experience in surveys made in different parts of the world. As the emphasis is on the social aspects dietary surveys receive no special consideration. There is a bibliography which runs to 33 pages and in which many of the studies have been grouped according to the regions in which they were made.

Report of the Third regional meeting on Food and Agricultural Programs and Outlook in Latin America. Buenos Aires, 1-10 September 1954. Rome, Italy, 1955, pp. 99. Price \$1.00.

The third regional meeting was attended by delegates from 17 Latin American, 1 North American and 3 European countries and by observers from 10 international and Inter- and Pan-American organisations. Basic agricultural problems and policies were considered and a number of recommendations were made with the aim of improving regional co-ordination and avoiding indiscriminate expansion of production which would accentuate the problem of surpluses. On the particular subject of the improvement of nutrition it was recommended that governments should determine for each region what is the minimum cost of a family diet and that this cost should be the basis for fixing wages. Specific problems on which recommendations also were made were technical assistance to farmers, livestock planning, statistics, marketing and plant protection; others were on related problems in the development of forestry and fisheries.

There are appendices (pp. 54-99) giving papers prepared for the meeting.

FAO Nutrition Meetings Report Series No. 9. Joint FAO/ WHO Expert Committee on Nutrition. Fourth report. Session held at Geneva 26 Oct.-2 Nov. 1954.

N.A. and R., October 1955

Rome, Italy, July 1955, pp. 58. Price \$0.60. Issued also as World Health Organization Technical Report Series No. 97.

At its fourth session the Joint Committee resumed consideration of the wider aspects of the subject as at its second session (see p. 1016, Vol. 21), the third having been limited to malnutrition in mothers and children (see p. 485, Vol. 24).

An outline is given of the separate and joint studies made by the Organizations since 1951. There follow under 12 headings more detailed references to particular subjects

on which advances have been made or on which further investigations are required. Suggestions towards such researches are advanced concerning requirements for energy and protein, the search for suitable protein-rich foods for infants and children, enrichment of dried skimmed milk with vitamins A and D, non-nutritive additives to foods, educational training in nutrition and in the particular diseases, pellagra, endemic goitre and degenerative conditions especially as they affect the heart. The use of anthropometric measurements for the assessment of nutritional status is also suggested for review.

See also Abst. 5999.

9. DEPARTMENTAL AND OTHER REPORTS

AUSTRALIA

Commonwealth Scientific and Industrial Research Organisation. 6th Annual Report for the Year ending 30th June 1954. Pp. 179.

Division of Biochemistry and General Nutrition

Nutrition and wool production. Causes underlying the seasonal variation in wool production by merino sheep: metabolic lesions occurring in copper deficiency; protein metabolism and wool growth.

Processes of rumination. Distribution of nitrogen between the protozoa and bacteria of rumen contents; digestion of nitrogenous compounds and conversion of plant nitrogen to microbial nitrogen; amino-acid composition of microbial protein; hemicellulose bacteria.

Carbohydrate metabolism of sheep. Pyruvate levels in blood; insulin hypoglycaemia; hexokinase activity of intestinal mucosa and brain; effect of pancreatotomy; toxicity of fluoroacetate.

Minor elements in animal nutrition. Cobalt deficiency in ruminants and relation to vitamin B₁₂; copper deficiency in sheep and relation to molybdenum.

Pinularis staggers.

Urea nitrogen as source of protein for sheep.

Metabolism in pregnant ewes. Pregnancy toxæmia.

Drought feeding of sheep.

CANADA

Range Experiment Station, Kamloops, B.C. Progress Report 1947-1953. Pp. 53.

Timber milk vetch (*Astragalus serotinus*) poisoning.

Abortion in beef cows caused by western yellow and lodgepole pine needles.

Cobalt and urea in relation to nutrition of sheep.

UNITED KINGDOM

Grassland Research Institute, Hurley, Berks. Experiments in Progress. No. 7, 1954 and 1955 Pp. viii + 72.

Production of worm-free lambs at pasture.

Worm infestation of sheep in relation to pasture management.

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Lungworm infestation of cattle in relation to pasture management.

Feeding value to pigs of herbage leaf protein extracts.

Bioassay of leaf protein extract.

Automatic recording of grazing behaviour.

Studies on the intake of pasture by grazing animals.

Analysis of minerals in plant material (P, Fe, Al, Mn, Zn, Cu, Mo, Ni, Co).

Large-scale extraction of leaf protein.

Feeding value of herbage leaf protein in chick rations.

Biological value of leaf proteins by the Thomas-Mitchell method.

Distribution of organic nitrogen compounds in plants.

UNION OF SOUTH AFRICA

South African Institute for Medical Research. Annual Report for the Year ended 31st December 1954. Pp. 106.

Calcium metabolism in South African Bantu. Chemical composition and density of bone; incidence of rickets in urban and rural areas; the height-weight relationship in Bantu mine workers.

Iron metabolism in the Bantu. Correlation between serum iron and hepatic siderosis; maternal serum-iron, breast milk iron and infant hepatic iron concentrations; histopathology and iron concentration of vertebral bodies from Bantu adults habituated to a high iron intake; haemoglobin concentration and nutritional state; haemoglobin concentration in gross under-nutrition.

Diet, serum cholesterol concentration and atherosclerosis. The etiological role of dietary factors other than fat; pathological grading and chemical composition of aorta from elderly Bantu and European subjects; serum cholesterol in obese Bantu women.

Nutritional studies on Bantu babies and young children. Methionine concentration of Bantu breast milk; rarity of scurvy in Bantu infants and children; metabolism of nutrients by Bantu children suffering from kwashiorkor.

Parasitic disease and nutritional state.

UNITED STATES OF AMERICA

Sixty-seventh Annual Report of the New York State
College of Agriculture, 1954. Pp. 119.

Relation of feeding and management to cause of the "stiff-limb" disease.
Comparison of various protein supplements and supplemental mixtures, and effects of vitamin and antibiotic supplements for growing and fattening pigs.
Prolongation of productive life.
Protein requirements of growing, fattening lambs.
Nutritional requirements of herbivora as studied by purified diet methods.
Comparison of protein supplements for fattening lambs.
Comparison of certain concentrate feeds for milk production.
Physiology and metabolism of fats and related constituents in animals.
Effect of curing methods upon feeding value of hay.
Investigations with young dairy calves on effects of composition of dry starters, levels of starter and hay consumption, and rumen inoculation, levels of milk consumption, and antibiotics.
Requirements and functions of cobalt in rations of livestock.
Value of cull beans in rations for fattening lambs.
Study to determine most economical methods of fattening steers under New York conditions, using maximum amount of pasture and other roughage with minimum amount of grain.
Milk production from permanent and rotation pasture mixtures, and its relation to herbage characteristics.
Studies on causes and prevention of reproductive failures in dairy cattle.
Causes and prevention of ketosis in ruminants.
Development and use of indirect methods for measurement of digestibility and rate of consumption of feedstuffs, particularly forages, by ruminants.
Value of molasses and urea in rations for dairy cattle.
Influences of feeding and management practices of young upon early rumen development and subsequent mature performance.
Nutritional requirements of baby pigs.
Whole-body composition and carcass studies of cattle at different ages and at 3 nutritional levels.
Chemical and biological evaluation of nitrogenous requirements of animals.

Influence of antibiotics in rumen digestion and synthesis.
Development of dry diets for mink.
Value of fat (beef tallow) in the ration for fattening lambs.
Pantothenic acid requirements of poultry.
Folic acid requirements of poultry.
Requirements of poultry for vitamin B₁₂.
Requirement of poultry for compounds furnishing labile methyl groups.
Requirements of poultry for nicotinic acid.
Requirements of poultry for protein and amino-acids.
Studies of physiology of growth, development, production, and food utilisation by poultry.
Mineral requirements of poultry.

JAPAN

The National Institute of Nutrition, Tokyo. Annual
Report 1954. Pp. 63.

Effect of environmental temperature on basal metabolism of Japanese.
Effect of environmental temperature on calorie intake of Japanese.
Energy metabolism of physically handicapped persons.
Studies on basal metabolism related to menstrual cycle.
Calcium balance of middle school boys and girls.
Estimation of calcium requirement of Japanese people during growth.
Fortification of takuanzuke (pickles) with calcium, vitamin B₁ and vitamin B₂.
Effect of maturing on the vitamin C in vegetables.
Estimation of vitamin C in foods with 2,4-dinitrophenylhydrazine.
Stability of vitamin A in enriched miso (soya bean paste).
Stability of vitamin A during baking of enriched bread.
Availability of vitamin A and carotene to deficient rats.
Biochemical effects of vitamin B₁ and riboflavin derivatives.
Effect of vitamin B₁₂ and antibiotics on calcium and protein utilisation.
Effect of sugar on the influence of oxalic acid on calcium utilisation.
The diet of urban workers.
Absorption of calcium and phosphorus from rice.
Iron intake of Japanese.
Iron binding capacity of human blood serum.
Salt intake of Japanese.

